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**Educational
Development:
Theories and
Application**

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Amanda da Silva
Head Organizer

**Educational Development Theories
and Applications**

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PRESENTATION

Welcome to “Educational Development: Theories and Application”, an essential work for all those involved in the field of education. This book offers a comprehensive and accessible exploration of the theories and practices that shape educational development.

Aimed at teachers, students, professionals in the field and anyone interested in the subject, this reading provides an insight into the fundamental concepts that underpin modern educational practice. Throughout the text, you will find an analysis of contemporary educational theories and their practical applications, offering valuable tools for improving pedagogical practice and theoretical understanding.

Whether you are an educator looking for new strategies, a student in training or a professional committed to deepening your knowledge, this book will serve as a guide to understanding and implementing best practices in educational development. By exploring the topics presented, you will be better prepared to face the challenges and seize the opportunities in the field of education.

Get ready for an enriching journey that will not only broaden your view of educational development, but also offer applicable insights for turning theory into effective practice.

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CHAPTER 1

INNOVATION FROM THE PERSPECTIVE OF PUBLIC SCHOOL TRANSPORTATION POLICIES IN PERNAMBUCO

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ABSTRACT: The State of Pernambuco develops public policy for school transportation, whose existence (or lack thereof) has a direct impact on the simplest level of the opportunity to attend school. Therefore, given the importance of this service, it is important to know how the state of Pernambuco is basing and organizing, for implementation and/or innovation of these policies. Starting from the conception of innovation as a rethinking in the current operationalization of these services either internally or externally, this research proposes to identify the instruments of innovations (or the lack of them) in the management of school transportation services in Pernambuco. As for the methodological procedures, the research is a descriptive exploratory study of qualitative approach, whose sources of information considered are the existing control instruments in the Management of Municipal Articulation of the State Secretariat of Education and Sports in the period 2017-2020, in the form of documents, spreadsheets, graphs, reports and tables. As for the management of school transport services in Pernambuco, innovation was emphasized in a broad perspective, having as a basis the knowledge connected with the interactive processes through which knowledge is created, exchanged, inter and intrainstitutionally, based on the principles of innovation strengthening the design of the public policy of public school transport. Therefore, it is emphasized the importance of public policy in the lives of students and how we must observe all the context that surrounds it, so that we have a fairer and more transparent State.

KEYWORDS: innovation, service management and monitoring, school transportation, public sector.

RESUMO: O Estado de Pernambuco desenvolve política pública de transporte escolar, cuja existência (ou falta dela) tem um impacto direto no nível mais simples da oportunidade de frequentar à escola. Para tanto, dada a importância deste serviço, é importante saber como o estado pernambucano está fundamentando e organizando, para implantação e/ou inovação dessas políticas. Partindo da concepção de inovação como um repensar na atual operacionalização desses serviços seja interna ou externamente, esta investigação propõe-se a identificar os instrumentos de inovações (ou a falta deles) na gestão dos serviços de transporte escolar em Pernambuco. Quanto aos procedimentos metodológicos, a pesquisa é um estudo descritivo exploratório de abordagem qualitativa, cujas fontes de informação consideradas são os instrumentos de controle existentes na Gerência de Articulação Municipal da Secretaria Estadual de Educação e Esportes no período de 2017-2020, sob forma de documentos, planilhas, gráficos, relatórios e tabelas. Quanto a gestão dos serviços de transporte escolar em Pernambuco, enfatizou-se a inovação numa perspectiva ampla, tendo como base o conhecimento conectado com os processos interativos através do qual o conhecimento é criado, trocado, inter e intra institucionalmente, com base nos princípios da inovação fortalecendo o desenho da política pública de transporte escolar público. Portanto, enfatiza-se a importância da política pública na vida dos estudantes e o quão devemos observar todo contexto que a envolve, para que tenhamos um Estado mais justo e transparente.

PALAVRAS-CHAVE: inovação, gestão e monitoramento de serviços, transporte escolar, setor público.

1 INTRODUCTION

The educational problems found in our country highlight that the process of exclusion in education has been occurring mainly in two ways: lack of access to schools and the precarious inclusion of students in education systems. According to Gristy and Johnson (2018), “transportation is not simply a means to an end in terms of access to education.” Given that some children, young people, and adults do not even enroll, while others have their school attendance interrupted due to the absence or inadequate provision of school transportation services.

Assuming that significant inventions and improvements implemented constitute innovations, it is appropriate to affirm that innovations have always been part of humanity’s trajectory (Silva, 2019). From this perspective, the literature on innovation associates it with the emergence of new ideas. Schumpeter (1934), for example, addresses the topic through the commercial application of a new idea, relating innovation to a process characterized as creative destruction, which occurs through the introduction of a new good or a new quality of a good, a new production method, the use of a new raw material, the conquest of a new market, or the creation of a new form of organization.

The state develops public policies for school transportation, whose existence (or lack thereof) has a direct impact on the most basic level of the opportunity to attend school. Innovation in the management of school transportation services is conceived as a rethinking of its current internal and external operationalization. Given the importance of this service, it is crucial to understand how the state of Pernambuco is grounding and organizing the implementation and/or innovation of this policy.

From the perspective of suggesting alternatives for resizing the activities and, consequently, the functions and responsibilities of those involved at the central, regional, and municipal levels, Freitas Filho (2013) describes innovation as the capacity of organizations to use their creativity, knowledge, and skills to generate a change that alters the current state of a product, service, or new technology, a process, or even in the creation of a new untapped market. When we speak of change, we are referring to innovation, as well as new combinations of factors that alter existing equilibriums.

In this context, basic or incremental innovation was chosen, which means small continuous improvements, always present in each wave of innovation, increasing performance, lowering price or cost, and thus bringing social and economic benefits, new

ideas that need to be “new” in that they represent an improvement of something existing, whether the invention of something fundamentally new or the implementation of existing ideas in a new context.

The objective of this research is to identify the instruments of innovation (or the lack thereof) in the management of school transportation services in Pernambuco. In this sense, the study was based on knowledge connected to the interactive processes through which knowledge is created and exchanged, both inter- and intra-institutionally, grounded in the principles of innovation, strengthening the design of public school transportation policy while always measuring the empirical analysis of data, a key factor for innovation.

The following text is divided into five sections, in addition to this introduction. The second section presents the methodology; the third section covers organizational innovation in the public sector, barriers and facilitators of innovation in school transportation, and innovative experiences related to public school transportation in Pernambuco with the implementation of a Public School Transportation Monitoring Action (AMTEP). In the fourth section, some data collected on the innovation instruments used in the school transportation policy in Pernambuco from 2017 to 2020 are analyzed. The fifth section concludes the paper with final considerations, followed by the references used.

2 INTRODUCTION

Regarding the methodological procedures used, the research had a qualitative character, as it encompassed a mosaic of orientations with multiple interpretations of the same event (Yin, 2016). The study sought to identify innovations implemented in the school transportation policy in Pernambuco, with sources of information considered being the control instruments available at the Municipal Articulation Management of the State Secretariat of Education and Sports during the period of 2017-2020, in the form of documents, spreadsheets, graphs, reports, and tables, as well as published articles that reference the focused theme.

As for the objectives, the study fit as an exploratory and descriptive one. According to Martelli (2020), exploratory research leads the researcher to new discoveries of approaches, perceptions, and terminologies, gradually contributing to a modification in

their own way of thinking. In this sense, it is typically the first step for those who intend to study a field in which they do not yet have sufficient knowledge, serving as a starting point for future studies. Descriptive research, on the other hand, requires careful planning regarding the definition of methods and techniques for data collection and analysis, recommending the use of information obtained through exploratory studies (Fernandes et al., 2018). Examples of this type of research include case studies, document analysis, and ex-post-facto research.

Bibliographic research was used, which consists of analyzing material already developed on a specific topic in search of answers to a particular question (Sihler, 2018). Through this approach, the researcher creates interrelations between materials considered relevant on the subject: books, journal articles, newspaper articles, historical records, government reports, theses, and dissertations, among others.

For the development of this study, documents with the data collected on the management of transportation services used by students from state schools in the 170 partner municipalities of the Program in the State of Pernambuco were first analyzed. This data was transformed into information. From there, theoretical publications that could provide theoretical support on the topic of innovation were researched. Within this context, the Municipal Articulation Management (GAM) implemented the Public School Transportation Monitoring Action (AMTEP), aiming to understand the daily reality of the execution of these services, with the goal of taking timely measures to correct probable irregularities, as well as gradually contributing to a culture of preventive work.

3. THEORETICAL DISCUSSION

3.1 ORGANIZATIONAL INNOVATION IN THE PUBLIC SECTOR

Innovation plays an important role in the development of nations and should be a focus of attention not only for the productive sector but also for the academic and governmental segments. The latter, among its responsibilities, must concern itself with the creation of public policies capable of enabling the integrated actions of different social agents and, consequently, promoting development.

According to Freitas Filho (2013), innovation is considered the union of idea, implementation, and positive results. The author explains that inventing and innovating

are distinct terms, with the former related to the exclusive creation of a new product or solution, while the latter presupposes the implementation of a concept in light of improved results, which may be applied in either an exclusive or transformative manner. Considering the objectives and functionality that an organization intends to transform or build, Tigre (2014) presents three forms of innovation performance. According to him, innovation can occur through technological, procedural, or organizational modeling.

According to the European Commission (2014), innovation can be defined as the process of generating and implementing new ideas aimed at creating value for society, with a focus either internally or externally on public administration (Cavalcante et al., 2017). Innovation is not the only tool, but it should become one of the main strategies for the public sector to achieve better results and reduce costs.

In this sense, innovation involves the implementation of new ideas capable of generating significant and positive changes, especially in the public sector, where it can be translated into collective benefits. The opportunity for innovation presents itself as an imperative of new times in the public sector. Innovating in the public sector can be understood as: improving something already in progress to enhance the institution's impact in delivering services; gradually adapting a tested idea to a new context; or developing something entirely new to meet or exceed the institution's goals.

It is important to note that innovation in services is organized in a less formal way, has a more incremental and less technological nature, but empowerment is a prerequisite for this practice. From this perspective, Innovation Management in services can be understood as the set of actions and activities that serve as a foundation for an institution to gradually innovate and turn this into a routine. It has a strategic character in which the institution must establish a work line that the entire team can contribute to, making it necessary to direct all institutional actions accordingly and measure them against the proposed objectives. Moreover, this is an alternative to managing a team and ensuring that service delivery is focused on this procedure.

3.2 BARRIERS AND FACILITATORS OF INNOVATION IN SCHOOL TRANSPORTATION

For organizations to deal with change, uncertainty, instability, competition, and promote innovation systematically, they must pay attention to their work environment, removing barriers and encouraging actions that maximize opportunities for innovation to emerge.

In this research, identifying barriers and drivers of innovation in school transportation is a crucial step in analyzing the main obstacles encountered and the fundamental aspects required for innovations to occur, which can support future decision-making by public managers.

The study of barriers to innovation focuses on the problems that may arise throughout the complex and delicate innovation process. These factors, which introduce some obstruction or inertia to innovation, known as barriers to innovation, can emerge for various reasons (Gentil, 2016; Ribeiro & Tentes, 2016; dos Santos et al., 2019). Thus, their identification and categorization are essential, as they will enable the creation of mechanisms to reduce their presence, minimizing, eliminating, or even converting them into facilitators of innovation.

Among the main barriers identified in Pernambuco were: resistance, limitation of human resources, conflict of interest, legacy practices from the outsourcing process, lack of knowledge about social control, costs, and restrictions in the public structure specifically aimed at meeting the demands of rural school transportation in Pernambuco.

As for facilitators, teamwork, legitimacy and commitment, and the development of people and competencies stood out. As a driving factor for the adoption of innovative practices, federal and state regulations were highlighted, which led to the emergence of the need to include outsourcing in school transportation and the social pressure exerted in discussion spaces such as forums and public hearings.

3.3 EXPERIÊNCIA INOVADORA LIGADA AO TRANSPORTE ESCOLAR PÚBLICO EM PERNAMBUCO

Educational projects such as the rural school transportation program, implemented through structured planning and funding within a public policy framework, can establish a process that creates new arrangements and models for basic education in Pernambuco.

It is evident that support for educational systems cannot be limited to funding alone. Quality, effective, and efficient technical assistance with collective participation is necessary to contribute not only to the proper execution of resources but also to the organization of actions.

Within this context, Pernambuco sought, from 2017 to 2020, to implement some innovations in the management of the State School Transportation Program (PETE), with the aim of addressing two major challenges: safety and qualified service for students in public schools at both state and municipal levels. These innovations were structured around the following aspects: qualification and improvement; monitoring; and legislation.

Regarding qualification and improvement, the development of any service requires the qualification and improvement of those responsible for its execution, as service quality is the fundamental indicator to ensure user satisfaction. For this qualification, the "In-Company" training method was adopted, as it addresses professional development according to the specific needs of the respective functions, while simultaneously ensuring the development of concepts, techniques, tools, and skills aligned with the institution's needs. This training practice offers the following benefits: content customization, alignment with the institution's reality, schedule flexibility, time savings, and guaranteed engagement.

This "In-Company" training was conducted in partnership with the Professor Barreto Guimarães Public Accounts School (ECPBG), affiliated with the Pernambuco Court of Accounts (TCE-PE), with the primary theme being "School Transportation – Project Analysis and Management in Light of TCE Resolution No. 006/2013." The training aimed to strengthen technical support actions for municipalities in terms of planning and organizing the provision of transportation services. It involved participants from 171 municipalities, divided into 9 groups of 40 participants each, by Regional Education Management (GRE), with a total of 20 hours of theoretical and practical classes taught by TCE-PE auditors. The topics covered included internal control and a series of procedures on how the transportation service should function. The target audience for the qualification consisted of education secretaries, mayors, those responsible for school transportation in the municipalities, as well as technical staff and managers of regional education management offices.

Finally, in terms of legislation, the state of Pernambuco enacted Law No. 16.882, dated May 15, 2020, which amended Law No. 13.463, dated June 9, 2008,

the law that established the State School Transportation Program (PETE). This program operated for 11 years before being amended to meet the new realities of municipalities and students, including the implementation of innovative high school and vocational education. These changes responded to new demands from students and ensured their constitutional right to education.

It is important to note that with the amendment of Law No. 13.463, dated June 9, 2008, the state of Pernambuco ensured the right to education for students who do not necessarily reside in rural areas. This notably places Pernambuco among the Brazilian states that also serve students residing in urban areas who lack the financial means to afford transportation to their school. This is because national legislation guarantees transportation only to students living in rural areas.

In fact, this initiative by the state of Pernambuco to expand this right to other students has become a local public policy, with resources allocated from the state treasury, respecting the provisions of the 1988 Federal Constitution and the Law of Guidelines and Bases (LDB), thus contributing to the realization of a socially inclusive quality education.

Within the regulatory framework, it is worth noting that the obligation to provide school transportation is supported by various legal texts, such as:

- Federal Constitution/1988: Article 208. The State's duty to education will be fulfilled by ensuring: VII - student assistance, at all stages of basic education, through supplementary programs of school materials and transportation;
- Law No. 9.394/96 (as amended by Law No. 10.709/2003): Article 10. The States shall be responsible for: VII - assuming the school transportation of students in the state network. (Included by Law No. 10.709, dated July 31, 2003). Article 11. Municipalities shall be responsible for: VI - assuming the school transportation of students in the municipal network (included by Law No. 10.709, dated July 31, 2003);
- Amendment to Law No. 13.463, dated June 9, 2008, which established the State School Transportation Program (PETE). Article 1, 2008, through Law No. 16.882, dated May 15, 2020, is amended as follows:

"Article 1. The State School Transportation Program (PETE) is established in Pernambuco, under the Secretariat of Education and Sports, with the objective of providing school transportation to students in the State Education Network, residing in

rural areas more than 2.5 kilometers from their school, through technical and financial cooperation with municipalities or Regional Education Management Offices." (NR)

§ 1. For the purposes of this Law, students who do not reside in rural areas may be served when enrolled in schools located in hard-to-reach areas for which there is no alternative transportation available. (AC)

§ 2. The provision of school transportation for students regularly enrolled in the State Education Network, when not served by partner municipalities, will be the responsibility of the Secretariat of Education and Sports through Regional Education Management Offices." (AC)

- Amendment to Law No. 16.882, dated May 15, 2020, which establishes the State School Transportation Program (PETE) through Law No. 17.856, dated June 27, 2022, which introduces the following changes in financial transfer bands:
- Municipalities with a territorial extension up to 500 km² Band 1: R\$ 1,096.30;
- Municipalities with a territorial extension above 500 km² and up to 1,000 km², Band 2: R\$ 1,315.55;
- Municipalities with a territorial extension above 1,000 km² up to 1,500 km², Band 3: R\$ 1,644.46;
- Municipalities with a territorial extension above 1,500 km², Band 4: R\$ 2,137.79, with an increase of R\$ 180 per capita/student;
- Municipalities with a territorial extension above 1,000 km² and a population density of less than or equal to 50 inhabitants per km² receive a 50% increase (I, II, III, and IV) on specific additional routes (New High School, EREMs/EREFs).

In addition to the clear obligation regarding quality school transportation for students who need it, the 1988 Federal Constitution establishes the need and importance of collaboration between federative entities, always aiming to ensure access to education with a focus on quality student learning.

3.4 PUBLIC SCHOOL TRANSPORTATION MONITORING ACTION IN PERNAMBUCO

The Municipal Articulation Management (GAM), in alignment with the Secretariat of Coordination and Planning (SECO), implemented the Public School Transportation Monitoring Action (AMTEP) in June 2022. Its purpose was to portray the real situation of

the school transportation services provided in the 183 municipalities of the state of Pernambuco using public funds.

According to de Martino Jannuzzi (2020), the function of activity monitoring is to generate simple and timely information while simultaneously verifying the regular and systematic execution of activities and their results. It also includes gathering data, producing information, and observing service delivery to ensure that the services are being executed in accordance with the terms of the service contracts. In this sense, monitoring acts as a tool that broadens managers' knowledge of the program's execution, identifying its respective problems, obstacles, and occurrences. This tool helps managers recognize and address various situations.

According to Piecha and Valerelli (2008), monitoring fulfills several functions, the most notable of which are:

Contributing to program efficiency by feeding back into management, optimizing resource use, and reducing costs.

Guiding, reviewing, and adjusting the development and execution of the services provided for school transportation. As it is an indispensable management and learning tool, it supports the reflection and adjustment of execution strategies.

Providing transparency in information and strengthening communication. Monitoring can serve to keep different stakeholders, partners, and the general public informed about the progress of actions and the status of service execution.

In terms of monitoring in the state of Pernambuco, this is understood as the continuous and systematic follow-up by those involved in the execution of the State School Transportation Program (PETE), specifically regarding the services provided to students in Pernambuco's state schools. The purpose is to provide managers with objective and accurate information about daily occurrences that may hinder the smooth operation of services, and consequently, the end product, which is the student—ensuring their access to and retention in school.

Thus, focusing on monitoring means anticipating problems and resolving them in a timely manner. With this mindset, the Municipal Articulation Management (GAM) implemented the Weekly Occurrence Spreadsheet (POSTE), a tool for recording weekly occurrences filled out via phone calls with technicians from 14 Regional Education Management Offices, as well as through online submissions. This tool has strengthened collaboration with the technicians responsible for school transportation in the 14 regional

offices, clarifying doubts, encouraging, and guiding local decision-making to avoid potential barriers to student access and retention in schools.

In addition, it contributed to updating GAM's database with the main occurrences. Through this monitoring process, problems were detected and classified as follows:

Recurring (always happen): lack of vehicle maintenance and preservation, delays in student transportation to school, overcrowding, and vehicle stoppage due to non-payment to outsourced companies.

Occasional (happen from time to time): drivers not taking students home at the end of classes, and students enrolled in programs with a different academic calendar from regular education.

As the monitoring process continues and is refined, it becomes clear that monitoring is an inherent management function, as it supports decision-making and provides social oversight of public policy implementation and execution.

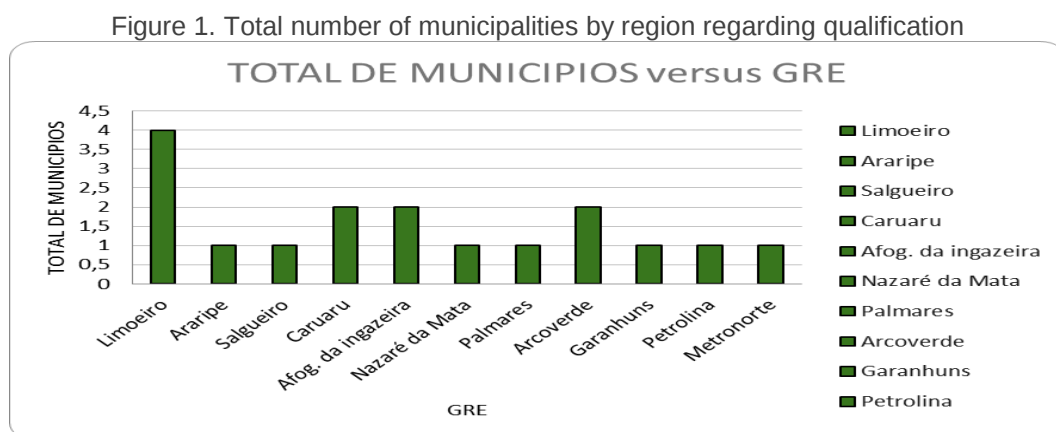
From this perspective, monitoring relies on the systematic observation, collection, and analysis of data and indicators on service delivery. It is a tool that uses information to guide, correct, and adjust potential irregularities during execution. In this context, monitoring can increase transparency in public management, lead to more efficient decision-making, promote the exchange of ideas and experiences regarding service delivery, and drive the implementation of innovations and the generation of new knowledge in public administration.

Therefore, monitoring tools are, in practice, a way to enhance management practices and optimize the reach of public resources allocated to school transportation.

4. DATA ANALYSIS

The rural area of Pernambuco presents many specificities, particularly complicating data collection. From the perspective of seeking cause-effect relationships in the variables related to the management of school transportation services, the lack of information poses a challenge. This shortage of data limited the research to the information available from the Municipal Articulation Management (GAM). Due to these limitations, the study focused on the association between two variables: qualification/training and monitoring.

Initially, regarding the aspect of qualification and training, the importance of the "In Company" training for the management of school transportation services was taken as a point of analysis, based on the number of municipalities per regional office versus the number of registrants. The number of registrants in relation to the municipalities by Regional Education Management (GRE) is represented in Figure 1 below.



Source: Data provided by the Municipal Coordination Management /SECO

Table 1 below shows the number of municipalities by region and the respective occurrences regarding monitoring.

Frame 1. Monitoring of municipalities by region regarding occurrences

OCCURRENCES	GRE	NUMBER OF MUNICIPALITIES
Lack of payment and fuel	Petrolina	2
	Araripina	1
	Floresta	1
	Garanhuns	1
	Salgueiro	3
	Caruaru	1
Irregularities in contracted routes	Petrolina	1
	Afogados da Ingazeira	2
	Garanhuns	4
	Salgueiro	2
	Araripina	1
	Caruaru	1
	Arcoverde	3
Poor and inadequate vehicles	Arcoverde	5
	Salgueiro	4
	Petrolina	1
	Floresta	2
	Garanhuns	1
	Metro Sul	1
	Nazaré da Mata	1
	Garanhuns	5
	Arcoverde	6

OCCURRENCES	GRE	NUMBER OF MUNICIPALITIES
Lateness in serving students	Vitória de Santo Antão	2
	Palmares	1
	Metro Sul	1
Overcrowding	Arcoverde	2
Inadequate Roads	Nazaré Da Mata	1
	Arcoverde	2
	Salgueiro	1

Source: Data provided by the Municipal Coordination Management /SECO

Table 1 above shows that, despite quality of service being a fundamental principle of constitutionally guaranteed public services, the number of participants per class did not meet the proposed number of vacancies and was consistently lower across all regional offices.

Regarding monitoring, the data analyzed were derived from the POSTE Spreadsheet, covering the period from May to December 2019, which outlines the main occurrences. Based on the variables studied, a clear cause-and-effect relationship is presented; that is, without guaranteed school transportation services, students are consequently kept out of school.

Therefore, it is evident that, even partially and temporarily, there is a practical denial of the right to education. The main occurrences during this period include: non-execution of services due to lack of payment and fuel; irregularities in contracted routes; poor and inadequate vehicles; tardiness in providing service to students; overcrowding of vehicles; and inadequate roads.

The analyzed data shows that even within a smaller number of municipalities, occurrences that harm state school students using school transportation are identified, such as: incompatibility between the state and municipal school calendars, established workload, and different teaching projects from regular education. For example, 170 students from EREM Desembargador João Paes in the municipality of Serrita lose 10 classes weekly due to scheduling conflicts, as the municipality does not guarantee transportation for students at the end of the school day. In the municipality of Araripina, drivers refuse to pick up students living 18 to 34 km away from the school, resulting in 30 to 40 students from regular high school and the Travessia program missing school for several days. Other reported factors include: dissatisfaction with the provision of transportation services and dissatisfaction among mayors regarding the amount of state funding allocated to municipalities, among others.

5. FINAL CONSIDERATIONS

This study was structured based on the information collected about the management of school transportation services in the state of Pernambuco, with the guiding axis being the concept of innovation, both as a rethinking of the operationalization of these services and the theoretical foundations of the innovation theme. This concept, far from being limiting, served to identify the types of innovation present in the public policies of school transportation in Pernambuco.

Considering the results presented, demonstrating the response to the demand for accessible public school transportation services, which is one of society's aspirations to facilitate children's and young people's access to school, it can be inferred that public policies for school transportation have sought to contribute, although there is still much to be done, to ensure access and retention of students in school, supporting the challenge of addressing the disparities and issues involved in the development of basic education in our state.

After analysis, it was found that there is a need to implement innovations in the workplace, including new methods, the distribution of new responsibilities, decentralization of activities, enhancement of effective monitoring activities, incorporation of data processing practices to transform data into information; and the annual allocation of financial resources to research in order to obtain accurate information on how services are being provided in regions with their respective specificities, with the aim of ensuring the constitutional right of students with safety and quality in the provided school transportation.

It is concluded that the adoption of daily managerial monitoring, which involves methodically and systematically overseeing the application of financial resources for school transportation, the identification and conditions of contracted routes, and the conditions of vehicles, with a focus on student safety and comfort, is a significant innovation in the managerial control of the state of Pernambuco. This is an interactive and proactive management tool that uses information with the necessary depth to achieve its purpose. Thus, it satisfactorily fulfills the methodical and organized monitoring of the use and application of financial resources, contracted routes, travel conditions, vehicles used, and circulation conditions.

The information gathered here leads us to understand that concrete actions and viable solutions, within the framework of a state policy and plan, can become essential elements for solving problems in the educational reality of Pernambuco. However, it is necessary to go beyond the analyses presented here and seek to understand how public programs are initiated and not discontinued, becoming state policies that continue to expand and remain linked to people's needs.

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CHAPTER 2

PSYCHOSOCIAL IMPACTS INVOLVING ADOLESCENTS IN THE PREPARATORY PHASE FOR THE ENTRANCE EXAM IN PRIVATE AND PUBLIC SCHOOLS IN MOSSORÓ/RN

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ABSTRACT: This study is intended to identify the psychosocial impacts on students facing the preparation for the college entrance exam, for public and private education system, through a case study with an applied purpose and a quantitative approach of a comparative nature, with a sample size of 70 students. The results highlighted the authentic importance of psychological work to mitigate psychosocial impacts in this scenario, in addition to the real emotional instability pointed out by the students themselves to meet personal, social and family demands in the search for identity and professional role. The article also found the need for more studies aimed to analyze the identified emotional shocks, such as anxiety.

KEYWORDS: psychosocial impacts, entrance exam, adolescent, public school, private school.

RESUMO: Esse estudo teve como objetivo identificar os impactos psicossociais em alunos na face preparatória para o vestibular, em rede pública e privada de ensino, através de estudo de caso com finalidade aplicada e abordagem quantitativa de caráter comparativo, com número de amostragem de 70 alunos. Os resultados apontaram a autêntica importância do trabalho psicológico para atenuação dos impactos psicossociais nesse cenário, além da real instabilidade emocional apontada pelos próprios estudantes para atender a demanda pessoal, social e familiar na busca de

identidade e função profissional. O artigo também constatou a necessidade de mais estudos voltados para análise dos abalos emocionais identificados, como a ansiedade.

PALAVRAS-CHAVE: impactos psicossociais, vestibular, adolescente, escola pública, escola privada.

1 INTRODUCTION

Adolescence is a phase marked by significant experiences that assume different functions depending on the individual's socioeconomic condition. While some experience this transition through first romances, completing high school, taking entrance exams, and the early years of college, others may stop studying, enter the job market, establish marital relationships, and may quickly enter parenthood (Melsert & Bock, 2015; Dias et al., 2014 apud Galla-Belluzzo et al., 2017). It is evident that the way adolescence is experienced is deeply associated with the social, economic, cultural, historical, and geopolitical contexts in which it occurs (Montezi et al., 2023; Tachibana et al., 2015 apud Galla-Belluzzo et al., 2017).

Regarding the potential vulnerabilities characteristic of adolescence, which may cause harm to health and coincide with risk behaviors, this phase can lead to mental disorders that reflect and precede numerous etiologies originating from social and environmental interventions. As Avila (2005) points out, when adolescents look at themselves in the mirror, they notice changes happening that they cannot control, changes that invade and transform them. With this growth comes the fear of losing their childhood status: will I still be loved? The insecurity between the unconditional love, dependence, clearly defined roles, and protection that they had as children and the desire for autonomy and freedom leads them to contrasting behaviors, sometimes acting as adults and sometimes as children.

Furthermore, psychosocial development in adolescence is marked by the search for identity, the onset of sexual experiences, instability in social and family relationships, and the likelihood of antisocial and even violent behaviors. Confronting the need for future professional choices, the search for identity is a primary factor that, as "Erikson defined, is a coherent conception of the self, constituted by goals, values, and beliefs with which the person is solidly committed – comes into focus during the adolescent years" (Papalia et al., 2013, p. 422 apud Erickson, 1998). The search for the self is a natural and necessary process, serving as a foundation for the experiences of childhood that will project into adult life (Papalia et al., 2013).

In a study on stress among college entrance exam candidates, Martins et al. (2021) found higher stress levels among female students, possibly due to societal pressures and hormonal variations, and students living with their parents, where family

pressure was a significant factor in the student's preparation, either beneficial or detrimental. The importance of healthy bonds between parents and children is emphasized to ensure security and trust. In parallel, Sindeaux (2020) highlighted that confidence in taking the entrance exam might be justified by intermediate levels of anxiety, supporting the understanding of the changes occurring during this period and the search for identity.

As the professional project in adolescence is marked by entering higher education, characterized by the significant milestone of the college entrance exam (vestibular), it becomes a priority for many. The vestibular is a public examination that grants admission to higher education in Brazil, and its evaluative process can lead to an exacerbation of feelings, sometimes previously unexperienced by students. Some physiological disorders related to the onset of pathological anxiety include headaches, insomnia, tremors, chest pains, and, primarily, Chronic Non-Communicable Diseases (CNCs). Unexpected physical symptoms may arise when students cannot differentiate the complex factors, allowing emotion to dominate reason (Pelazza et al., 2019).

According to Neves, Raizer, and Fachinetto (2007), education in Brazil has shown some progress in recent years, but the scenario has not changed significantly. They refer to the expansion of higher education after the 1970s, where the country stopped expanding the public network, favoring the private network; in this network, students from wealthier families have more opportunities due to their families' financial conditions. Their study also highlighted that the expansion of Higher Education Institutions does not translate to increased access for students from poorer families. PNAD/IBGE data from 2004 show that the majority of university students come from wealthy families, "only 2.3% and 1.2% are occupied, in public and private education respectively, by poorer students, [...] who represent 30.2% of the country's families" (Neves, Raizer, & Fachinetto, 2007, p. 146).

Therefore, considering the relevance of this issue, the article aims to identify the psychosocial impacts on adolescents during the preparatory phase for the vestibular, considering this experience as triggering feelings of fear, powerlessness, doubts, and uncertainties. By identifying which psychosocial impacts are related to adolescent development during this phase, whether they interfere or not, categorizing the cognitions, emotions, feelings, and behaviors that may emerge from this period, and assessing the possible social consequences over their lifetime. It will also seek to understand the

psychologist's role and the importance of psychological treatments to alleviate these pre-exam sensations. To address this, applied, quantitative, and descriptive research will be conducted using case studies. The relevance of this research lies in promoting studies and information for psychological treatments and practices used with adolescents during the pre-exam period, as well as contributing to the knowledge production on these impacts from a psychological perspective.

2. METHODOLOGY

The method used in this study was descriptive research, with an applied purpose and a quantitative approach of a causal-comparative nature, aiming to analyze the psychosocial impacts among adolescents preparing for the college entrance exam and the differences between public and private schools. Furthermore, as Hymann (1967) notes, descriptive research reports on an observed phenomenon by analyzing, interpreting, and demonstrating how it occurs.

The non-probabilistic sample included students from a classroom in both public and private high schools, allowing students the option to choose whether or not to complete the questionnaire. From the private school, located in a central neighborhood of Mossoró/RN, which has its own building and includes students from Early Childhood to the 3rd year of High School, with two classes and 66 enrolled students, 46 responses were collected. From the public school subsidized by the State of Rio Grande do Norte, located in the Alto do São Manoel neighborhood of the same city, which only has students in the 3rd year of High School with one class and 33 enrolled students, 24 responses were obtained, totaling 70 completed questionnaires.

The research instrument was an objective questionnaire with a total of 13 questions: 11 multiple-choice questions with single answers and 2 with the possibility of multiple answers, one of which was conditional. The questionnaire was administered in the morning at both schools, provided by the present teacher, with no identification to ensure that students felt completely free to answer the questions.

The analysis of the responses sought to identify age, sex, and family income to map the sociodemographic profile, investigating whether these factors correlated with the identified psychological impacts. Additionally, questions with a psychological focus were included, such as family interference, personal and family professional

expectations, and possible emotional instabilities, as well as aspects related to study practices. Patterns, relationships, differences, and trends between the responses from students in public and private networks were observed to identify any psychosocial impacts associated with this aspect.

All participants signed the Free and Informed Consent Term (TCLE), allowing the use of data for research and publication. This document was crucial for ensuring the ethical application and analysis of the research project, guaranteeing respect for participants' rights.

3. RESULTS AND DISCUSSIONS

Das respostas aplicadas emergiram várias categorias de análises e comparações. Todavia, serão ressaltados os principais resultados relacionados diretamente ao alcance dos objetivos deste trabalho. É importante destacar que todas as perguntas-respostas estão apresentadas na perspectiva comparativa entre rede pública e privada, tornando mais claro as possíveis diferenças existentes.

A maioria dos resultados referente a idade determina que os adolescentes têm entre 17 a 19 anos, sendo apenas um abaixo dessa idade. No qual, 17 e 18 anos seria a idade ideal para finalizar o ensino médio, levando em conta a hipótese de já se matricularem na faculdade no ano seguinte.

Cerca de 56,5% dos alunos da rede privada declararam que a renda total da família é acima de 5 salários mínimos, considerando um salário de cerca de R\$1.320,00, e 23,91% entre 3 e 4 salários. Em contrapartida a rede pública com 38,46% recebem até um salário mínimo e aproximadamente 26,16% recebem de um a dois salários mínimos. Essa diferença de renda impacta diretamente no desenvolvimento e no aprendizado do jovem. Sabemos que a realidade do aluno da rede pública é bem diferente, onde muitos precisam trabalhar para ajudar os pais com as necessidades domésticas. O foco muitas vezes é desviado dos estudos (investimento de tempo e dinheiro) para uma recompensa momentânea (trabalho).

Como reforça Salvato (2010) a média da escolarização em regiões mais vulneráveis é aproximadamente três anos menor que as demais regiões desenvolvidas. Observando que a renda é regular com a escolaridade, confirmando a conjectura da diferença da renda ser explicado pela diferença da escolaridade.

Ao serem questionados sobre a rotina diária de estudos, a maioria dos alunos responderam que apenas estudam, somente 8,69% da rede privada e 8,33% declararam que também trabalham. Um número baixo, porém, essa pequena quantidade de estudantes pode apresentar um esgotamento físico e mental mais rápido que os demais que apenas estudam.

Frame 1. If students consider they have easy access to studies

Alternatives	Privada	Pública
Going to school	95,65%	92,30%
Internet access	95,65%	91,66%
Access to books	93,47%	37,50%
Quality time to study	86,95%	8,33%
Rest/leisure time	84,78%	33,33%
Emotional stability	58,69%	4,16%
Family support	93,47%	25%

Source: Prepared by the authors

Regarding Table 1, three responses are highlighted for discussion. Firstly, the discrepancy regarding easy access to quality study time between private (86.95%) and public (8.33%) schools; secondly, emotional stability in private (58.69%) versus public (4.16%) schools; and thirdly, the familial support that adolescents feel they receive in private (93.47%) versus public (25%) schools.

These data clearly demonstrate the differences in the environment that students experience concerning study opportunities in preparation for the college entrance exam. Conjecturing that these are crucial aspects for optimal cognitive and emotional functioning, the individual who manages to have quality study time, as noted by the Programa Pró-vida of the Tribunal de Justiça do Distrito Federal e dos Territórios (2023), considers this as a space dedicated with full attention to a task. Constant alertness leads to harm beyond mere disposition, affecting mental and physical health, and results in more satisfactory learning and development outcomes.

Secondly, the low index of responses from public schools raises concern. According to Dockhorn (2023), emotional stability is understood as the ability to recognize emotions, involving a reflective process before decision-making. Therefore, this ability is essential in any life context, particularly crucial in this phase of professional choice that the young adolescent theoretically wishes to pursue throughout their life. Moreover, "Emotional stability depends, therefore, on the establishment of affective matrices that contribute to achieving a life experience based on trust and a reasonable

competence to handle life's challenges" (Paladino et al., 2011, p. 1). Lastly, the predominant familial support in private schools raises a question about parental preparation for their children's education. Are parents prepared to accept their children's choices regarding their professional paths?

To address this question, Almeida et al. (2011) conducted a literary review article that elucidates the influence of parents on their children's choices, present within the family group from childhood. It discusses two aspects: the objective, including "financial support, educational formation, dialogues/actions facilitating vocational exploration" (p. 82), and the subjective:

support, approval/disapproval of choices, expectations of results, demands and even influences of family interaction styles, parents' values/beliefs about the world of work, their vocational problems, dreams and projects they have for their children, difficulties in the parent-child separation process, among others (p. 82).

In light of the need for parental responsibility in the development of their children, it is essential for parents to be consciously aware of their supportive role. Almeida et al. (2011 apud Palmer & Cochran, 1988; Pinto & Soares, 2002; Soares & Pinto, 2004; Almeida, 2009) recognize the need for family interventions with an orientation goal for parents in the career choice process so that they can act as intermediaries. "Parent interventions can contribute to the understanding of the emotional quality of the parent-child bond and create conditions that facilitate the career choice process and the young person's development towards adulthood" (p. 83).

Regarding the education system, 80.43% of students in private schools attend regular education, with only 17.39% in semi-integral systems and just one student in an integral system. In public schools, 95.83% study in integral education systems and only one student in a semi-integral system. These data are influenced by the fact that the public school chosen operates with an obligatory integral system, while the private network allows choices between students and their guardians. However, it is important to note that the majority of public school students are in an integral education system.

In 2010, the Programa Mais Educação was launched, initially designed to include 1,380 schools in 55 municipalities across 26 states and the Federal District, in partnership with 1,309 Education Secretariats, through Portaria Interministerial No. 17/2007 and regulated by Decree No. 7,083 of January 27, 2010 (Brazil, 2010). Created to initiate an educational agenda in the field of integral education in the public network at the state and

municipal levels, Programa Mais Educação introduced new actions, including extending the student's time at school to a minimum of 7 hours per day and optional activities through sports and leisure, culture and arts, health, communication, new media, science, nature, economy, human rights, environmental education, and additional pedagogical support (Ministry of Education, 2022).

Coitinho (2021) shows that the impact of full-day education in Latin America and the Caribbean has divergent effects on students' academic performance. Citing Alfaro, Evans, and Holland (2015, apud Coitinho, 2021), a literature review of 19 studies on the subject in these countries found that of the twelve studies investigating the effects of full-day education on students' grades, only five showed positive and significant impacts on math performance. Four studies found no significant effects, while three reported reductions in performance in this subject. Furthermore, among the seven studies examining other indicators such as school dropout rates or the likelihood of progressing to higher education, only three found positive effects of full-day education on their variables of interest, while three showed no significant effects, and one presented negative results.

Continuing with data collection, students were asked about their study routines. 54.34% of private school students reported having a study routine of 2 or more hours daily, compared to 21.73% who have no routine and 15.21% who study only during exam periods. In contrast, among public school students, 8.33% have a study routine of 2 or more hours daily, compared to 50% with no routine and 16.66% who study only during exam periods.

One of the first points observed is that even though public school students attend full-day classes, the rate of students who reported not having a study routine (50%) is significantly higher than the students in private schools who reported no study routine (21.73%), despite the fact that private school students do not attend full-day programs entirely. This indicates that inequality still exists between public and private education networks, even though full-day education in the public sector was introduced to achieve better learning outcomes. It is observed that the government supports the idea that extending time associated with a differentiated curriculum is necessary to contribute to students' learning, as measured by external evaluations, and to increase their employability and income. However, the state's provision does not align with this concept

and presents a more technical view of the teaching-learning process, failing to consolidate the policy for equal rights.

Another observed discrepancy is between 54.34% of private school students who reported having a study routine compared to 50% of public school students who reported not having a study routine. Sampaio and Guimarães (2009) show that the establishment of the education system, the quality of teachers, the availability of quality laboratories, organization, and the level of other students influence academic performance. Cavalcanti, Guimarães, and Sampaio (2007 apud Sampaio & Guimarães, 2009) found that students from public schools perform, on average, 17% to 7% worse compared to students from private schools.

Supporting these results, maintaining a study routine is important as it sets rules for study times, avoiding procrastination and establishing discipline and concentration. Routine also enhances the quality of learning, making it more effective. In addition, for a study routine to be efficient, it is essential to care for physical and mental health, have leisure time, and maintain an organized study environment—factors that public school students often lack due to socioeconomic factors.

In this context, only 13.04% of private school students reported some family interference in their studies related to college entrance preparation compared to 8.33% in public schools. According to Sampaio and Guimarães (2009), regarding family influence on student performance, several aspects must be considered. The family environment, parental education, motivation, access to information, and income are significant factors. A stable family environment should provide greater security for the student, avoiding negative impacts on their personality. This aspect is debated regarding its significance. Parental education influences in various ways: it can serve as an example, reinforce motivation for study, expand access to information, and provide a reference for the consequences of achieving a higher level of education.

Parental influence on children's career choices, both intentionally and unintentionally, can be positive or negative. Therefore, the family can inspire adolescents to explore a diverse range of potential occupations or to follow a path they believe their parents will approve of. It all depends on how and which approach the parents take. In this context, it is important for parents to provide tools for their children to develop autonomy and critical thinking to make the best choices.

When asked about career choice, most students stated that they have chosen their future profession, both in public and private schools. However, it is worth noting that 30.43% of private school students and 37.50% of public school students have not yet decided. As Neiva et al. (2002; 1999 apud Neiva, 2005) argue, career choice is not determined by a single factor but by a combination of various elements. This decision is influenced by political, economic, social, educational, familial, and psychological factors. Among psychological factors, several variables play a crucial role in vocational decision-making, such as interests, skills, personality traits, values, future expectations, and maturity for career choice.

In this context, adolescents increasingly face career choices earlier, but they are not always mature for such decisions. Adolescence is a life stage marked by numerous physical, psychological, and social changes. Amid these intense changes, doubts, and insecurities, many adolescents have the responsibility to choose a profession (Cericatto et al., 2017). "Career choice is an attitude that demands maturity due to the emotional and financial investment of the family and the individual in their life project" (Coelho et al., 2002 apud Cericatto et al., 2017, p. 24).

Thus, an autonomous and responsible choice implies awareness of both internal and external factors influencing the decision-making process. Almeida et al. (2008) state that when an adolescent faces a career choice, it involves not only their interests and aptitudes but also how they see the world, how they see themselves, the information they have about professions, external influences from their social environment, peers, and especially their family. Identifying the level of maturity for vocational decisions becomes a relevant aspect.

Continuing the discussion, when asking students how they see themselves in 5 years, with perspectives on professional and personal achievement, and how they think their parents see them in the same timeframe (presented in Table 2), it was planned to identify if there is a sense of opposition between their own views and the expectations of their future life as they believe their parents have of them, or if there is a clash of ideas regarding this perspective. The responses showed that the feelings and expectations were aligned between how the children saw themselves and what they believe their parents felt, as there was no significant difference proving otherwise, as shown in the table below, both in public and private schools:

Frame 2. How students see themselves and how they think their parents will see them in 5 years

Alternatives	Private Network		Private Network	
	How do you see themselves	They think their parents see them	How do you see themselves	They think their parents see them
Personally and professionally accomplished	78,26%	78,26%	75%	79,16%
Performed only professionally	13,04%	8,69%	12,50%	4,16%
Only performed in person	4,34%	6,52%	12,50%	12,50%
Don't know or not realized	4,34%	6,52%	0	4,16%

Source: Prepared by the authors

However, it is worth discussing the public scenario where 12.50% of students believe they will achieve only professional fulfillment, while 4.16% think their parents share these same feelings. Yet, the majority in both networks believe they will be fulfilled both personally and professionally.

Féres-Carneiro et al. (2017) in their research found that the primary parental-child expectation involves professional issues. Regarding parenting, creating a possible scenario to provide secure means for children in adulthood, compensatorily, children should take advantage of these opportunities to demonstrate their efforts, preparing for the job market.

Nevertheless, the promises associated with the consequences of modernity, where everything is possible at the touch of a button with rapid access to technologies and social comparisons, evoke the intense journey of children and adolescents being engaged in extracurricular activities, reducing their free time to explore creativity and relational interaction, in an attempt to achieve post-modern expectations for adolescence into adulthood. This pressure impacts both psychological and social development, as previously observed.

Regarding emotional instability, 73.91% of private school students reported having this characteristic, with the most cited issues being: anxiety (56.52%), poor concentration and lack of attention (47.82%), frequent unexplained physical pain (15.21%), and frequent family disagreements, with relationship difficulties (10.86%). In public schools, 83.33% reported emotional instability, with: anxiety (70.83%), poor concentration and lack of attention (62.5%), frequent unexplained physical pain (29.16%), and frequent family disagreements, with relationship difficulties (20.83%).

Adolescence involves a range of evolutionary changes in physical and biological maturation, as well as psychological and social adjustment. During this period, young people face various developmental adaptations, encountering new and challenging realities. As a result, it is common for them to experience anxiety and difficulty adjusting to this new phase of life. Anxiety serves as a danger alert, a feeling of unease manifested through physiological eruptions like hyperactivity and agitation, and cognitive disruptions such as constant vigilance and dysfunctional thoughts (Batista & Oliveira, 2005).

In clinical practice, children and adolescents often struggle with the pressure to excel early on, facing difficulties in coping with high parental expectations. Notable anxiety manifests through an overload of activities and a quest for validation even during supposed leisure times. In many cases, this involves boys and girls with intense fear of rejection from their reference group, including parents and peers, displaying severe self-criticism at the slightest hint of failure or loss (Féres-Carneiro et al., 2017, p. 40).

Given the above citations, the results clearly show the reasons behind students' emotional instability, and the significant difference in percentages between schools, largely due to their living contexts. Overall, it is crucial to understand what anxiety is and the most common symptoms to intervene effectively, prevent, minimize, and provide assistance. Additionally, the necessary involvement and contribution of psychology professionals, along with family guidance and support, are essential in alleviating the emotional turmoil associated with this stage of life.

4. CONCLUSION

This descriptive study aimed to identify and analyze the psychosocial impacts on adolescents during the preparatory phase for college entrance exams, based on a comparison of data between public and private school students. The research demonstrated the consequences of these impacts, highlighting the relevance of psychological treatments for alleviating symptoms in pre-college students.

From the analysis of thirteen questions addressed to adolescents from both schools, it was possible to identify and observe certain characteristics of this period, their perceptions about this stage, and how emotional instability has even caused physiological reactions, such as frequent unexplained pains.

The survey revealed discrepancies in results regarding easy access to quality study time between private (86.95%) and public (8.33%) schools, emotional stability in private (58.69%) and public (4.16%) schools, and family support perceived by adolescents in private (93.47%) and public (25%) schools. These findings illustrate the asymmetry in study opportunities between these two groups in this context. Another significant point in the research is related to emotional instability, with 73.91% of private school students reporting this characteristic, with anxiety being the most cited at 56.52%. Concurrently, 83.33% of public school students reported emotional instability, with anxiety at 70.83%.

Therefore, it is concluded that, along with other questions, the primary cause of this anxiety is the preparatory phase for college entrance exams, which relates to the future, career choices, the search for identity, family and social influences, and the exam's role as a determinant of personal and professional satisfaction. Additionally, the social factor triggers different conditional study opportunities for individuals, demonstrating that socioeconomic levels play a role in quality of life differences.

Furthermore, the importance of ongoing academic research on this topic is emphasized, as current studies are insufficient. There is a need for further analysis of new studies on psychosocial differences and impacts, identifying the cognitions, emotions, and behaviors emerging from this period. Future work should focus on the role of family and social influences during this challenging time for young people. The multidisciplinary perspective on how students should be viewed within their educational and familial contexts has grown in recent years. Currently, therapy should be actively integrated into this period, playing a crucial role, as emotionally maladjusted students may not engage effectively in the process, potentially impacting their physical well-being if their emotional state does not align with the situation.

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CHAPTER 3

REVIEW AND PROSPECTS OF GEOTEXTILES: ROLE OF BABASSU FIBERS

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ABSTRACT: With the increase of global environmental changes and intensive anthropogenic activities, it is extremely important to maintain and improve soil function. Soil erosion is a naturally occurring process that affects all landforms. Different structures and forms of geotextiles are available to geotechnical engineers. Geotextiles in the form of woven and nonwoven structures are mostly used in various geo-engineering applications. This article focus on how the use of geotextiles have grown during the last decades and the importance of a particular material to be base of geotextiles, babassu (*Attalea speciosa* Mart. ex Spreng, Arecaceae) that is a palm with socioeconomic and ecologic importance found in humid tropical areas in Brazil.

KEYWORDS: babassu, geotextiles, soil stability, slope stability.

RESUMO: Com o aumento das mudanças ambientais globais e das atividades antropogênicas intensivas, manter e melhorar a função do solo se tornou extremamente importante. A erosão do solo, um processo natural, afeta todas as formas de relevo. Várias estruturas e formas de geotêxteis estão disponíveis para engenheiros geotécnicos, com geotêxteis tecidos e não tecidos sendo predominantemente usados em uma variedade de aplicações de geoengenharia. Este artigo se concentra no crescimento do uso de geotêxteis nas últimas décadas e destaca a importância de um material específico usado como base para geotêxteis: babaçu (*Attalea speciosa* Mart. ex Spreng, Arecaceae). Esta palmeira, encontrada em áreas tropicais úmidas do Brasil, tem importância socioeconômica e ecológica.

PALAVRAS-CHAVE: babaçu, geotêxteis, estabilidade do solo, estabilidade de encostas.

1 INTRODUCTION

Environmental changes challenge both biodiversity persistence and human wellbeing. The science and practice of restoration ecology, in collaboration with other disciplines, can contribute to overcoming these challenges. With the increase of global environmental changes and intensive anthropogenic activities, it is extremely important to maintain and improve soil function.

Soil erosion is a naturally occurring process that affects all landforms. Erosion, whether it is by water, wind or tillage, involves soil detachment, movement and deposition. Soil erosion contributes to the pollution of adjacent watercourses, wetlands and lakes. Soil erosion can be a slow process that continues relatively unnoticed or can occur at an alarming rate, causing serious loss of topsoil. Soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinization and soil acidity problems are other serious soil degradation conditions that can accelerate the soil erosion process (<http://omafra.gov.on.ca/english/engineer/facts/12-053.htm>).

Depending of the case, permeable or impermeable barriers are a need in several engineering works, the last one in waste containment systems and effluents ponds, and compacted soils have been used for that purpose (Macambira, 2002). Slope stability prediction research is a complex non-linear system problem. Chuan et al (2013) made a slope stability calculation of open pit using 3Dslope software. More recently, Wang et al. (2022) using artificial intelligence, made predictions on slope stability based on visual exploratory data analysis of 77 in situ cases. Nie et al, (2022) propose a method of analysis with combining scaled boundary finite element method (SBFEM), strength reduction method (SRM) and polytree-based mesh refinement algorithm. Others, proposed the use of an ensemble learning techniques for the prediction of slope stability (Zhang et al., 2022).

2 GEOTEXTILES

Geosynthetics are man-made materials used to improve soil conditions. Most geotextiles consist of polymers of polyolefin, polyester or polyamide family, which involve environmental problems related to soil pollution. Geotextiles can be used for at least one

of the following functions: separation, reinforcement, filtration, drainage, stabilization, barrier, and erosion protection (Wu et al., 2020).

According to Brazilian legislation: “Geosynthetics - Generic term that describes a product in which at least one of its components is produced from a synthetic or natural polymer, in the form of a blanket, strip or three-dimensional structure, used in contact with the soil or other materials, in geotechnical and civil engineering applications” (NBR ISO10318-1:2018).

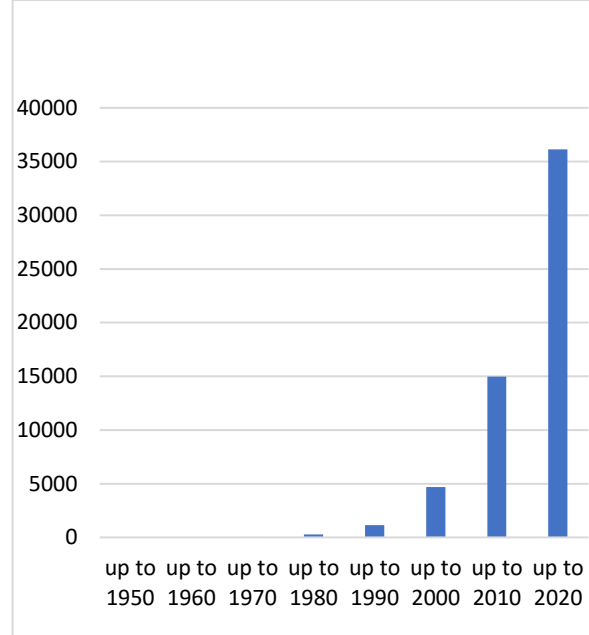
Geosynthetics are planar polymeric products, which are used in connection with soil, rock or other soil-like materials to fulfill various functions in geo-environmental engineering (Müller & Saathoff, 2015).

Geotextiles fall under the grand category of Geosynthetics. Geotextiles are high in strength to allow for maximum slope support, stabilization and erosion control, and there are three types of them: non-woven, woven or knitted. In particular, short-lived geotextiles find application as protection covers against soil erosion and revegetation aids, where plant growth is promoted until a natural green cover has established and the vegetation can take over the protective function. Usually geotextiles are placed at the tension surface to strengthen the soil (Morgan & Rickson, 2011).

Making a survey on databases, with just articles pair-reviewed published as a function of time, it is possible to see that the interest on studies on soil stability, slope stability and geotextiles correlate as expected. Figures 1- 3 display respectively those data. Present results evidence the multiple geotechnical applications of geotextiles mainly as slope reinforcement, or soil stabilization.

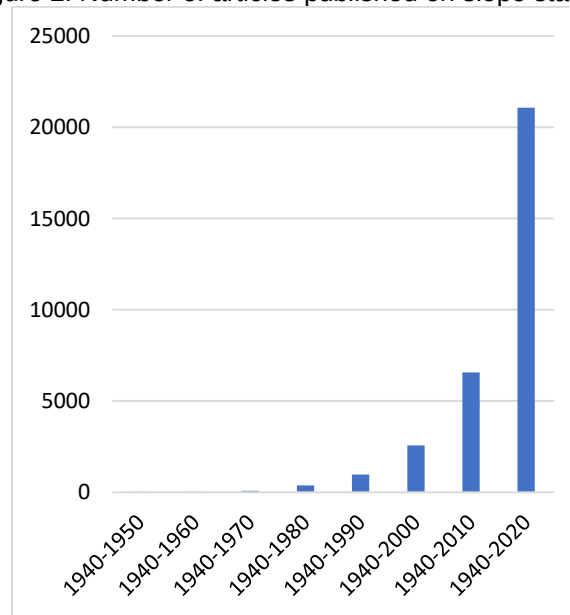
Systematically and academic interest on the mentioned subjects started in the last decades of the last century but had an extraordinary increment in the current one. The figures from the 2010 almost triplicate in the following decade.

Figure 1. Number of articles published on soil stability.



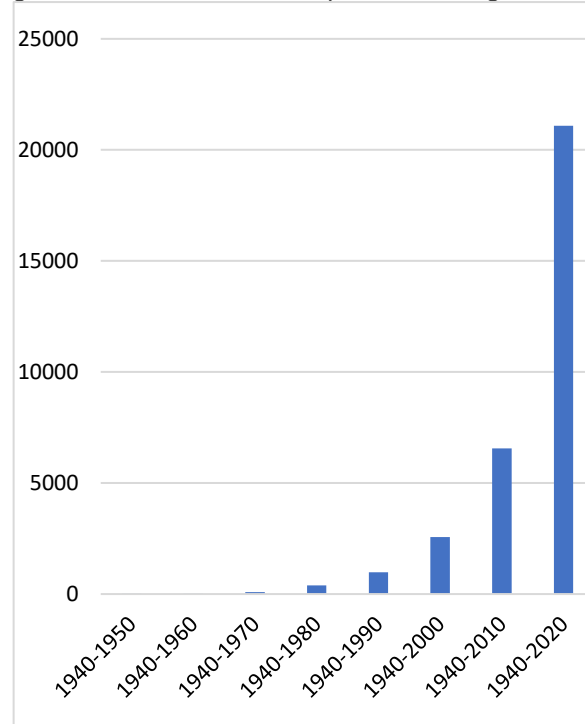
Source: The authors

Figure 2. Number of articles published on slope stability.



Source: The authors

Figure 3. Number of articles published on geotextiles.



Source: The authors

Different structures and forms of geotextiles are available to geotechnical engineers. Geotextiles in the form of woven and nonwoven structures are mostly used in various geo-engineering applications. Nonwovens are predominantly used for drainage, lining systems and asphalt overlay fabrics whereas the wovens are most frequently used for subgrade and base reinforcement, soil stabilization and separation, and sediment walls (Sengupta, 1991).

Some functional properties need to be satisfied by geotextiles:

1. **Mechanical properties.** This category covers properties such as tensile strength, breaking extension, modulus, abrasion resistance, bursting strength, frictional, bending and creep;
2. **Environmental properties.** This category covers chemical resistance, biological resistance, thermal resistance and resistance to UV degradation;
3. **Hydraulic properties.** In-plane water permeability and transverse water permeability properties are in this category.

Geotextiles market share, according to Desai & Kant (2016), were as follows: road construction, 44%, erosion control, 20%, drainage, 16% and others, 20%.

Kalore & Babu (2022) pointed out the importance of the design criteria for nonwoven geotextile to be used as filters with internally stable and unstable soils.

Reinforcement is probably one of the earliest application of geotextiles (Ingold, 1994). Geotextiles are used to increase soil stability, provide erosion control or aid in drainage. In roads and rail applications, they allow filtration and separation of granular layers. They are also used to protect membranes in landfill applications and in coastal defense applications, and Sabiri et al. (2020) described the performance of some nonwoven geotextiles on soil drainage and filtration.

Geotextiles processed to flexible material sheets are installed on various landscapes for reinforcing or protective purposes. Most applied materials in the field are non-degradable polymers, such as polyolefins or polyesters. The development of more environmentally friendly and biodegradable geotextiles is of interest for several application purposes. In general, there are two material classes available, which are natural fibers and biodegradable polymers. Geotextile fabrics, made of plant fibers, represent a promising approach and were already successfully installed in several applications (Prambauer et.al., 2019). However, the use of natural fibers also entails some limitations regarding water uptake and stability. Therefore, the potential use of a different material class, which comprises degradable, thermoplastic biopolymers, must be considered. There is only little information available on the use of these biopolymers in connection with geotextiles, thus their suitability regarding biodegradation, price and mechanical properties were evaluated.

A variety of lignocellulosic materials are applicable to produce biobased, biodegradable geotextiles (English, 1994). Natural fibre-based geotextiles can compete with polymeric geotextiles on both technical and economic grounds (Leao et al., 2012; Tanasa et. al, 2022). Basu et al. (2019) proposed bioengineering of river earth embankment using natural fibre-based composite-structured geotextiles.

As already mentioned, geotextiles can be produced from polyester or polypropylene polymers and or natural fibers. Vegetable or plant fibres have suitable properties to meet technical requirements cost effectively for use as natural geotextiles. Plant fibres can be classified according to the part of the plant as principal sources from which they are extracted: bast fibres, leaf fibres and fruit or seed fibres.

Highway construction broke the balance of ecological environment, especially in mountains areas. However, the plant community reconstruction at the highway slope can reduce the destruction effect, especially at the beginning of the project. Yang & Wang (2018), used three types of geotextiles including coir-straw blanket (CB), straw blanket

(SB) and nonwoven geotextile net (NG) to paved on highway slopes and the effects on soil erosion, the soil hygrothermal condition and vegetation growth were investigated. The results of field experiments, based on two years of research, showed that in artificial rainfall experiments CB, SB and NG could delay the time to runoff, reduce the runoff and decrease the erosion, effectively. The geotextiles as mulching material had multiple benefits including protected the topsoil and seeds from being washed away from the no vegetation covered slope, and enhanced vegetation growth by improving soil conditions, particularly in the beginning stage of slope vegetation restoration. In the mentioned work, the natural geotextiles effectively controlled runoff and soil erosion, although the effectiveness of the three natural geotextiles varied. For runoff control, straw blanket performed better than MCSB followed by CB. For soil erosion control, coir blanket was the most effective followed by MCSB and then SB.

Natural lignocellulosic fibers exhibit a good set of mechanical properties and their incorporation into polymers, not only leads to a reduction of the environmental impact of the compounds, but also to an improvement of biodegradability (https://books.google.com.br/books?hl=en&lr=&id=AwXugfY2oc4C&oi=fnd&pg=PP1&ots=gNN7TAZbPQ&sig=_MRCPhiG690gliPjYF3yrTixZ69w&redir_esc=y#v=onepage&q&f=false.)

Although jute, sisal and coir geotextile products are currently available worldwide, also hemp, kenaf and African palm are also suitable raw materials for geotextiles (Leao et al., 2012; Gupta et al., 2018). Li et al. (2020) described that the use of plant-mat geotextiles, like palm-mat geotextiles, is an effective soil conservation strategy with promising application prospect and ecological profit.

In Brazil, there is a great variety of vegetal fibers with different chemical, physical and mechanical properties that can be used for the preparation of geotextiles. There are many Brazilian coir fiber suppliers and manufacturers. Fontes et al. (2021) evaluate the use of geotextiles made from natural fibers on the erosion control in the Lower São Francisco riverbank. The experimental trial was conducted for 12 months monitoring, taking into consideration two periods analysis: rainy and dry, in a riverbank of 16.6° performing an area of 12.4 X 4 m, in three blocks with the following treatments: *Typha latifolia* Geotextile (TG), *Juncus sp.* Geotextile (JG), *Syagrus coronata* Geotextile (SG) and Bare Soil (BS) without geotextiles, located on the right bank of the Lower São Francisco river downward, in the municipality of Amparo de São Francisco in Sergipe state, northeastern Brazil. The vegetation cover development, tensile strength,

deformation and sediments loss by runoff were evaluated. Among the tested geotextiles, the *Syagrus coronata* and *Juncus sp* geotextiles were more efficient in the erosion control producing a less amount of sediment, although on the resistance and durability of the fibers, *Typha latifolia* presented better results.

The potential of some other fibers remain little known like piassava (Elzubair & Suarez, 2012) or babassu (Franco, 2010).

3 BABASSU

Babassu is an erect perennial evergreen palm, reaching up a height of 15 to 30 m. The trunk is slender, ringed with leaf scars, 20-50 cm in diameter. It is a palm with socioeconomic and ecologic importance found in humid tropical areas in Brazil, especially in frequently burned and degraded landscapes (Ferrari & Soler, 2015). Babassu is native to Brazil, but also to Guyana, Suriname and Bolivia (USDA, 2010. GRIN - Germplasm Resources Information Network. National Germplasm Resources Laboratory, Beltsville, Maryland). The babassu palm is considered weed in pasture areas of “Cerrado”, the vast tropical savanna ecoregion in Brazil.

Various scientific names are usually found for the babassu in current literature: mainly *Orbignya phalerata* and *Attalea speciosa*, but also *O. speciosa* and *O. martiana*, among others. This multiplicity of names leads to great confusion in the scientific community causing mistakes to be successively propagated. According to Cavallari & Toledo, (2016) it is recommended the adoption of *Attalea speciosa* Mart ex. Spreng as the most suitable name for the babassu and highlight that a broad taxonomic review of the *Attalea* group is necessary.

Babassu is one of the most important non-timber forest resources of rural communities in the Amazon. Araujo et al. (2016) explored the ethnobotanical knowledge and uses of babassu by riverine populations inhabiting the Tucuruí Lake Protected Areas Mosaic in the eastern Amazon, by examining the diversity, purposes and descriptions of its uses and aspects of its extraction. Data were collected in 2010 and 2014 from 193 families. A total of 1,226 use records were cited representing 60 different uses. Records were classified into nine use-categories; utensils and tools were the most important category, followed by construction and human food.

Babassu oil has been used in South American countries for cooking and medicinal purposes. It also has industrial applications as a biofuel. In the United States, it's mainly used in skin and hair care products.

There are several uses for babassu oil; however, its potential for providing other industrial products remains unexploited, due to the lack of scale and production structure. The rudimentary nature of the babassu kernel extraction process employed by the peasantry has been blamed for being one of the key factors of the crisis in the babassu oil industry economy. Pinheiro & Frazão proposed in 1995 the use of a new model, instead the traditional one, for sustainable exploitation of babassu palm forests and integral fruit processing at the village and farm- level. The new model includes the coordination of fruit collection and storage, and the gradual replacement of the traditional system of manual breaking by mechanized integral processing at local level. The machinery consists of a dehushing machine (to separate epicarp and mesocarp), a breaking machine (to crack the dehushed fruits), and a machine to separate the small pieces of broken endocarp from the kernels. In 2015, Ferrari & Soler established conditions for the preparation of the raw material fruit of babassu for oil extraction by pressing and producing biodiesel by ethanolic transesterification. Oil and press cake were obtained through hydraulic and continuous press, biodiesel was produced and the quality of products was compared. The total of saturated fatty acid in babassu oil was between 78% and 82%, and the total of unsaturated fatty acids that promote good oxidative stability in the oil was in the range of 17% to 20 %. Oil obtained by cold pressing extraction and its biodiesel had better results in terms of quality. The quality of oils is within the Codex standard and biodiesel from oil extracted by cold pressing had higher oxidative stability.

Babassu is a source of biomass for energy and raw material in the manufacture of handicrafts. The babassu oil corresponds to only 7% of the total weight of the fruit; the other parts like the epicarp, the endocarp, and the mesocarp (93%) are underused as biomass. The babassu endocarp and epicarp have high content of fixed carbon, which makes them more suitable for carbonization and burning than the babassu nuts and mesocarp, which contain less than 5% fixed carbon.

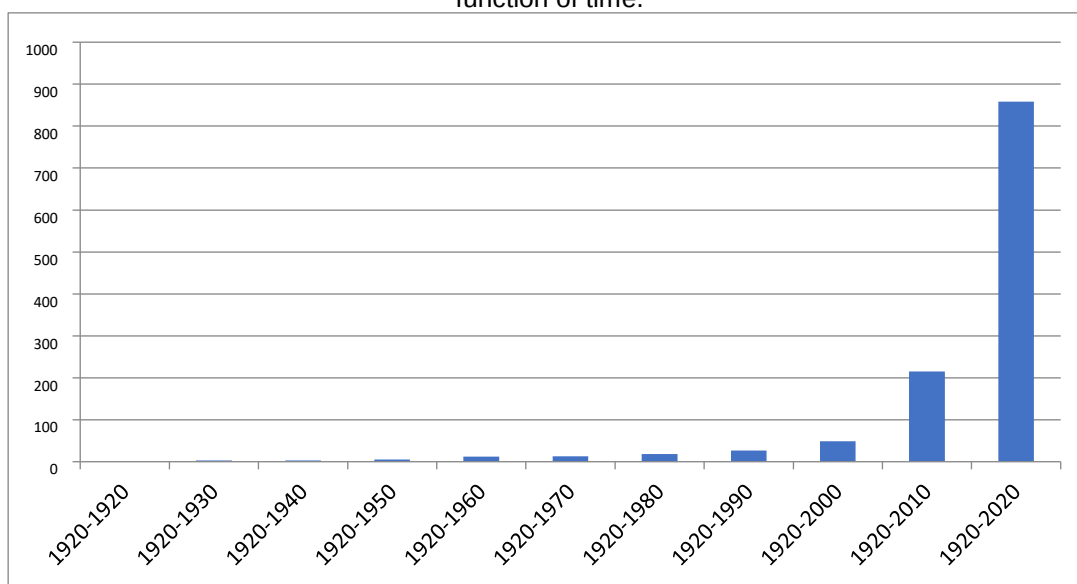
The babassu mesocarp is usually transformed into flour and used in animal feed. Also, babaçu by-products (endocarp, mesocarp, epicarp and activated carbon) can be

used as a potential adsorptive target species for inorganic and organic molecules (Teixeira, 2008, Silva et al, 2013, Maniglia et al. 2017; Silva et al, 2019).

According to Chaves et al (2023) babassu fiber has a chemical composition, of 28.53% lignin, 32.34% hemicellulose, and 37.97% cellulose. In addition, it showed a high crystallinity index of 81.06% and a microfibril angle of 7.67°. These characteristics indicate that babassu fibers have favorable chemical and morphological properties to be used as reinforcements in composites, highlighting its potential as an important material for applications in technology areas.

Although some articles were published as early as 1930 (Lee, 1930) and 1940, the interest in academic studies on babassu and all their multiple uses was very low until the present century. Fig. 4 presents the number of articles published in English that appeared on line mainly peer-reviewed works according Web of Sciences database. It is evident the poor academic interest on this palm until the couple of last decades, but also the huge potential ahead of babassu fibers in terms of the present tendency.

Figure 4. Number of articles published online according to Web of Science database on babassu as a function of time.



Source: The authors

In the present century, new applications on babassu were described showing the impact of such increased interest. Raposo et al. (2021) developed formulations for polymeric alginate films with added starch from the babassu coconut mesocarp, fiber removed from the babassu coconut epicarp and glycerol, crosslinked with CaCl_2 , to be used as base materials to manufacture utensils such as biodegradable packaging and shopping bags.

Staufenberg et al., (2015) prepared biomimetic fibre-reinforced composites using babassu nut based on regenerated cellulose fibres (lyocell, L) with two different fineness values as reinforcement embedded in a polylactide (PLA) core matrix and polypropylene (PP) based outer layers. The biomimetic fibre composite reaches a significantly higher impact strength that is 1.6 times higher than the reference sample produced from a PLA/PP/L-blend. At the same time the hardness is slightly increased compared to PP/L.

The influence of thermoplastic starch and babassu mesocarp incorporation on the biodegradation of poly(butylene adipate-co-terephthalate), PBAT, PBAT/TPS blend, and its biocomposite were investigated by Nunes et al., (2019). The incorporation of thermoplastic starch and babassu mesocarp to poly (butylene adipate-co-terephthalate) led to a reduction in PBAT molecular weight on the blends and composite, but the reduction was higher on the blends than in the composite, while addition of thermoplastic starch accelerated biodegradation and incorporation of babassu retarded it. Mitjia et al. (2019) started a multidisciplinary research on the viability of the babassu palm eco-socio-system in Brazil, to enabling us to consider the best way to ensure its sustainability.

4 BABASSU AS A COMPONENT OF GEOTEXTILES

Fibers of babassu palm started to be described in promising experiments as adequate components to prepare bioblanket such as any other fibrous material like sisal (Sponga, & Coelho (2005). Costa et al., (2018) studied de degradation during processing of vegetable fiber compounds based on poly (β -hydroxybutyrate) (PHB) and poly (butylene adipate-co-terephthalate) (PBAT) blends, using materials obtained by grinding the outer layers of the fruit of the babassu palm tree.

Furtado et al. (2020) prepared a polymeric composite produced from fiber of babassu palm tree treated by mercerization and 5%, 10%, and 20% high-density polyethylene (HDPE) matrix. They studied the physico-chemical characteristics and evaluate the degradation of the polymeric composites. Polymeric composites, were characterized by FTIR, XRD, TG/DTG, SEM, AC impedance and traction test. Traction tests revealed that at a high fiber concentration of 20%, the mechanical resistance of the composites can decrease. After characterization, the materials were subjected to degradation processes via UV radiation. For comparison, a sample of an oxo-biodegradable plastic bag was evaluated under the same conditions. The incorporation

of babassu fiber into an HDPE matrix in the formation of a polymeric composite is promising for enhancing photo-oxidation degradation. Lemos et al. (2017) established the potential of natural fibers supplied by agroindustrial residues from sugarcane, wood and babassu to be used as reinforcement in biocomposites for various applications. Rodrigues (2019) described the preparation and properties of composite made from babassu coconut epicarp fiber plus polymeric residues.

A couple of years ago some experiments on the preparation of a babassu-based slope protection system were published (Bezerra, 2022).

5 CONCLUSIONS

The use of geotextiles, as showed in this work, have grown during the last decades employed in infrastructure, soil, construction, agriculture and environmental applications, been slope protection and restoration one of them. The basic concept of geotextiles dates back to ancient times when textiles consisting of locally available natural fibers employed to increase the stability of roads and soils. Nowadays, in spite of geotextiles made of synthetic fibers (geosynthetics) are considered a modern achievement, the return to the increasing use of plant fibers appears as a versatile tool for environmental sensitive applications in geotechnical engineering. Mainly in Brazil, babassu fibers seem to have a great potential to be use whether in the stabilization of soil, the river banks, ground reinforcement for civil infrastructure or filtration of water excess in farmlands and flood protection, hill slopes stabilization and drainage, as plant geotextiles are successfully performing in civil engineering and agriculture and becoming an increasingly viable alternative in many other applications.

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CHAPTER 4

PAGES THAT LEAVE A MARK: THE ROLE OF STORYTELLING IN THE DEVELOPMENT OF LANGUAGE, COGNITION, AND MEMORY IN CHILDREN

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ABSTRACT: Children's literature plays various roles in the development of children, serving as an important pedagogical, didactic, and therapeutic tool. Fables and tales represent a global heritage, spanning generations, eras, and locations, responsible for educating, entertaining, and raising awareness in diverse populations. In this integrative review, it aims to gather studies on the importance and effects of storytelling, linking this act to its role in the child population and seeking to understand if there are already known effects in the literature that correlate it with the development of memory in these individuals. To this end, the present study was conducted through the search for published works available in the PubMed, Scielo, and Google Scholar databases, using the PICO qualitative strategy for integrative reviews. In this way, it is observed that this act has repercussions in various aspects of child development. From shaping values to aiding in the school environment, reducing anxiety, developing linguistic and auditory skills, as well as improving working memory in these individuals. Therefore, storytelling is not just a recreational activity but an essential practice that profoundly influences the emotional, cognitive, and linguistic well-being of children, directly related to their memory development. This review has contributed to the understanding that the telling and retelling of stories can be used as an intervention tool.

KEYWORDS: child, storytelling, working memory.

RESUMO: A literatura infantil desempenha diversos papéis no desenvolvimento infantil, servindo como uma importante ferramenta pedagógica, didática e terapêutica. As

fábulas e histórias representam um patrimônio global que atravessa gerações, épocas e lugares, sendo responsáveis por educar, entreter e conscientizar diversas populações. Nesta revisão integrativa, objetivou-se compilar estudos sobre a importância e os efeitos de contar histórias, relacionando este ato com o seu papel na população infantil, procurando compreender se já existem efeitos conhecidos na literatura que o relacionem com o desenvolvimento de memória nesses indivíduos. Para tanto, o presente estudo foi realizado por meio da busca de trabalhos publicados disponíveis nas bases de dados PubMed, Scielo e Google Acadêmico, utilizando a estratégia qualitativa PICO para revisões integrativas. Desse modo, observa-se que esse ato repercute em diversos aspectos do desenvolvimento infantil. Desde a formação de valores para ajudar no ambiente escolar, a redução da ansiedade, o desenvolvimento de habilidades linguísticas e auditivas, bem como a melhoria da memória de trabalho nesses indivíduos. Portanto, contar histórias não é apenas uma atividade lúdica, mas uma prática essencial que influencia profundamente o bem-estar emocional, cognitivo e linguístico das crianças, diretamente relacionado com o desenvolvimento da sua memória. Esta revisão contribuiu para a compreensão de que contar e recontar histórias pode ser utilizado como ferramenta de intervenção.

PALAVRAS-CHAVE: crianças, contação de histórias, memória operacional.

1. INTRODUCTION

Children's literature plays various roles in the development of children, serving as an important pedagogical, didactic, and therapeutic tool. Fables and tales represent a global heritage, spanning generations, eras, and locations, responsible for educating, entertaining, and raising awareness in diverse populations (Pulimeno, 2020a).

From a didactic perspective, storybooks are crucial tools as they assist in expanding vocabulary and fostering language skills (Pulimeno, 2020b). Furthermore, reading and listening to stories can positively impact young individuals, constituting essential communal practices and instilling character values that are naturally absorbed by children.

It is well-known that the act of storytelling using words, sounds, and images is recognized as a cognitive therapy that aids in reducing anxiety in children, both in educational settings and even in hospital environments (Musviro, 2023). When fictitious situations align with real-life problems experienced by children, they begin to feel emotionally secure and better equipped to handle life's challenges (Rozalski, 2010).

In this literature review, the objective was to gather studies on the importance and effects of storytelling, linking this act to its role in the child population and seeking to understand if there are already known effects in the literature that correlate it with the development of memory in these individuals.

2. METHODOLOGY

The present study was conducted through the search for published works available in the PubMed, Scielo, and Google Scholar databases, using the PICO qualitative strategy for integrative reviews. The search strategy was implemented using the following descriptors: "Child" AND "Storytelling" AND "Working memory" AND "Phonological memory" AND "Anxiety" correlating with "Education" AND "School" AND "Hospital" (Table 1). The research question was: What is the importance, and what are the known effects of storytelling in children?

Table 1. Determination of qualitative PICo strategy		
P: population patient/ problem	Children	Child
I: phenomenon of interest	Storytelling effects	Storytelling Working memory Phonological memoryAnxiety
Co: context	Educational, hospital school	Education School Hospital

Source: Self made

Among the identified works, those with a theme consistent with the desired scope were included in this review. The criterion followed was to choose studies published in English with full accessible content (Table 2).

Initially, 27 articles were selected based on their abstracts. However, during the re-view of the materials, 14 were excluded for not presenting the expected content. Therefore, the literature review proceeded with the 13 chosen studies.

Table 2. Criteria of the qualitative PICo strategy used	
<u>Thematic Relevance:</u> Studies addressing the importance of storytelling in children	<u>Thematic Relevance:</u> Studies addressing the importance of storytelling in children
<u>Language and Access:</u> Studies published in English Fully accessible content	<u>Language and Access:</u> Studies not published in English Content not fully accessible
<u>Methodology:</u> Studies using qualitative or mixed methods approaches	<u>Methodology:</u> Studies employing exclusively quantitative approaches
<u>Age Range:</u> Studies involving children as the target population	<u>Age Range:</u> Studies exclusively involving adults

Source: Self made.

Out of the assessed articles, twelve were conducted in a university setting, and one in a hospital institution. The journals in which they were published cover various areas such as education, health promotion, language and cognition development, as well as technology applications. From this, it can be inferred that the theme is relevant to different spheres, highlighting the importance of knowledge and its application in everyday life. Table 3 provides an overview of the assessed articles, including their main findings.

Table 3. Presentation of the synthesis of the articles included in the review

Article	Title	Objective	Results
Tsitsani et al. (2010)	<i>Fairy tales: a compass for children's healthy development—a qualitative study in a Greek island</i>	Describing children's opinions and preferences regarding storytelling	Three main themes were constructed. The majority of the respondents acknowledged their strong belief in the power of fairy tales and affirmed that their children listen to stories at least once a week
Rozalski et al. (2010)	<i>Bibliotherapy: Helping Children Cope with Life's Challenges</i>	Providing teachers interested in bibliotherapy with a brief summary of its use, including a series of questions to be asked when reviewing books	Teachers can use children's literature as a powerful tool to initiate dialogues with their students and help them relate the messages to their own personal struggles
Loutrari et al. (2018)	<i>Phrase-Final Words in Greek Storytelling Speech: A Study on the Effect of a Culturally-Specific Prosodic Feature on Short-Term Memory</i>	Analyze the prosodic feature in the narration of Greek stories and its effect on free recall in thirty typically developing children between the ages of 10 and 12 years using short and ecologically valid auditory stimuli	The combination of a descending pitch contour and a prolonged vowel at the end of a syllable, which gives rise to the prosodic feature in question, resulted in statistically significantly higher performance values compared to the neutral final phrase prosody
Brondani, Pedro (2019)	<i>The use of children's stories in nursing care for the child: an integrative review</i>	Identifying how children's stories can be used in childcare	From the analysis of 16 selected articles, three categories emerged: The use of stories in the hospital; Specialized nursing in intervention and Stories in the educational dimension
Veraksa et al. (2020)	<i>The Relationship between Executive Functions and Language Production in 5–6 Year-Old Children: Insights from Working Memory and Storytelling</i>	Examine the relationship between working memory capacity and narrative skills in children aged 5 to 6 years	The results revealed a significant relationship between both components (verbal and visual) of working memory
Pulimeno et al. (2020)	<i>School as ideal setting to promote health and wellbeing among young people</i>	Analyze evidence demonstrating why school is the ideal environment for promoting the wellbeing of younger generations	Preventive approaches should increase students' motivation for personalization of health knowledge, and storytelling is described as a strategy
Pulimeno et al. (2020)	<i>Children's literature to promote students' global development and wellbeing</i>	Examine pedagogical, didactic, and psychological/therapeutic aspects of children's literature, with the aim of highlighting its role in promoting holistic	The tales convey fundamental values useful for children's lives. From an educational perspective, appropriately chosen storybooks represent a valuable resource for school

			activities, enhancing students' language skills
		development and well-being in students	
Srinatania et al. (2021)	<i>Story Telling as Therapeutic Intervention Toward Anxiety Level: A Literature Review</i>	Explore the effectiveness of storytelling among hospitalized preschool children	Telling stories is proven to be effective in reducing the impact of hospitalization, especially anxiety levels in preschool children
Lin et al. (2021)	<i>Parental Acceptance of Children's Storytelling Robots: A Research Technique of Projection of the Uncanny Valley of AI</i>	Qualitative study involving 18 parents using the research technique of design fiction	Three predictors of parental acceptance of these robots were identified: usage context, perceived agency, and perceived intelligence
Musviro et al. (2023)	<i>The Application of Storytelling Therapy in Reducing Anxiety in Preschool-Aged Children Experienced Hospitalization: Literature Review</i>	Deepen the effect of storytelling therapy on reducing anxiety in preschool-aged children experiencing hospitalization	Storytelling therapy can reduce anxiety by controlling negative thoughts in children. Storytelling is a therapeutic approach that can be used in nursing care for preschool children experiencing anxiety due to hospitalization
Wijayanti et al. (2023)	<i>Teacher's Strategy to Overcome the Learning Plateau in Early Childhood Learning</i>	Describe and analyze educators' strategies to overcome learning difficulties in children	Four methods capable of completing early childhood readiness by forming logical thinking and mental readiness are described
Glanz et al. (2023)	<i>Robofriend: An Adaptive Storytelling Robotic Teddy bear – Technical Report</i>	Describe the Robofriend a robotic teddy bear designed for storytelling for young children	Robofriend aims to be a tool used by a preschool teacher so that part of the class can listen to a story while the teacher engages more personally with the remaining children
Delage et al. (2023)	<i>Working memory training in children with developmental language disorder: Effects on complex syntax in narratives</i>	Large scale experiment dedicated to working memory training and its impact on language in children with DLD	Promising trends toward transfer effects of verbal working memory training in the capacity of participants with DLD

Source: Self made.

3. RESULTS AND DISCUSSIONS

In relation to the objective of this review, which was to gather various studies on the importance and known effects of storytelling in children, it was observed that this act has repercussions in various aspects of child development. From shaping values to aiding in the school environment, reducing anxiety, developing linguistic and auditory skills, as well as improving working memory in these individuals.

Fairy tales have always been part of children's everyday lives. The descriptive qualitative study by Tsitsani *et al.* (2011) reports that most parents tell stories to their children at least once a week and recognize the influence of this act on various aspects of children's development. Regarding young listeners, there is a preference for classic fairy tales, with Little Red Riding Hood standing out. It is interesting to note that most children are satisfied when the villains in the stories are punished, emphasizing the power of shaping values and character in young citizens (Tsitsani, 2011).

Certain conditions can directly affect child development, such as hospitalization situations. Especially preschool-aged children may experience excessive anxiety when hospitalized, leading to other physical and psychological problems. Storytelling therapy through narration can assist in this scenario, controlling children's negative thoughts and changing their perspective through the presented stories (Srinatania, 2021; Musviro, 2023).

Stories are capable of reducing stress and providing comfort, promoting bonding, and facilitating conversations about difficult situations. In the integrative review by Brondani and Pedro (2019), benefits were observed in various areas with the use of children's stories in the hospital context. They can be used in group or individualized settings, with the aid of books, puppets, and digital resources (Brondani, 2019).

Storytelling is also an essential tool in certain stages of child development, such as during the learning plateau. This state occurs when the student appears to be stagnating in learning, possibly due to emotional, cognitive, or physical fatigue. The act of storytelling is a strategy that can assist in this regard, being implemented in early childhood education to stimulate motivation, curiosity, and intelligence (Wijayanti, 2023).

New technologies have been implemented to capture the attention of children, and recently, robots with artificial intelligence have become common (Lin, 2021). An example of this is Robofriend, a robotic teddy bear developed to tell stories to young children. Through the detection of listeners' faces, it is possible to collect information such as how many are looking at the robot, how focused they are on the story, and to measure the present anxiety and excitement. This tool was designed to be used in daycare settings, with the aim that part of the class can listen to the story while the teacher can dedicate more individual time to children who have difficulty paying attention due to background distractions (Glanz, 2023).

There is a strong relationship between language development and working memory. The verbal and visual components influence language skills, as it has been reported that children with a high level of phonological (verbal) working memory use a greater variety of words, with more intense grammatical accuracy and good storytelling skills. The study by Veraksa *et al.* (2020) confirms this fact, as it involved 269 children aged 5 to 6 years, in which a fable was told and retold in three reading rounds. Subtests of the NEPSY-II, a neuropsychological battery that assesses the development of children aged 3 to 16 years, providing measures of language, visuospatial processing, memory and learning, as well as attention and executive functions, were used. The authors concluded that the visual and verbal components of working memory were related to a range of oral language outcomes, with emphasis on phonological working memory (Veraksa, 2020). Delage *et al.* (2023) also demonstrate the importance of working memory in language benefits, reporting that training this memory can characterize a therapeutic approach in children with Language Development Disorder (Delage, 2023).

In the context of the relationship between storytelling and memory, prosodic speech patterns play a significant role. Loutrari *et al.* (2018) conducted a study in which Greek stories were told to thirty typically developing children aged 10 to 12 years, using auditory stimuli. Extensive vowel elongation at the ends of syllables resulted in statistically higher performance values in short-term memory compared to neutral prosody at the end of the sentence (Loutrari, 2018).

4. CONCLUSIONS

Children's literature plays a vital role in the holistic development of children, serving not only as a means of entertainment but also as a pedagogical and therapeutic instrument. Through stories, children expand their vocabulary, develop language skills, and learn to deal with emotions and adversities. Tales that withstand the test of time and are universal in nature help children feel understood and prepared for the challenges of real life.

Therefore, storytelling is not just a recreational activity but an essential practice that profoundly influences the emotional, cognitive, and linguistic well-being of children, directly related to their memory development. This review has contributed to the understanding that the telling and retelling of stories can be used as an intervention tool.

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CHAPTER 5

VALIDATION OF THE MENTAL VISUALIZATION EFFECT ON ANSWER SELECTION IN CLOSED QUESTIONS IN SURVEYS

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ABSTRACT: The selection of listed answers in surveys is influenced by numerous aspects. At the moment of decoding, the mental representation of the item can represent a bias if it is distorted by personal impressions. The present research aims to identify these influences at the moment of choice of items presented sequentially in a closed-ended question by a nominal scale. For this purpose, the answers of a survey were correlated with the results of psychometric experimental pretests on mental image formation by applying them to experimental groups. Although the item selection affects several aspects of linguistic elements, it seems that this no influences the choice. The comparison between the data of mental visualisation of item and item frequency showed a very high correlation unusually in social or psychosocial sciences. Wording can increase the item comprehensibility but not eliminate the visual imagery effects, therefore represents a permanent bias.

KEYWORDS: mantal visualisation of item, psychometric test, pre-test, survey experimentation, item choice.

RESUMO: A seleção das item palavras listadas em surveys é influenciada por vários aspectos. Nessa decodificação, a representação mental do item word pode representar um viés caso seja distorcida por impressões pessoais. A presente pesquisa tem como objetivo identificar essas influências no momento da escolha do item apresentado sequencialmente em uma questão fechada por uma escala nominal. Para tanto, as respostas de um survey foram correlacionadas com os resultados de pré-testes experimentais psicométricos sobre compreensibilidade dos itens e formação de imagens mentais, aplicando-os a grupos experimentais. Embora a seleção dos itens afeta diversos aspectos dos elementos linguísticos, parece que isso não influencia a escolha. A comparação entre os dados de visualização mental do item e a frequência do item

mostrou uma correlação muito alta, incomum nas ciências sociais ou psicossociais. Wording pode aumentar a compreensibilidade do item, mas não elimina os efeitos das visualizações mentais, portanto esses representam vieses permanentes.

PALAVRAS-CHAVE: visualização mental de item, teste psicométrico, pré-teste, survey experimentação, escolha de item.

1. INTRODUCTION

A review of the scientific literature on Linguistic, Social, Cognitive Sciences and Survey Metodology demonstrates a consensus concerning the influence of mental visualization or visual imagery of items at the moment of item selection. The results are largely based on experimental studies; however, in relation to public opinion research, there are only a few studies which describe surveys as being an interviewee who needs to choose a discursive item presented in a sequential order on a nominal scale. In opinion research, the choice of an answer not bound in the context of the item but rather influenced by an effect or bias like mental visualisation represents a distortion of the answer and not a rational choice.

The paper aims to identify the relationship between mental visualisation of an item and the response frequency of these items. The work is divided into four chapters. At first, some bias related to items are described in general as well as the effect mental visualisation or visual imagery may have on the items. Then after, a psychometric pre-test is conducted to measure the easy comprehensibility of items. Thereafter, a psychometric experiment is secribed to identify the easy degree of mental visualisation of the respective items. In the last chapter, the frequency of the items of the real survey are compared with the results of the mental visualisation experiment.

Two hypotheses are proposed to explain the relationship between item frequency and imagery. The first proposes that the response frequency is less reflected by the easy mental imaginability of items and the interviewee may pay more attention to the contextualization of the item. The second hypothesis states that the visual representation of objects has a stronger influence at polyatomic scales with many items, because the interviewee shortened the cognitive process of selection using the mental visualisation of items.

2 THE INFLUENCE OF BIAS ON THE SELECTION OF ITEMS IN CLOSED- ENDED QUESTIONS

In an interview, a chosen item presented in a closed-ended question on a nominal scale can represent the theoretical existing, true answer. However, the choice can be also influenced by effects not bound to the contextualization of the question or item like

cognitive problems of decoding, difficult comprehensibility, memory query or item specific effects like excessive number of items, item sequence, among other things, conceivably causes measurement bias and response tendencies.

A bias associated with linguistics aspects is the item-level priming effect (Heyman, Bruninx, Hutchison, & Storms, 2018) which facilitates the cognitive processing of an item by a stimulus associated with another previously placed item-word and; therefore, increases the probability that former responses produce similar responses ("*television news*" → "*newspaper*"; "*cow*" → "*milk*").

The conceptual priming effect influences the item choice through virtue of orthographic similarities to other previously presented items, which generates a false recognition of semantic association, but it results in a more fluent cognitive processing ("*politics*" → "*politician*"; "*migration*" → "*migrants*") (Thapar & Rouder, 2001).

Other biases are related to emotional effects of item words, covered by the context of items like "*war*", "*gay*" or "*racism*" (Altarriba & Bauer, 2004), or words related with unwanted behaviour ("*...argue...*"; "*Do you hate...*"), which the respondent avoids answering.

The phonological repetition effect can occur when the interviewee is saying the words mentally and chooses an item according to the similarity of the sound or of items previously presented during the interview ("*protection*" → "*protectionism*"; "*federal*" → "*federalism*") (Lopes, 2006).

A distortion independent of previously listed items may represent the size of the item. The interviewees choose short items to reduce the cognitive effort or choose shorter items because there would have a lower probability of misinterpretation due to the limited dimensions and; therefore, they have a higher comprehensibility. Although the effect is one of the most robust findings in psycholinguistics (Schreuder & Baayen, 1997), there is no consensus relating the operational definition of what is a long or short item.

The choice of an item may also be preconditioned by a framing, regarding no willingness to put in cognitive effort ("Yes", "Yes", "Yes"; preferences ("*radio*", "*car*" or "*television*") or lack of decision making ("*I don't know*").

These biases are treated like probabilistic, because it is still unknown which word elements, language structure or contexts effects produce distorted responses, which makes prevention nearly impossible (Vieira, 2019). It is also not clear, how the list-

strength effect of special item-words presented in an item sequential list impair the free recall of the remaining items (Diana & Reder, 2005).

3 THE MENTAL VISUALISATION OR VISUAL IMAGERY OF ITEM

In public opinion research, imagery of item is defined as the mental visualization of a descriptive answer (Logie, Zucco, & Baddeley, 1990). A memorized mental visualization has some structural resemblance with the context of the item because it integrates representatives, but also subjective interpreted elements (Rickheit, Herrmann, & Deutsch, 2008). Therefore, regarding like in all other the decision-making process (Oliveira, Figueiredo, Loiola, & Pereira-Guizzo, 2020, p. 68694) on how to answer a question as in a survey, the answer is interpreted as not being completely contextualized with the item-word, because the information about it is previously captured from real existing, often physical conditions and saved in long-term memory which can cause

failures (Robin & Garnier, 2022, p. 10). The use of mental visualisation points to a heuristic strategy and leads to an easier choice of items by reducing cognitive efforts by having to balance less the pros and cons with a certain response with stored information in the brain. The survey response, instead, which is influenced by this visually generated idea (Engelkamp, 1995) is, therefore; consequently, interpreted as bias and completely contradicts the criterion of the invariance of the rational choice theory. If a communication study, for example, confronts a respondent with the closed-ended question: "*What type of media and political propaganda most influences you in election campaigns?*" and the respondent selects "*candidate debate on television*" from the list of predetermined items, but visualizes it with "*swear word*" or "*insult*", the answer is not contextualized with the aim of the study which is to know what "political" element influenced the voter.

However, in some cases, mental visualisation leads to an increase in information processing, which makes the decision-making process more difficult because there must be more analysed dimensions. The item-response "... *results of public opinion research*", for example, represents four linguistic contexts or measurement dimensions ("*results*" + "*public*" + "*opinion*" + "*research*") and, therefore; a greater cognitive effort.

The mental visualisation of the item is formed by an external perspective, in which the interviewee only observes the context of the item ("*radio*", "*billboard*", etc.), which does not allow a concrete participation, or through an internal perspective, in

which the interviewee can imagine to participate actively and execute the action linked with the item (*"I did a door-to-door canvassing with the candidate in the neighbourhood"; "I waved the party flag in the street", etc.*) (McAvinue & Robertson, 2008).

Mental visualisation can influence the choice of items in the long-term memory as well as in the working memory (Roche, Tolan, & Tehan, 2011), or at any position when reading the items.

Due to the fluid reading of the questions and items in a survey, the mental visualisation of the item is called a subordinate bias (Binder & Keith, 1999), and may be accompanied by a social desirability situation, stress, tiredness, or other biases.

4 METHODOLOGICAL PROCESS

To measure the influence of the mental visualisation at the moment of item choice sequentially presented behind a closed question on a nominal scale was used a survey*, pre-test and survey experiment. Since the designer of the survey questionnaire (academic) and the respondent (collage students) in Belém belongs to different social groups with different understandings or transgressions of cultural differences, a pre-test was conducted as an assessment of cultural, linguistics and conceptual equivalence between interviewer and respondent (Cardoso, 2006) for identify cognitive burdens on the part of the interviewee to detect vulnerability aspects of the instrument. Without this pre-test and the identification of a sufficient understandability of questions and items, it is not possible to determine the construct validity of the questionnaire as instrument (Taherdoost, 2016). In the pre-test was applicated a quantitative questionnaire to test the future application of the sample questionnaire. With the test was the design of the questionnaire and logic sequence of question targeting; easy of question and item comprehensibility; easy to fill out the checkboxes; appropriateness of the items and item sequences; entre outros (Auer, Hampel, Möller, & Reisberg, 2000).

When referring to the similarity between a survey and the pre-test probability, the sample to select the participants of the pre-test can be probabilistic to obtain a representativeness in relation to the survey. However, the present selection was based on theoretical sampling, in which the random sample selected according to theoretical

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ideas and not on the statistical probability theory. To better measure the contextualization and comprehensibility of questions and items as a product of cognitive and social language processes, the pre-test was applied to the extreme focus groups of the survey universe (Cyr, 2019). In this way, 50 sixteen-year-old students were randomly selected, with this age group delimiting the survey universe downwards, and 50 twenty-fourth year-old students who demarcated the universe upwards. The groups generally differ in life experience and, although not necessarily, in cognitive evolution.

Although exist pre-tests using cognitive techniques, the research used a standardized psychometric pre-test questionnaire (Bolten, 1993), that indicated the validity through quantification. In this questionnaire, the student rated the degree of understanding of the survey questionnaire on an ordinal Likert scale from 0 (= very difficult to understand) to 10 (= very easy to understand). From a cognitive-psychological point of view, this scale rated better sociolinguistic aspects (Rohrmann, 2007) and is used in school examinations, so the college students have a certain familiarity with this type of assessment.

With the questionnaire modified in this way, the survey was carried out by a random sample in 76 secondary schools in Belem with $n = 800$ college students. The questionnaires were completed in self-administration by the students and without any intervention from the interviewer.

Due to the situation of a written group interview, there was no knowledge about how the interviewee completed the questionnaire. The process of detecting the items could have begun with a sensory-virtual reading of all items of a question successively presented up to the last, and then continued with the selection of the preferred item, or the item was immediately selected after reading. The second case is more predestined for the additional use of the mental visualisation of the item, while the first selection method indicates a more rational choice reorientation by the interviewee.

The experimental test to measure the capacity of the mental visualisation of item was carried out with 57 university students of the disciplines "Data Analysis" and "Scientific Methodology" of the Psychology course of the Federal University of Pará. Thirty to fifty selected participants are indicated as sufficient, which permits the detection of significant aspects and item problems (Blair & Srinath, 2008). For Perneger, Courvoisier, Hudelson, and Gayet-Ageron (2015) small samples with 5-15 participants may fail to uncover even common problems and recommend a size of 30 participants.

In order to facilitate the identification of the imagery effect, the students chose the questions "*Which policy areas are you most interested in?*" with a nominal scale with $n = 12$ items and "*What kind of media and political propaganda most influences you?*" with $n = 14$ items according to the hypothesis, that a greater number of items leads the interviewee to incorporate more the mental visualisation effect (table 1).

Table 1. Question and item-set used

question	Item
"Which policy areas are you most interested in?"	"public security policy" (1), "social policy" (2), "public health policy" (3), "agricultural policy" (4), "regional policy" (5), "education policy" (6), "foreign policy" (7), "urban policy" (8), "monetary policy" (9), "sport policy" (10), "environmental policy" (11) "none of these items" (12).
"What kind of media and political propaganda most influences you?"	"newspapers" (a), "music show" (b), "radio" (c), "journals" (d), "sticker on car" (e), "television" (f), "billboard" (g), "car parade" (h), "door-to-door canvassing" (i), "visiting community centers" (j), "waving flags on the streets" (k), "public opinion results" (l), "distributed propaganda material" (m), "candidates' debate on television" (n) e "none of these items" (o)

Source: Henkel (2022)

The first set of items (1) – (11) was also selected in order to achieve a phonological equality with the word repetition "...policy" ("...policy", "...policy", etc.) and, thus; the influence of mental visualisation of item would, therefore; be more important. The second item-set (a) – (n) was selected because the items were represented by short ("radio") as well as long item-words ("distributed propaganda material") which means that the effect could influence the selection both strongly and weakly.

In order to compare the values for the ease or difficulty in visualizing the respective items (1 to 11 and a to n) with the future answer frequencies of the items, there was applied a special questionnaire with the labels "easy to imagine visually" and "difficult to imagine visually" (two-point Likert rating scale) (Visser, Krosnick & Lavrakas, 2000). The scale was used since from the language-psychological point of view specific language elements or written words are difficult to measure with interval-scaled statements and the present scale resulted in a methodically tenable measurement (Forsberg, Johnson & Logie, 2020).

The completion time for reading the question, items, and marking of the answers of the psychometric questionnaire was < 5 minutes and therefore represents a short time test and is less than the recommended time for filling out psychometric experimental questionnaires (Sutin & Robins, 2007).

The relevant literature on psychometric tests to measure the mental visualisation generally does not indicate a high validation, as the items do not involve contextualizing

with the interview situation, questions and represents only the item's lexicographic aspect (Clark & Maguire, 2020). In addition, responding to psychometric questionnaires gives the respondent the expectation of answering a very important scientific question, but one that is very simple (Schwitzgebel, 2002). The results are often assumed to confirm preestablished theories but also may refute inaccurate ratings (Woisetschläger,

Eschweiler & Evanschitzky, 2007). In experiments, the interviewee knows that he is the subject and represents a single-source bias like the Hawthorne-effect (Brannigan & Zwerman, 2001), which can influence the motivation of the participants. Since students usually do not take part in experimental studies during lecture time, it is possible that they feel praise for their participation which may cause an exaggerated rating (aggravation effect), an overvaluation of the rating score, or a downplaying, leading to an undervaluation (Druckman & Kam, 2011). These biases are not necessarily intentional, but rather unconscious acts, maybe are applied only by a few participants within the normal within-group variability and due to its probability are difficult to identify.

On the other hand, since the psychometric test measures subjective impressions of persons and not their attitudes regarding social norms, behaviour, self-assessment, or subjective desirability, the reliability of the responses is classified as good.

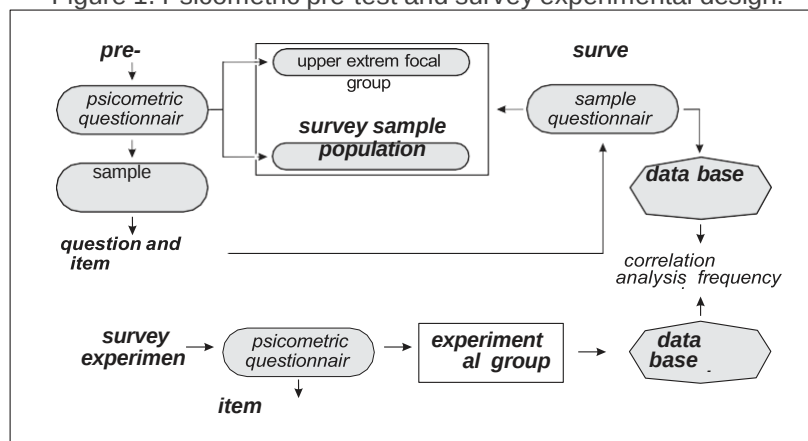
A simple comparison of the survey data base and experimental data base would not indicate necessarily the reliability. The test and survey do not represent identical processes, because the survey is associated with bias like the interviewer's presence, different in questionnaire length, and so forth. On the other hand, the experimental tests, due to the reduction to only a few testable hypotheses, the biases are limited to the hypothesis components (Wilholt, 2009). In addition, even an almost simultaneous beginning of test data and survey data collection ($t_{\text{test}} \approx t_{\text{survey}}$) therefore does not eliminate the problem of measurement invariance across time (Little *et al.*, 2019).

In addition, according to test theory *sensu stricto*, data correlation between different data bases like survey and experimental tests differ significantly (Zimmerman & Williams, 1977) and produces correlation errors like extreme values, which do not occur when data from only one survey database is compared to one another (Andrews, 1984). Therefore, it would be better to use the expression experimental test – survey correlation to explain the results.

Since the survey experimental test in this study analyses independent groups (survey population and experimental test group from different universes), the expression

survey population – experimental control group is more adequate. Therefore, the methodological design is based on two statistical models: the random-effects model (survey) and the fixed-effect model (experimental group) and is also known as meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2019). However, despite the critics, the model combines a broad and deep understanding of context through a variety of participant perspectives (figure 1).

Figure 1. Psicometric pre-test and survey experimental design.



Source: authors

5 RESULTS AND DISCUSSION

5.1 PRE-TEST ANALYSIS OF QUESTION AND ITEM COMPREHENSIBILITY

When analyzing the ease comprehensibility and answerability of the questions and items in the pre-test, it must be considered that some members of the upper extreme group of the survey population, due to their age and life experience, know certain topics of the questionnaire better, while those from the lower extreme group do not. However, the content of the question about "...most interested...?" ("*agricultural policy*"; "*sports policy*"; "*environmental policy*". etc.) represents areas that are discussed at school, but also presented in particular in the tele media environment, and, therefore; must be known by all pre-test participants.¹

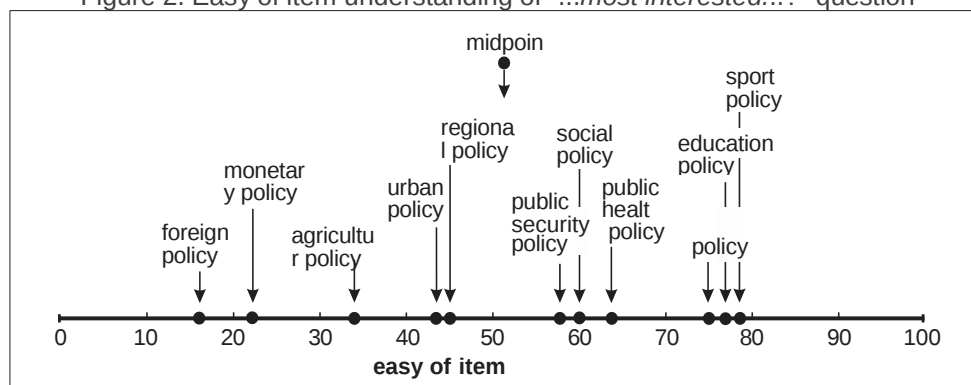
When it comes to the question of the influence of propaganda during election times, older respondents may also give "true" answers because they have participated in these past events and can more recall it with more ease from long-term memory.

Regarding validation aspects, the questionnaire was implemented with efficiency (no recall by the participants how to fill it out), followed a linguistic agreement (there was no nonresponse) and, therefore; represents acceptable reliability. The ease of all survey's questions was rated at 6,8 on the 10-point numerical scale. The questions "...most interested..." and "...most influences..." received a rating of 7.0 respectively 6,5. This means that using the visualization would make it easier to answer the last question in particular.

The difference between the question "...more interest...", which is considered more understandable, and the question "...more influences..." can hypothetically be explained by the number of items (12 items against 15 items) or, a greater number of items which makes the answer more difficult. However, the phonological standardization of the items with "...policy" may also have made the comprehensibility easier in the decision-making process.

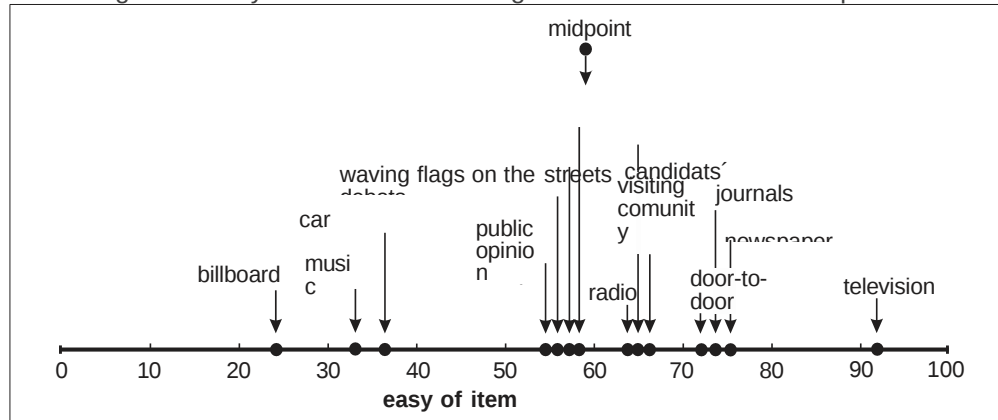
Although some items of the question "... most influenced ..." are characterized by physical aspects ("radio", "television", "magazines", "newspapers", etc.) and, therefore; by one-dimensionality, the presence of items consisting of more (logically) connected dimensions difficult the comprehensibility (51,6 %, respectively 59 %). Also, it can be difficult to remember how a past event, in this case an election, affected someone (figure 2 and 3).

Figure 2. Easy of item understanding of "...most interested..." question



Source: authors

Figure 3. Easy of item understanding of "...most influences..." question



Source: authors

Referring to the relation between item comprehensibility and item response frequency, different situations arise due to the correlation coefficients. The first question (“...most interested...” shows a strong correlation ($r(09) = .61, p > .048$) and indicates that the values are not random and, thus; are dependent. However, the statistical power is low due to the small number of cases in the study ($n = 11$), but indicates, that increases or decreases in one variable do (significantly) relate to increases or decreases in the second variable. The second question (“...most influenced...”) shows a medium-strong correlation ($r(12) = .40, p > .159$) and means that they are also, but less dependent. It is impossible to determine what caused the different ratings between the questions. It must be noted that the values represented cognitive aspects (validation, item selection) and not social or compartmental actions.

5.2 THE RELATIONSHIP BETWEEN MENTAL VISUALISATION OF ITEM AND ITEM FREQUENCY

The psychometric experimental test of the question “...most interested...” shows an average easy mental visualisation of the items of = 52 % and for the question “...most influences...” such an average of 57 %. To declare the items “*agricultural policy*”, “*regional policy*”, “*monetary policy*” and “*foreign policy*” as difficult to visualize (23 %) is not based on a lack of knowledge concerning the physic dimensions of the

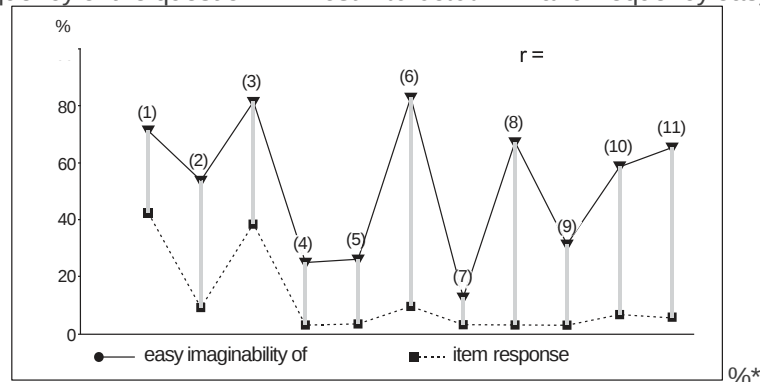
items, because of their regional identity the interviewees know aspects associated with agricultural like “*cassava*”, “*mango*” or “*cattle ranching*”. However, they do not know and maybe cannot utilize information in the national television reports about “*policy*” for agriculture, regional planning, financial aspects, and so forth, in context with their local

life. Therefore, it must be the “...*policy*” *aspect* that is more difficult to construct regarding imaginability. The respondent can also disregard the dimension “...*policy*” and only consider the principal dimension such as “...*security*...”, “...*health*...” or “*education*...”, and now analyzing the items with their daily life user experience. This means, that the respondent can visualize and analyse the item structures assembled or decoupled.

The second question “... *most influences*...” is composed of more logically connected item words. With 57% on average the visualizable is slightly higher, than the items of the first question, because of the one-dimensionality of some items (“*newspapers*”, “*radio*”, “*journals*”, “*television*” or “*billboard*” for example), while other has extended dimensions (“*candidates*” + “*debates*” + “*on*” + “*television*”). However, the average of unidimensional and multi-dimensional items is equal (58 %). Therefore, there must still be another additional component that supports an easy visualization. It is to be assumed that there is a higher and easier mental visualization when the interviewee has acquired a personal experience with the item content.

A comparison between easy item visualization and item frequency shows the accompaniment of both variables (figure 4).

Figure 4: Item frequency of the question “... *most interested*...” and frequency easy visual imagery, in

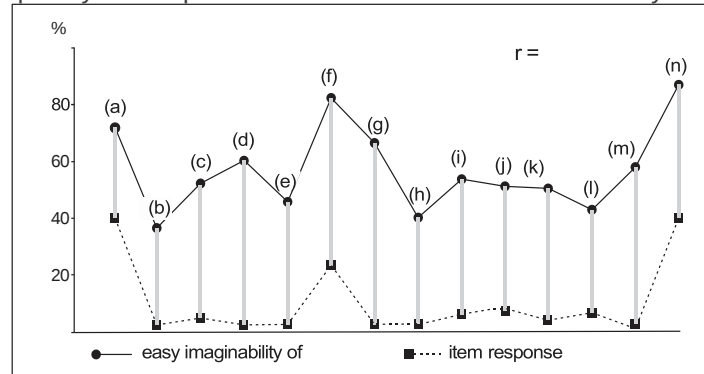


* Note: To identify the items, see the numbers in the text; Source: authors.

Contrary to the general direction, only items (8) and (11) show an opposite tendency. However, due to the large differences, it is visible that the easy mental visualisation of the item does not solely explain the selection for the items, and that there must be, in addition to this effect, other not yet known, maybe a rational choice that influences the interviewee. However, the correlation between the mental visualisation and the frequency of items expresses a very strong correlation ($r(9) = .66, p < 0.05$).

There is also a strict relationship between the item response frequency and the easy imagery of the item for the question “...most influences...” (figure 5).

Figure 5: Item frequency of the question “... most influences ...” and easy mental imagery, in %*



* Note: To identify the items, see the numbers in the text Source: author, 2021.

Figure 5 also shows the accompaniment of easy mental visualisation of item and item frequency. Only the items (d) and (m) show an opposite relation. Again, the correlation value between item response frequency and imagery shows a very impressively high relationship ($r(12) = .65$, $p = 0.05$).

Methodological conflicts or data quality aspects between the collection of survey data and experimental data should be excluded as explanations for the high correlation values. The participants of the survey experimentation were unaware of the survey population and future comparison.

In contrast to the social-behavioral sciences, which assume (semi-)stable subjective social norms when analyzing people involved in social and interactive scenarios such as word decoding, item comprehensibility, item selection, decision making, and so forth, the brain sciences understand effects in this moment of information transfer (Novembre & Iannetti, 2021) like short term correlations in functional related brain areas (Biswal *et al.*, 2010). However, neuroscience is not yet ready to show the exact relations (Vul, Harris, Winkielman, & Pashler, 2009). Therefore, the correlations seem to show a stochastic result and the high correlations seem to be occasionally related to items and not depend on a specific structure and therefore the effect is unpredictable.

Hence regarding the hypothesis, there are no clear explanations. The acceptance or rejection of the hypothesis that phonological standardized items influence the choice less than non-standard items cannot be expressed with the differences in the correlations ($r = 0.66$; $r = 0.65$).

Also, the second hypothesis that many items of a scale favor the influence of the effect, which can theoretically be explained by the greater cognitive effort required to read and process more items, cannot be confirmed either, especially since the data shows the opposite or the greater number of items, the smaller the influence.

6 CONCLUSION

Although there are studies that examine the relation between the mental visualisation of an answer item and his response frequency of in surveys, the causes cannot be explained exactly. From a psychometric point of view, the comprehensibility of items can be measured to different degrees. The study cannot clarify, on what on what the comprehensibility depends, be it the semantic nature of the item, number of syllables, dimensionality (one or more dimensions), socio-linguistic use, item length, empirical knowledge of the interviewee, among other aspects.

A single-choice question eliminates the influence of a few psycholinguistic effects, however, not the effect of mental imagery of the item. The research indicate that each structural element of an item word sources an influence and creates an effect, which makes the identifying process of these special effects impossible.

For public opinion research the results shows that the items can be changed or substituted to achieve better understandability, as well as differentiation from one another, but still represents a latent variable.

The high correlation values indicate that in decision-making processes such as the selection of answers, imaginary or mental representation of the item are always undesirably generated. This also means, that an answer obtained through a rational choice process, interpreted as only context-bounded to question and item and characterized as a true answer without bias, can, but does not need to be influenced by elements non- contextualized such as the item's imaginary. The results show that items are always visualizable, or the compressibility of a word or phrase is only achieved by the mental visualisation, although at different intensities, but that their inclusion in the decision- making process or anatomy of a functional response cannot be proven through selection. Even a precise and well-defined methodological design between pre-test and survey experimentation does not identify the real relation and thus, the empirical confirmation of the influences of the mental visualisation.

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CHAPTER 6

INVESTIGATION INTO NON-COMPUTERIZED ARCHIVES: A CASE STUDY: THE REAL CAPILLA OF GRANADA (ESPAÑA) IN THE MUSIC MAGISTRY OF ANTONIO CABALLERO (1758 - 1822)

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ABSTRACT: This article is trying to raise awareness about the figure of Antonio Caballero who, born in Cordoba and after having passed the relevant competitions, served as Master of the Music in the Royal Chapel of Grenada from 1757 to 1822, with Real Appointment signed by D. Íñigo de Torres y Oliverio, Secretary of the Royal House at the time of Ferdinand VI. His activity as chapel master and composer extends for the entire second half of the XVIII century and almost the first quarter of the nineteenth century, always in the same institution grenadine. This paper is structured into three main principal parts: historic approximation to the era of Antonio Caballero, functions and salaries and Headings and Index.

KEYWORDS: XVIII century, royal chapel, master chapel, salaries, stocktaking, headers, index.

RESUMO: Este artigo tenta conscientizar sobre a figura de Antonio Caballero que, nascido em Córdoba e depois de ter passado nas competições relevantes, serviu como Mestre de Música na Capela Real de Granada de 1757 a 1822, com Nomeação Real assinada por D. Íñigo de Torres y Oliverio, Secretário da Casa Real na época de Fernando VI. Sua atividade como mestre de capela e compositor se estende por toda a segunda metade do século XVIII e quase o primeiro quarto do século XIX, sempre na mesma instituição granadina. Este artigo está estruturado em três partes principais: aproximação histórica à era de Antonio Caballero, funções e salários e Títulos e Índice.

PALAVRAS-CHAVE: século XVIII, capela real, capela mestre, salários, inventário, cabeçalhos, índice.

1. INTRODUCTION

The present article serves as a summary of a much broader research project, which itself is the result of many hours spent within the Archive of the Royal Chapel of Granada, reviewing all the documents related to the figure of Antonio Caballero, Master of Music at the Royal Chapel of Granada from 1757 to 1822.

Maestro Caballero worked at this Granada institution for almost his entire life, having secured the position of Master of the Chapel through a competitive selection process with a Royal Appointment in 1757 at the age of 29. He remained in this role until his death in 1822, at the remarkable age of 94.

With the title originally given to the work, *Antonio Caballero, Master of the Royal Chapel of Granada from 1757 to 1822*, it seemed possible to encompass all the different aspects of his activity as *Maestro de Capilla* without the need for exclusion of any kind.

1.1 JOB DESCRIPTION

It should be noted that the result of this research was not the creation of a *biography* in the strict sense of the word on the figure of Antonio Caballero. Biographical notes emerged as a byproduct of the consultation and study of various documents, such as the *Capitular Acts*, *Factory Account Books*, and *Protocol Books*, all preserved in the Archive of the Royal Chapel, which make reference to him. What we intended, however, was to conduct a comprehensive study of his work as the *Maestro de Capilla* of the Royal Chapel of Granada, based on the documents we were able to locate in its Archive.

After examining all the documents available, we still know little about the private life of Antonio Caballero, but we did gather a great deal of information regarding his professional activities and his relationship with the Chapter of the Royal Chapel of Granada throughout his long tenure.

His interactions with the Chapter, which were not always smooth and were often fraught with tension, are evident throughout his professional career: his salary, his work as the master of the *seises*, his participation in competitive selections, his involvement in forming tribunals, his role as archivist, composer of works, and the director and visible head of the other musicians of the Royal Chapel of Granada.

Although, as previously mentioned, information about his private life is scarce, the same cannot be said about his musical output. The Archive contains nearly all the works of this *Maestro de Capilla* in excellent condition, cataloged years ago by Dr. José López Calo in his *Catalogue of the Royal Chapel of Granada*, listing a total of 221 works. Most are written in Spanish, generally *villancicos*, with fewer works in Latin such as masses, psalms, *magnificats*, etc.

It should be noted that in the principal research, from which this text is derived, we began with a general overview of the 18th century, the cultural atmosphere of Granada during that period, and the functioning of the Royal Chapel of Granada from its foundation until the time of Antonio Caballero. This historical context was intended to clarify the economic, social, and cultural environment, as well as the musical one, in which our *Maestro de Capilla*—the primary subject of this study—carried out his work.

The collaboration and good disposition of the entire Chapter of the Royal Chapel of Granada were crucial for the development of this study, especially that of its then Chaplain Archivist, Don Manuel Reyes, who facilitated access to the Archive and the handling of the documents under his care, without which this work would have been impossible. The assistance of all the concierges and other staff at the Granada institution was also invaluable, as they willingly opened and closed doors for me, both during regular hours and after hours, for many months and years, always with a smile on their faces.

I also greatly appreciate the contribution of Don Vidal González, Canon Archivist of the Cathedral of Málaga, who kindly provided information regarding the Archive under his care.

I must also express my gratitude to Dr. Antonio Martín Moreno, who gave me access to the catalogues of nearly all the Spanish, Latin American, and Portuguese cathedrals, guiding and advising both the structure and development of this research.

The full research was published in a book by the *Centro de Documentación Musical* of the *Consejería de Cultura* of the Andalusian Regional Government, headquartered in Granada, with the support of the then *Caja General de Ahorros* of Granada. We owe a debt of gratitude to both that institution and to the directors of the *Centro de Documentación Musical de Andalucía* (Beatriz de Miguel, Esteban Valdivieso, and Reynaldo Fernández) for their interest in this work*

* See in Bibliographic References: Ortiz Molina, María Angustias, 2002.

1.2 WORK STRUCTURE

The complete research work was divided into several parts:

- First Part: Historical Overview of the Era of Antonio Caballero;
- Second Part: Antonio Caballero: Duties and Salaries;
- Third Part: Incipits and Indexes;
- Fourth Part: Bibliography;
- Fifth Part: Documentary Appendices;
- Sixth Part: General Index.

Moving on to the description of the content of each of the parts, we will comment that:

- The first section, titled *Historical Overview of the Era of Antonio Caballero*, focuses on studying 18th-century Spain, 18th-century Granada, and provides a brief history of the Royal Chapel of Granada.
- The second section, titled *Antonio Caballero: Duties and Salaries*, centers on the analysis of Caballero's role in the various aspects of his duties as *Maestro de Capilla*: participation in competitive examinations; appointment to the Royal Chapel of Granada; involvement in competitions for other positions; activity as a composer and inventory of his works; role as *Maestro de Capilla* and *Maestro de Seises*; participation in examination committees; work as an archivist; references to his own works and those of other authors; relations with the Chapter; Caballero's salaries; and conclusions.
- The third section, titled *Incipits and Indexes*, contains the headings (*incipits*) of all Caballero's works preserved in the Archive of the Royal Chapel of Granada, which we were able to locate—214 in total—arranged alphabetically, by key, by musical form, by the number of voices in each work, and finally, an index of proper names and abbreviations.
- In the fourth section, *Bibliography*, we present various 'groupings' of the consulted sources:
 - A. Non-musical studies;
 - B. On the Royal Chapel of Granada;
 - C. General repertoires on Spanish music;

• Ortiz Molina, María Angustias (1997). Antonio Caballero: Chapel Master of the Royal Chapel of Granada from 1757 to 1822. Barcelona: ETD Micropublications.

- D. General and local works on music;
- E. Works on 18th-century music;
- F. Catalogs of the various Spanish, Latin American, and Portuguese cathedrals;
- G. Chapter Acts Books of the Royal Chapel of Granada from 1757 to 1823;
- H. Factory Account Books of the Royal Chapel of Granada from 1757 to 1823;
- I. Protocol Books of the Royal Chapel of Granada from 1757 to 1823.

We must highlight the fact that in the specialized bibliography we do not find many news alluding to the figure of Antonio Caballero – except for those of Dr. Martín Moreno and those of Dr. Tejerizo Robles - and which can be summarised as follows: he was born in Córdoba, with no date of birth specified, that in 1757 he occupied the position of Chapel Master at the Royal Chapel of Granada, that on three occasions he tried unsuccessfully to change his position, taking competitive exams for positions at the Cathedral of Malaga, that of Seville, that of Zamora and finally, that he remained at the service of the Granada institution until his death at an advanced age in the early years of the 19th century.

As for his works, we had from the first moment the Inventories that Dr. López Calo published on the Music Archive of the Royal Chapel of Granada, collecting in them up to 221 works by our author, of which in our research we were only able to locate 214 –as we already mentioned–.

We also investigated whether works by the Master Caballero were located in other archives, so we proceeded to extract all the catalogues published to date on both religious and noble archives; the result was not very satisfactory since only one of his carols is included in the Catalogue of the Monastery of El Escorial. The aforementioned carol, which we managed to locate –after making the appropriate trip– is similar, as we commented during the work, to one of the same title that is in the Archive of the Royal Chapel of Granada.

- In the section entitled Documentary Appendices we include:

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- Martín Moreno, Antonio (1985). History of Spanish music. The 18th century. Madrid: Alianza Música.
 - Tejerizo Robles, Germán (1989). Baroque Christmas Carols in the Royal Chapel of Granada. Granada: Andalusian Music Documentation Centre – Andalusian United Publishing House S.A.
 - López Calo, José (1958). "The music archive of the Royal Chapel of Granada (I)". Musical Yearbook, XIII, Madrid, pp. 103-128.
 - Rubio, Samuel (1976). Musical Catalogue of the Royal Library of the Monastery of El Escorial. Cuenca: Institute of Religious Music of the Ex.ma Provincial Council.

- a. A record of all the wages received by Antonio Caballero (which were paid in "thirds," meaning every four months, or three times a year) during the uninterrupted 65 years he served at the Royal Chapel of Granada;
- b. We present a complete transcription of the *Villancico Adoremos la luz* (undated), for 3 voices;
- c. We include the *Villancico Una zagala graciosa* (undated), for 4 voices and solo;
- d. We include the *Villancico Vaya de Tonadilla* (1760), for 5 voices and solo; d. We include the *Villancico Del monte bajan* (1802), for 6 voices and solo;
- e. We append several documents from the life of Antonio Caballero.

2 METHODOLOGY

The methodology employed has always aimed to be highly respectful of the historical and musical data handled, both in its general scope and specifically in the documents worked on within the Archive of the Royal Chapel of Granada and the Archive of the Royal Monastery of El Escorial.

Since the work was primarily conducted within an archive, we had to adopt the methodology for handling the documents as instructed by the then-archivist, without any contribution on this aspect from the author of the research.

Nevertheless, the writing and presentation of the study follow the standard method used for historical research, beginning with general aspects and progressively narrowing down to the specific, and moving from the oldest to the most recent information. In our case, the process was as follows: contextualizing the 18th century, the 18th century in Spain, the 18th century in Granada, the Royal Chapels, the Royal Chapel of Granada, the Royal Chapel of Granada in the 18th century, the Royal Chapel of Granada during the time of Antonio Caballero, and documents referring to Antonio Caballero in the archive of the Royal Chapel of Granada.

3 RESULTS, DISCUSSION AND CONCLUSIONS

We hope that this work assists scholars and researchers in these subjects to position Antonio Caballero in his rightful place within the history of Spanish religious

music in the second half of the 18th century. From among all the aspects we considered, we will highlight the following due to space constraints:

1. Spain's 18th Century Context: In the second half of the 18th century and the early years of the following century, Spain was experiencing an evident economic decline within the broader European context, caused by various factors. Internationally, the country was embroiled in continuous wars (Netherlands, England, France...), which drained the royal treasury and made it difficult to replenish it with precious metals from Spanish America. This was due both to the plundering of Spanish ships by the aforementioned nations, with whom Spain intermittently waged war, and to the continuous fluctuations in gold and silver prices in European markets.

Domestically, despite the differences between the reigns of the Bourbon monarchs who ruled Spain in the 18th century, common difficulties included the unequal and poor distribution of agricultural lands, epidemics that often ravaged populations weakened by hunger and scarcity, the decline of industry due to outdated machinery, making it more profitable to import goods, the deterioration of both domestic and foreign trade, significant fluctuations in prices (especially of staple goods like wheat, oil, and wine), and the poor management of public finances despite attempts to reform them, particularly by the ministers of Charles III. One of the most costly issues was the "vellón" problem, where large amounts of copper were added to the alloy used for coinage, maintaining the face value of the currency while its real value was significantly lower.

Culturally, although Spain joined the Enlightenment movement – the so-called "Century of Lights" – somewhat late and faced considerable opposition, especially at the beginning. In literature, notable figures included Father Feijoo, Father Isla, Jovellanos, Cadalso, and Moratín. In music, aside from Spanish-born composers discussed at the appropriate time, two major Italian-born but Spanish-adopted figures, Luigi Boccherini and Domenico Scarlatti, signaled the transition from the *stile galante* to classical music proper. From the reign of Philip V, Spain was "invaded" by Italian musical influences, brought by various Italian opera singers and companies that traveled across the peninsula.

In terms of music theory, major Spanish contributors include Father Feijoo, Antonio Eximeno, Francisco Vals, and Antonio Soler. None of these developments were lost on Maestro Caballero as a musician and composer.

2. Granada's Situation in the 18th Century: The aforementioned issues affecting Spain were fully felt in Granada, a provincial city increasingly slipping into economic isolation, maintained as a provincial capital mainly thanks to its cultural activity, primarily emanating from the University. This facilitated the creation of cultural circles in various fields of knowledge: the Economic Society of Friends of the Country, the Lyceum, the Academy of Medicine, the Academy of Fine Arts Nuestra Señora de las Angustias, literary circles, theaters, and salons.

The city's musical life revolved around religious institutions (the Cathedral, the Royal Chapel, the Collegiate Church of El Salvador, and others of lesser importance), theaters that periodically hosted both Spanish and Italian operas, and the salons of provincial nobility and high bourgeoisie homes, where poems were recited, literary works discussed, and musical pieces performed during gatherings.

3. The Decline of the Royal Chapel of Granada: During this period, the Royal Chapel of Granada entered its final decline. Economically, it suffered under the imposition of tithes and new taxes levied by the Crown on religious institutions, leading to a gradual loss of power, income, and property. After Ferdinand VI granted the "Constitutions for the governance of the Royal Chapel of Granada" in 1758, which set the rules and salaries for non-prebendary members of the institution, the monarchy gradually distanced itself from these "royal centers" outside the capital, considering them costly and unnecessary.

From its foundation, the priests of the Royal Chapel ("Royal Chaplains") were independent of the ordinary ecclesiastical jurisdiction, reporting not to the Archbishopric of Granada but directly to the Royal Household. This independence led to numerous conflicts with the nearby Cathedral. Under Charles III, there was a growing trend to integrate the Royal Chapel into the regular ecclesiastical jurisdiction, making it increasingly subordinate to the Archbishopric. Over time, the Royal Chaplains had to accept this reality.

A similar situation affected the members of the Chapel of Music. Musicians took great pride in securing a position through competitive examination at the Royal Chapel of Granada, as they were awarded a Royal Appointment from the Crown. However, this sense of privilege caused friction with the Chapter, as musicians felt more aligned with the Royal Household than with the Chapter itself. With the economic decline affecting the Royal Chapel but the need to maintain musicians' salaries as stipulated in the 1758

Constitutions, the Chapter opted not to fill vacancies through competitive examination, instead relying on interim appointments or leaving positions vacant, hiring musicians only for specific celebrations as needed.

When Antonio Caballero, the last official Maestro of the Royal Chapel of Granada, passed away, his position was never again filled through competitive examination (from 1822 to the present), and Antonio Luján assumed the role on an interim basis. After 1822, interim appointments increasingly affected the rest of the members of the Chapel of Music. In early 1869, the Chapter dismissed the last choirboys (*Seises*). Two years later, in late 1871, it informed the remaining members of the Chapel of Music that their duties had concluded. From this point onward, the Chapel of Music of the Royal Chapel of Granada ceased to exist entirely due to financial difficulties.

4. Antonio Caballero's Early Life and Career: Antonio Caballero was born in Córdoba in 1728 and baptized in the parish church of San Hipólito in that Andalusian city. Little is known about his childhood and youth, including where and with whom he received his musical training. The first verifiable information we have about him comes from 1757, when at the age of 29, he competed for and won the position of *Maestro de Capilla* at the Royal Chapel of Granada. He served in this role until his death at the age of 94 on March 2, 1822, and was buried in the parish church of El Sagrario in Granada, as recorded in Burial Book No. 17, folio 18 verso.

5. Family Life: Antonio Caballero married Juana Molina, a native of Granada, with whom he had two children: Antonio and María. Little is known about his son Antonio, except that he was alive when his father passed away in 1822, as he was named a beneficiary in the will. His daughter María, born in Granada on August 9, 1778, joined the convent of Santa Isabel la Real in 1804, took her vows in 1805, and passed away in 1842 at the age of 63, outliving her father by 20 years.

6. Caballero's Last Will and Testament: Antonio Caballero's will was drawn up before Juan Manuel de Vílchez, Royal Notary* On August 20, 1819, naming the Priest D. José Márquez and D. Antonio Navas as executors, and his children D. Antonio and D.^a María Caballero Molina as heirs.

7. Caballero's Pursuit of Better-Paid Positions: Throughout his career, Caballero made unsuccessful attempts to obtain better-paid positions by applying for the

* Abbreviation for His Majesty.

Maestro de Capilla positions at the cathedrals of Málaga, Zamora, and Granada, as well as for the *Maestro de Seises* position at the Cathedral of Seville.

8. Work at the Royal Chapel of Granada: Caballero served his position at the Royal Chapel of Granada with dignity for 65 years. He caused no major issues for the Chapter, aside from occasional disorder in maintaining the music archive and, in his younger years, overstaying his leave beyond the permitted time. In his old age, he requested financial assistance to pay for doctors and medicines due to the ailments caused by his advanced age.

9. Economic Challenges and Salary: Despite limited reference points for comparison, it can be asserted that Caballero took his position at the Royal Chapel of Granada during the institution's economic decline. His salary was modest relative to the work he performed, considerably lower than that earned by other *Maestros de Capilla* in the cathedrals of Córdoba or Santiago de Compostela, or the Royal Chapel and convents such as the Encarnación and the Descalzas Reales in Madrid.

It is possible that the reduced salary was somewhat offset by the prestige associated with holding such a position. The records of his earnings in the final years of his life are unclear, with anomalies in how amounts were recorded and a uniformity in figures that suggests he may not have been formally included in the payrolls. Instead, it is likely that he was granted a subsistence allowance, akin to a "retirement" pension, in recognition of his many years of service. After his death, these payrolls were regularized, with Caballero's payments from 1806 to 1822 being included in one go, possibly leading to the errors noted by the scribes.

10. As *Maestro de Seises* at the Royal Chapel of Granada: Caballero served in this role for a relatively short time, around ten or eleven years, and it seems that his disorganized nature made him ill-suited for working with children. He himself considered this part of his duties to be unpleasant, and he resigned from this position in 1769 when the 1758 Constitutions of the Royal Chapel of Granada came into effect, thus relinquishing the associated salary bonuses. The role of *Maestro de Seises* was then assigned to other members of the Royal Chapel of Granada.

11. His Work as Archivist: Caballero was also tasked with the role of archivist, a responsibility typically attached to the position of *Maestro de Capilla*. However, this task did not suit him due to his apparent lack of organization. During his tenure, Caballero

was required to compile three inventories of the musical works housed in the archive of the Royal Chapel of Granada:

The first inventory was completed in 1781, after he had already been *Maestro de Capilla* for 24 years, and it was carried out under the mandate of the Chapter, with Capellán Mayor Don Francisco Ruiz de Lenzano, Prefect of the Choir Don Miguel Gutiérrez, and Doctoral Don Evaristo Vefarano, who acted as Secretary*. In this Inventory Caballero refers to 316 works as his own, a wide numerical difference with the 214 that we were able to locate in our research and the 221 that Dr. López Calo refers to in his catalogues;

The second inventory is dated in 1792, eleven years after the previous one. This inventory was also carried out under the mandate of the Chapter, with Capellán Mayor Don José Joaquín de Eulate, Prefect of the Choir Don José Ramírez, and in the absence of the Chapter Secretary Don Alfonso Antonio de Cuenca. The inventory was conducted by Antonio Caballero and was subsequently signed by the titular Secretary*;

The **third inventory** was conducted five years before Caballero's death, in **1817**, when he was already **89 years old** and could not participate directly due to ill health. This inventory was carried out under the mandate of the Chapter, with Capellán Mayor Don Rafael Bernardo de Almería and Protector of the Music Chapel Don Rodrigo de Simón y Martín. The Chapter Secretary was Don Alfonso Antonio de Cuenca, and the functions of Antonio Caballero were filled by the contralto musician Don Andrés Orozco*.

The inventories he prepared were not done of his own volition, but were imposed by the Cabildo, which at times withheld portions of his salary or possessions until they were completed to the full satisfaction of the Royal Chaplains supervising him. Whether done willingly or under duress, it is certain that Caballero provides us with invaluable historical documents through these inventories, which allow us to ascertain with complete certainty the works that could be found in the Archive of Music of the Royal Chapel of Granada in the second half of the 18th century.

12. From his management of the numerous examination boards he had to establish over the years to fill vacant positions for musicians in this Granada institution, after studying all the preserved documents related to this matter, it can be said that he

* Archive of the Royal Chapel of Granada: File 144, piece 1, 16 pages, paper size 310 x 210 mm.

* Archive of the Royal Chapel of Granada: File 144, piece 2, 19 pages, the last of which is completely blank and closes the booklet, paper size 310 x 210 mm.

* Archive of the Royal Chapel of Granada: File 144, piece 3, 30 pages on paper of variable size.

appeared to be an honorable man, concerned with equipping the Chapel of Music with the best singers and instrumentalists who applied for these positions, revealing no sympathies or preferences in his reports other than those strictly musical. It is not uncommon in the study of such 'reports' for Caballero to describe the various qualities of each musician, but at times he would advise the Cabildo that it would be better to leave the position vacant than to fill it with someone unqualified to represent and meet the institution's needs.

On several occasions, we also observe that the Cabildo disregarded the examiner's findings—Antonio Caballero—and forwarded the names of candidates not favorably mentioned in the Master's report to the Royal Chamber for their appointment.

13. Among the duties of the Maestro de Capilla of the Royal Chapel of Granada, at least during the tenure of Maestro Antonio Caballero, was the procurement of works that contributed to the solemnization of specific religious functions, typically by more or less renowned composers. When the Chapel of Music lacked funds for this purpose, Antonio Caballero 'sought assistance' from the Cabildo of the Royal Chapel of Granada to achieve this goal.

14. As a composer—another facet inherent to his position—we owe him a considerable number of works, all of which are manuscript and preserved in the Archive of the Royal Chapel of Granada, except for a three-voice villancico with violins titled *Adoremus la luz*, which is kept in the Archive of the Royal Monastery of El Escorial—identical to one of the same title preserved in the Royal Chapel of Granada—along with some works held in the Cathedral of Málaga and a few works of difficult attribution preserved in the Archive of the Cathedral of Ávila. In total, 221 works are preserved in the Royal Chapel of Granada, most of which are signed with his name, and a few are attributed to him anonymously by Dr. López Calo, of which we were able to locate only 214 in our research, as previously noted.

Most of his output is written in Spanish and corresponds to the villancico form—in its variations for Christmas, the Holy Sacrament, and the Virgin— a form widely performed in 18th-century Granada, sung before the public on significant dates, not only in the Cathedral, the Royal Chapel, and the Collegiate Church of Salvador, but also in virtually all parishes.

A few of his works in Latin are written in a cappella polyphony, while all others—both in Latin and in Spanish—are of the vocal-instrumental genre, with the violin being

the instrument used in all of them, and the other instruments being variable but adapted to the limited instrumental ensemble available in the Chapel of Music of the Royal Chapel of Granada during Antonio Caballero's time.

15. From Caballero's preserved works in Latin, we have located and studied:

- 2 Masses for 6 and 8 voices with instruments;
- 7 Hymns, mostly dedicated to the Virgin; six of them for 4 voices a cappella and the seventh for 6 voices with instruments;
- 3 Lamentations with instrumental accompaniment;
- 23 Motets, 10 of them a cappella and the rest with instrumental accompaniment;
- 16 Psalms and Magnificats, with instrumental accompaniment.

16. From his production in Spanish, we located and worked on:

- 124 Christmas villancicos, all with instruments;
- 21 villancicos to the Holy Sacrament with instruments;
- 5 villancicos to the Virgin, likewise instrumentalized;
- 16 works included in 'varia en español,' in the form of villancicos and instrumentation, with violins predominating in all of them.
- 17. In addition to these works signed by Caballero, he is attributed* and we also take care of its study:
 - In Latin, 2 Psalms and 1 Motet, all a cappella, and 1 Mass for 6 voices with instruments;
 - In Spanish, 1 villancico with instrumental accompaniment.

18. Due to the musical characteristics of his works, we cannot categorize Antonio Caballero within the late Baroque period, as he ceased to employ some of its defining techniques, such as the continuo—functions that he sometimes compensates for with accompaniment, which is typically written in long values and with minimal use of rests—or polychorality, a practice he never utilized. In his works, when there are two complete choirs (SATB/SATB*, SSAT/SSAT, or SSAT/SATB), one is usually the choir soloist and the other accompanies, with the lower voice of the accompanying choir sometimes being replaced by the organ. When there are two choirs and only one of them is complete, the voices of the first one take the solo roles.

* López Calo, José (1958). "The music archive of the Royal Chapel of Granada (I)". *Musical Yearbook*, XIII, Madrid, pp. 103-128.

* SATB = Soprano, Alto, Tenor, Bass.

His earliest works could be considered ‘in-between’ the *stile galant* and classicism, solidifying the characteristic techniques of the latter movement. His music exhibits a clear structure, making it easy to discern the beginning and end of different musical phrases, each concluding with a cadence. Homophonic texture predominates, resulting in predominantly vertical writing.

The polyphonic works are more defined by the staggered entry of voices than by their construction, as their harmony is written vertically and not conceived horizontally. We find polyphonic texture only in certain tenor or alto embellishments and in the suspensions they perform to reach the cadences. In many works, he includes—typical of the Italian style—arias, duets, and recitatives. The homophonic texture apparent in his style may not stem from a conscious acceptance of classical norms or the new style, but rather from his lack of mastery over the complexities of the now ‘outdated’ Baroque techniques.

19. Regarding the instrumentation of his works, most include accompaniment or a bass line without specifying what type of instrument is to perform it. However, we assume it should be a harmonic instrument since it often indicates figures to form chords, and it should be a low-pitched instrument, as the parts are written in bass clef in the fourth line.

His ‘favorite instruments’ that dominate all his works are the violins. Whenever his works include violin accompaniment, there are 2 parts for the first and second violins. The violins are followed in frequency of use by horns and distantly by oboes, trumpets, flutes, bassoons, and organ.

We should not accuse Antonio Caballero of repeating the same type of instrumentation in his works. While this is true, we must consider that all of them were composed for use in the religious functions of the Real Capilla de Granada, and his duty as Maestro de Capilla was to adhere to the instrumental resources available in the institution where he served, which were quite limited and well-known to him.

20. Thus, we can include Antonio Caballero among the Spanish composers of religious music of his time—since we do not know of any secular works by him, most of his compositions belong to the vocal-instrumental genre, some to the exclusively vocal genre, and none that we know of in the instrumental genre.

His inclusion in the roster of Spanish musicians of the second half of the 18th century and the early years of the 19th century should not only be based on the considerable number of preserved compositions but also because he demonstrates that

his musical practice—even with the limited resources available—stands on par with that of his contemporary compatriots in terms of style, instrumentation, vocal functioning, and employed musical resources.

We must also acknowledge his effort to achieve a suitable musicalization that fosters a good relationship between music and text, not only aligning musical and grammatical accents but also employing, on several occasions, appropriate musical ‘devices’ to highlight the most interesting parts of the text and, at times, to simulate with music the images suggested by the text.

This endeavor of the Maestro to achieve a music-text fusion must have been quite a challenging task after studying, as we have, the texts of his villancicos in Spanish, since in many cases the local poets were rather uninspired in composing their verses. Another yet unrecognized merit of Antonio Caballero’s music is the creation of melodies, some of which are exquisite, performed sometimes by voices and other times by instruments, particularly those executed by the violins.

21. In conclusion, it would be desirable to rescue all his musical production from the archive in which it is located, and once his best works are selected, to have them ‘performed’ with the appropriate voices and instruments to bring them to light*.

* Ortiz Molina, María Angustias (2002). Antonio Caballero (1728-1822): Incipits of his works. Granada: Junta de Andalucía – Ministry of Culture, Musical Documentation Center of Andalusia and the collaboration of the General Savings Bank of Granada.

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- Rubio, Samuel (1979). *Catálogo de las partituras musicales del Monasterio del Escorial*. Madrid: Real Monasterio del Escorial.

Rubio, Samuel y Sierra, José (1982). *Catálogo del Archivo de Música de San Lorenzo el Real del Escorial (II)*. Cuenca: Instituto de Música Religiosa de la Ex.^{ma} Diputación Provincial.

Tejerizo Robles, Germán (1989). *Villancicos barrocos en la Capilla Real de Granada*. Granada: Centro de Documentación Musical de Andalucía – Editoriales Andaluzas Unidas S.A.

ANNEXES

Annex 1. Incipit digitalizado del Villancico Adoremos la Luz

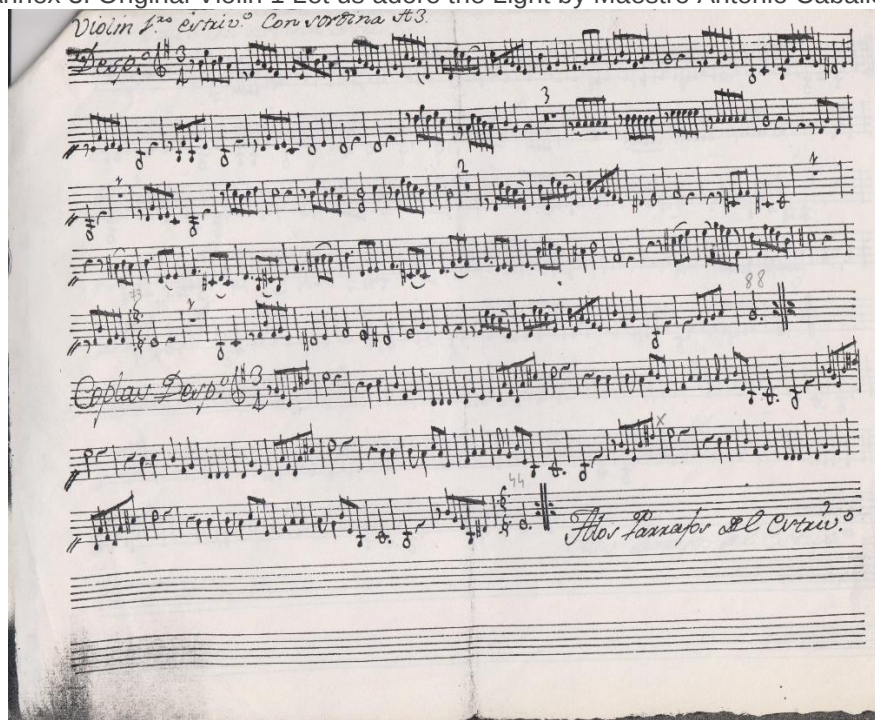
Autor: CABALLERO, Antonio
Fecha del documento: 1759
Título: Adoremos la Luz, a 3 v.
Material: Manuscrito, papeles sueltos (14), completa, buen estado.
Forma: Villancico, Tpos.2. / **Tonalidad:** Mi m.
Género: Vocal-Instrumental. **Voces:** S A T
Instrumentos: Violines I-II, Acompañamiento.
Observaciones: Bajo repetido; ambas copias con sordina. En español.
 De Navidad. Existe una copia igual en el Escorial: n° 24-3. Es muy parecido al n° 644 de la Capilla Real.
Signatura: 604

Source Annex 1: Prepared by the authors from the manuscript filed under the Signature No. 604 in the archives of the Royal Chapel of Granada.

Annex 2. Digitized transcription of the beginning of the Christmas Carol Let Us Adore the Light

Source Annex 2: Prepared by the authors based on the manuscript filed under Signature No. 604 in the archives of the Royal Chapel of Granada.

Annex 3. Original Violin 1 Let us adore the Light by Maestro Antonio Caballero



Source Annex 3: Archive of the Royal Chapel of Granada, manuscript archived with the Signature No. 604.

Annex 4. Incipit digitalizado de la Misa a 7 voces con instrumentos

Autor: CABALLERO, Antonio

Fecha del documento: S. XVIII

Título: Misa a 7 con todos los instrumentos.

Material: Manuscrito, papeles sueltos (128), completa, buen estado.

Forma: Misa. / Tonalidad: Re M. / Género: Vocal-Instrumental.

Voces: S A T / S A T B

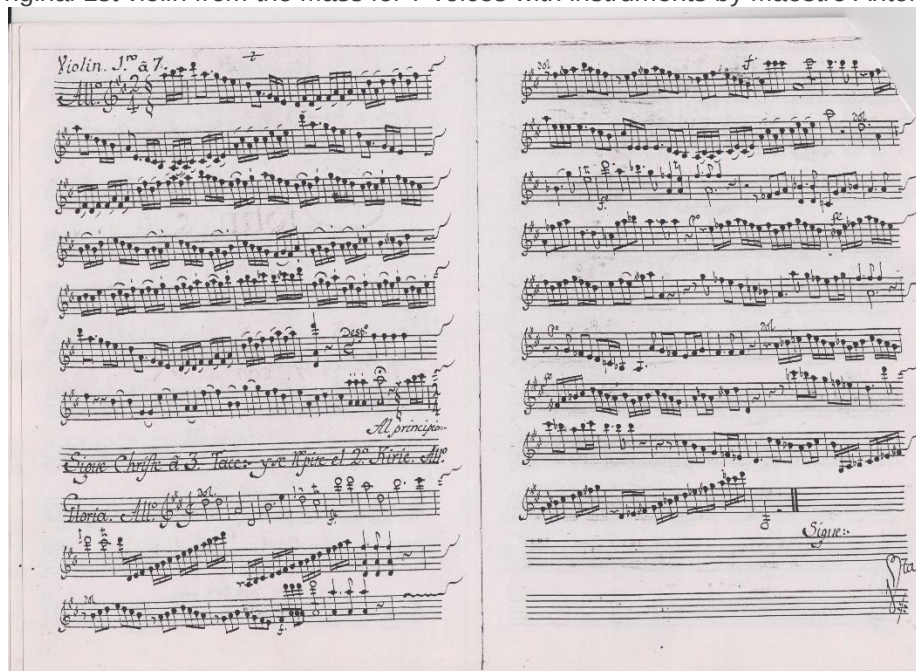
Instrumentos: Trompas I-II, Clarines I-II, Violines I-II, Acompañamiento

Observaciones: El acompañamiento está repetido. El bajo del 2º Coro es instrumental. Los clarines alternan con las trompas. En latín.

Signatura: 556

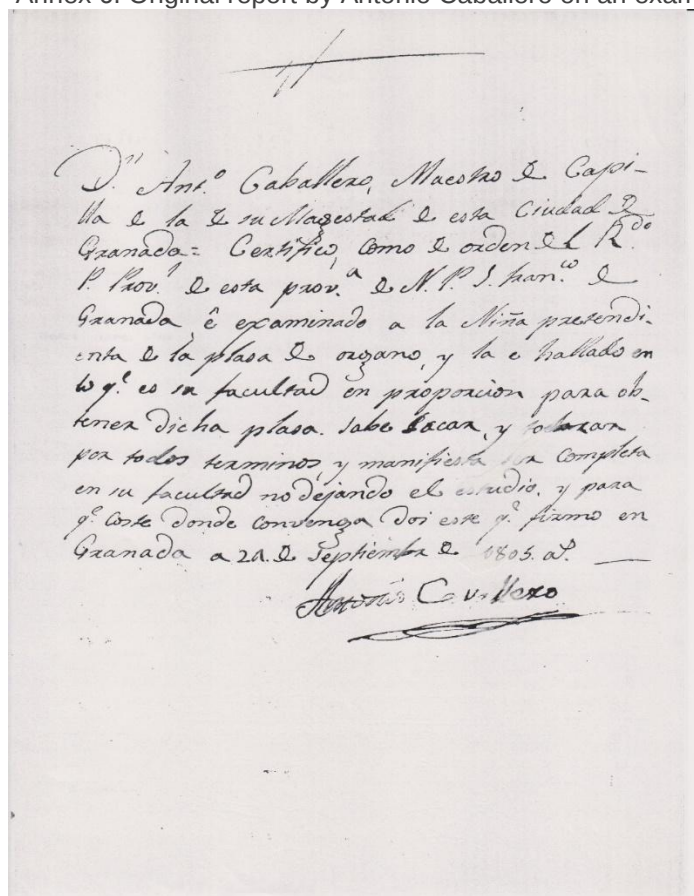
Source Annex 4: Prepared by the authors from the manuscript filed under the Signature No. 556 in the archives of the Royal Chapel of Granada.

Annex 5. Original 1st violin from the Mass for 7 voices with instruments by Maestro Antonio Caballero



Source Annex 5: Archive of the Royal Chapel of Granada, manuscript in "loose papers" no. 128, corresponding to the Mass at 7 with the Signature no. 556.

Annex 6. Original report by Antonio Caballero on an exam



Source Annex 6: Archive of the Royal Chapel of Granada, file 155; there are 940 sheets of paper measuring 310 x 210 mm.

Annex 7. Death certificate of Antonio Caballero



Reintégrese

B. N.º 001599

CERTIFICACION LITERAL DE PARTIDA DE DEFUNCION

Parroquia <u>Sagrario</u> Diócesis <u>Granada</u> Provincia <u>Granada</u> Libro <u>17</u> Folio <u>18 vto</u> Núm. _____	Don Manuel Morcillo Alabarces _____, Encargado del Archivo Parroquial de <u>Sagrario</u> _____, Diócesis de <u>Granada</u> _____, Provincia de <u>Granada</u> _____, CERTIFICA: Que el acta al margen reseñada, correspondiente al Libro de Defunciones, literalmente dice así: <u>El ilmo D. Antonio Caballero, viudo de Da Juana</u> <u>Molina, y feligres de esta Parroquia del Sagrario,</u> <u>otorgo su testamento por ante D. Juan Manuel de</u> <u>Vilchez Escribano de S. M. en veinte de Agosto de mil</u> <u>ochocientos diez y nueve, instituyo albaceas a el</u> <u>Presvitero D. Jose Marquez y a D. Antonio Navas; por</u> <u>herederos a D. Antonio y Da. Maria Caballero, y Mo-</u> <u>lina sus hijos; y manda se digan por su alma, e in-</u> <u>tencion cien misas rezadas su estipendio cinco V. vn</u> <u>de las que se aplicaron veinte y cinco, que tocaron</u> <u>cuarta, con el correspondiente Novenario. Vajo cuya</u> <u>disposicion fallecio en dos de Marzo de mil ochocientos</u> <u>veinte y dos, y su cadaver fue sepultado por esta su</u> <u>Parroquia, y en su enterramiento señalado lo que yo</u> <u>el colector certifico</u>
---	---

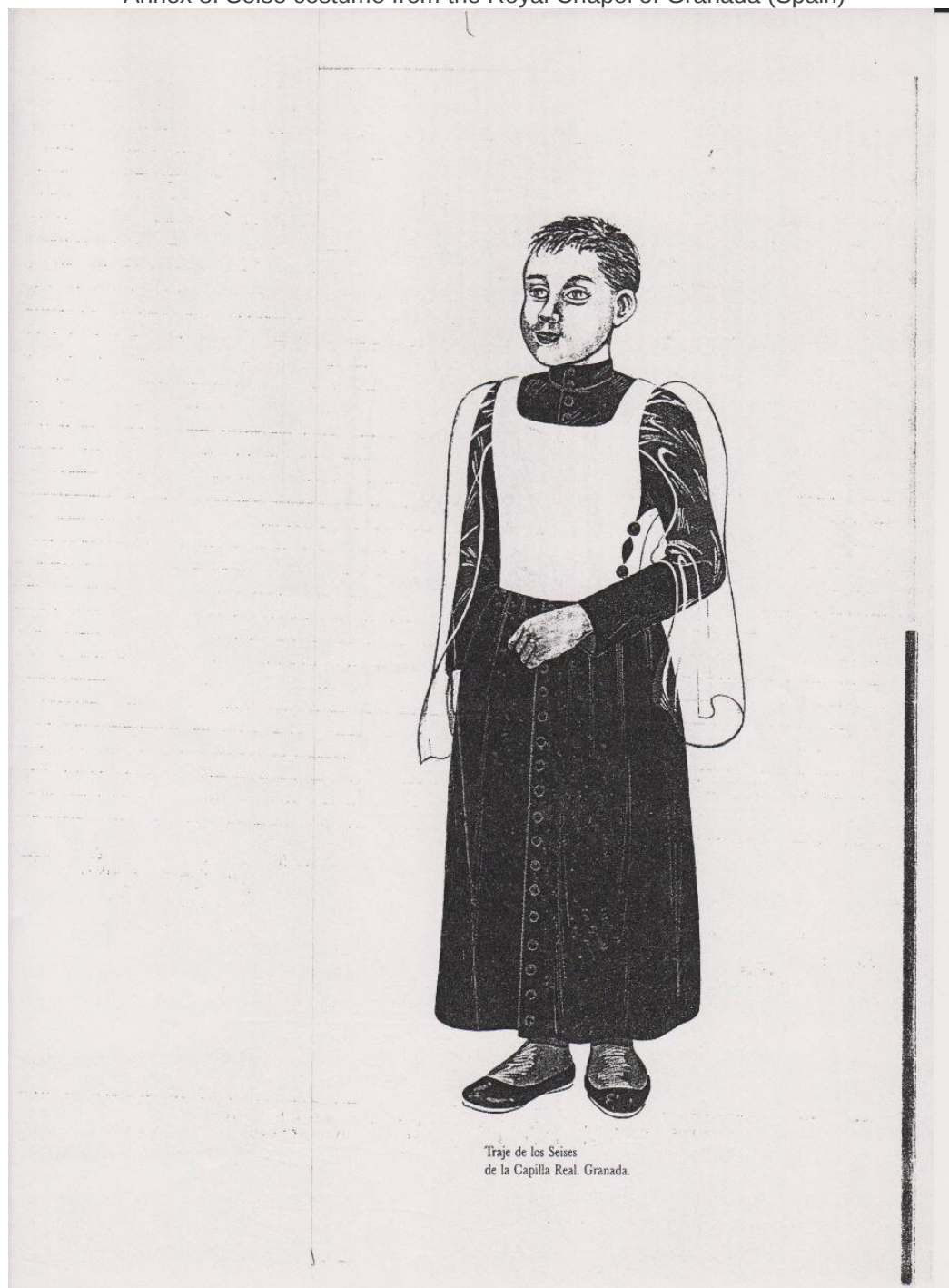
Notas marginales

Fabrica	
Capa	2
Sepult	19
Hacho	6
Suma	23 v
Velas	4

(Contínese al dorso)

Source Annex 7: Literal copy of Book 17, folio 18 back, of the Book of Burials of the Parish Church of the Sagrario of Granada (Spain).

Annex 8. Seise costume from the Royal Chapel of Granada (Spain)



Traje de los Seises
de la Capilla Real. Granada.

Source Annex 8: Own design based on that described by Bertos Herrera, P. (1988). The sixes of the Cathedral of Granada. Granada (Spain): Provincial Savings Bank.

SUELDOS PERCIBIDOS POR CABALLERO

Tercio de Diciembre 1757

- Aniversarios de Ministros (Medios Capellanes)
D. Antonio Caballero, Mtro. de Cap. 348 maravedíes.
- Aniversarios de Sres. Prevens y Ministros 3. de Diz. 1757
pagaderos en 3. de Diz. de 1758, Mtro. de Cap. 348 marv.
- Ministros de la Rl. Cap.(Medios Capellanes)
Mtro. de Cap. 13 duc. 260 marv.
- Salarios de Ministros (Medios Capellanes)
Mtro. de Cap. 390 marv.

(Total: 348 marv. + 348 + 260 + 390 = 1346 marv. y 13 duc.; si seguimos lo expuesto por Henry Raynor (1) de que en España en el XVIII 1 ducado era aproximadamente 375 maravedíes, tendremos que el sueldo en este tercio fue de aproximadamente 16,58 ducados).

Tercio de Abril 1758

- Aniversarios de Ministros (Medios Capellanes)
D. Antonio Caballero, Mtro. de Cap. d. 002-2 y d. 070.
- Aniversarios de 3. de Abl. pagaderos en 3. de Abl. de 1759
Mtro. de Cap. 70.
- Ministros de la Rl. Cap. (Medios Capellanes)
Mtro. de Cap. 18 d. 700 .
- Salarios de Ministros (Medios Capellanes)
d. 550 Mtro. de Cap. 18 d. 700.

Source Annex 9: Prepared by the authors from file 154, 820 pages on paper measuring 310 x 210 mm.
from the Archive of the Royal Chapel of Granada.

Anexo 10. Example 2 of Salaries of Teacher Antonio Caballero

ANTONIO CABALLERO (1728-1822): INCIPITS DE SUS OBRAS

453

- Ministros de la Rl. Cap. (Medios Capellanes)
Mtro. de Cap. 28 rs. 673.
- Salarios de Ministros (Medios Capellanes)
5 ff. rs. 843-11 (reales) Mtro. de Cap. 28 rs. 673 (maravedíes)

Tercio de Agosto 1821

- Aniversarios de Ministros (Medios Capellanes)
D. Antonio Caballero, Mtro. de Cap.: No figura en Nómina.
- Aniversarios de 3. de Agto. pagaderos en 3. de Agto. de 1822
Mtro. de Cap.: No figura en Nómina.
- Ministros de la Rl. Cap. (Medios Capellanes)
Mtro. de Cap. 28 rs. 673.
- Salarios de Ministros (Medios Capellanes)
5 ff. rs. 843-11 (reales) Mtro. de Cap. 28 rs. 673 (maravedíes).

Tercio de Diciembre 1821

- Aniversarios de Ministros (Medios Capellanes)
D. Antonio Caballero, Mtro. de Cap.: No figura en Nómina.
- Aniversarios de 3. de Diz. pagaderos en 3. de Diz. de 1822
Mtro. de Cap.: No figura en Nómina.
- Ministros de la Rl. Cap. (Medios Capellanes)
Mtro. de Cap. 28 rs. 673.
- Salarios de Ministros (Medios Capellanes)
5 ff. rs. 843-11 (reales) Mtro. de Cap. 28 rs. 673 (maravedíes)

Tercio de Abril 1822

- Salario de Ministros: Prorrata por entero trigo 4 ff. 7 a D. Antonio Caballero por 62 dias y 14 d. 814.
- Tercio fin de abril por 62 dias al Mtro de Cap. líquido 14 d. 814.

Source Annex 10: Prepared by the authors from file 137, 810 pages on paper measuring 310 x 210 mm. from the Archive of the Royal Chapel of Granada.

CHAPTER 7

THE PEDAGOGICAL USE OF DICT IN THE CLASSROOM: KNOWLEDGE NECESSARY FOR A CRITICAL AND MEANINGFUL PRACTICE

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ABSTRACT: As a reflection of what happens in society, Digital Information and Communication Technologies (DICT) occupy more and more space and time in the educational field. The challenge is, however, its critical and productive integration in school context. With that, this research is oriented around the following reflection: how can the use of DICT help to improve the teaching and learning process of students?; and how should teacher training be given for a critical and meaningful pedagogical practice with the use of this multimedia apparatus in a school context? To succeed in this work, we opted for a bibliographic review with data collection from the survey of complete publications on the subject in the Google Scholar database and in the author's personal library. Between January and Mars 2023, an online bibliographic survey was carried out, with the descriptors "DICT in education" and "Teacher training and DICT". A qualitative approach was chosen regarding the critical analysis of the contents in an exploratory perspective. It was concluded that in teaching practice the use of DICT brings great dynamism, which brings closer the relationship between theory and practice and can facilitate student learning. However, teachers need to go through an initial and ongoing training process on how to apply DICT in teaching practice, helping to build and organize thinking about how to make better use of these technological tools available to the school.

KEYWORDS: DICT in the classroom, pedagogical innovation, teacher training.

RESUMO: Como reflexo do que acontece na sociedade, as Tecnologias Digitais da Informação e Comunicação (TDIC) ocupam cada vez mais espaço e tempo no campo educacional. O desafio é, no entanto, a sua integração crítica e produtiva em contexto escolar. Com isso, esta pesquisa se orienta em torno da seguinte reflexão: como a utilização das TDIC podem auxiliar na melhoria do processo de ensino e da aprendizagem dos estudantes?; e como deve se dar a formação dos professores para uma prática pedagógica crítica e significativa com a utilização desse aparato multimidiático em contexto escolar? Para lograr êxito neste trabalho, optou-se por uma revisão bibliográfica com coleta de dados a partir do levantamento de publicações completas sobre o assunto na base de dados do Google Acadêmico e na biblioteca pessoal do autor. Entre janeiro e março de 2023, foi feito o levantamento bibliográfico online com os descritores "TDIC na educação" e "Formação de professores e TDIC". Optou-se por uma abordagem qualitativa quanto à análise crítica dos conteúdos em uma

perspectiva exploratória. Concluiu-se que na prática docente o uso das TDIC trazem grande dinamismo, o que aproxima a relação entre teoria e prática e pode facilitar o aprendizado dos alunos. No entanto, os professores precisam passar por um processo de formação inicial e continuada sobre como aplicar as TDIC na prática docente, ajudando a construir e organizar o pensamento sobre como aproveitar melhor essas ferramentas tecnológicas à disposição da escola.

PALAVRAS-CHAVE: formação de professores, inovação pedagógica, TDIC em sala de aula.

1. INTRODUCTION

As pointed out by Lévy (2010), when discussing digital technology in contemporary times, it immediately encompasses sound media, image media, and text media, which can be presented in various formats such as podcasts, augmented reality, interactive graphics, video streaming, animation, and an entire universe of software, hardware, and technological peripherals that enable different ways of interaction or sensory experience—whether this interaction is aimed at acquiring knowledge or simply for leisure. The development, integration, and delivery of any combination of these technological elements through a digital processing device is what has come to be known as Digital Information and Communication Technologies (DICT).

Today, almost everyone has access to these tools, which has dramatically changed the way social relationships occur. As a practical example, consider the desire to study or simply satisfy curiosity about the capital of Germany. It is enough to type the word “Berlin” into the Google search engine, press the “Enter” key, and voilà!, in a few seconds—or, depending on the available internet connection, in mere milliseconds—nearly infinite possibilities appear to take a virtual tour of the city, strolling through its streets and interesting locations, studying a bit of its history, viewing colorful photos of landscapes, 3D images of its main tourist attractions from many angles, learning about its notable figures, and exploring various curiosities about the place. Additionally, on YouTube, it is possible to watch incredible videos and interesting documentaries about the city, and if desired, even study some of the German language, reading, listening, and even practicing listening and pronunciation skills, potentially engaging in conversation with a native speaker. In summary, multimedia resources are available to the information society, which is inevitably connected, as they have become part of daily life for every citizen, directly or indirectly, much like the air we breathe, though often without realizing it.

As an inevitable reflection of what occurs in society, DICT are increasingly occupying space and time within the educational sphere. The challenge, however, is their critical and productive integration into the school context. In light of this, it is necessary to rethink or reconfigure teachers' pedagogical practices to ensure meaningful integration. Moreover, school practices should encompass processes that engage with the interests of a generation that was born into the digital world, promoting teaching and

learning situations that encourage the autonomy of today's students (Menegais; Pescador, Fagundes, 2013).

Pedagogical methodologies based on the traditional exposition of content no longer meet the aspirations of the connected society. Thus, educational institutions must develop teaching situations in which students take an active role in the construction of their own learning. With this, DICT propose a redesign of the school environment, where students and teachers engage and interact from a collaborative and even interdisciplinary perspective. Consequently, education is in constant renewal while presenting itself as a transformative force, responding to the desires and aspirations of people living in a society that constantly seeks new experiences. The use of technological means should therefore be seen as a facilitator of this process, especially when it comes to new forms of knowledge acquisition. However, for this to happen, educators must use this digital apparatus consciously and deliberately. Technological education thus becomes necessary when aiming for student protagonism and autonomy in the contemporary society permeated by the digital bias. In a world that has already become culturally digital, the classroom is a privileged space for the insertion of critical and pedagogical use of multimedia tools. However, to achieve this, it is necessary to analyze and rethink such use and engage in the social debate about its benefits and current and future implications. It is urgent to think about digital inclusion and how it occurs in school spaces and times, as this will demonstrate a healthy concern for the country's cultural and educational development, given that there are numerous explicit and other latent potentialities in the use of each digital communication technology, which should align with clear pedagogical objectives within the teaching context. Contrary to this reality, schools, at least in general, have not treated digital culture as an integral and necessary part of their lesson plans, where the construction of knowledge should be contemplated through a teaching and learning process that takes into account the technological skills of new generations. Embedded within this context, this research is guided by the following reflection: how can the use of Digital Information and Communication Technologies (DICT) assist in improving the teaching process and, consequently, students' learning?; and how should teacher training be structured for a critical and meaningful pedagogical practice using these multimedia tools in the school context?

2. METHODOLOGY AND DATA COLLECTION

To achieve success in the development of this work, a literature review was chosen, as “although almost all studies require some type of work of this nature, there are research projects developed exclusively based on bibliographic sources” (Gil, 2017, p. 44). This statement is corroborated by authors such as Poupart *et al.* (2008), who emphasize the importance of engaging in dialogue with other voices, as this fosters the continuation and deepening of discussions on a subject that has already been addressed in previous research. Data collection, therefore, was conducted through the gathering of complete publications on the topic from the Google Scholar database and the author’s personal library. To legitimize online research, Severino (2014) highlights the prominence of digital databases.

For the online bibliographic search, the descriptors “DICT in education” and “Teacher training and DICT” were used. The searches in the virtual database were carried out between August and October 2022. After downloading the publications, an initial complete reading of the articles was performed, followed by a screening of the most relevant texts for this research. Publications that were repeated or duplicated, either in whole or in part, and those lacking direct relevance to the topic under discussion, were excluded. After the screening and reading of the selected texts, a second reading and unitarization process was undertaken, with the aim of analyzing, understanding, and assimilating everything significant in the search for information on the subject under study by breaking down each text and identifying units of analysis/meanings or senses, as suggested by Paula, Menezes and Guimarães (2015).

As can be seen, a qualitative approach was chosen for the critical analysis of the content from an exploratory perspective, as the aim was to “gather information about a particular object, thus delimiting a field of work, mapping the conditions under which this object manifests” (Severino, 2014, p. 123). This assertion is supported by Gil (2017), who states that although exploratory research is flexible in nature, the literature review constitutes one of the most common methods for its execution.

3. THE USE OF DICT AS A PEDAGOGICAL RESOURCE: NECESSARY KNOWLEDGE FOR A CRITICAL AND MEANINGFUL PRACTICE THROUGH DICT

Currently, given the vast array of products, mobile devices, and digital tools with which our society is connected, many educational institutions have welcomed and embraced their use in teaching and learning situations. However, it is necessary to reflect pedagogically and critically on the ideal ways to use these tools, so that they are not seen, among other barriers, as competitors for attention between students and teachers (Sténico; Silva, 2014). Authors such as Ponte, Oliveira and Varandas (2003) support this view, stating that future teachers need not only to be aware of the possibilities offered by Digital Information and Communication Technologies (DICT) in general, but also to learn how to use them with confidence. Furthermore, for teachers not to perceive DICT as threats or competitors but rather as allies, they must possess more than just instrumental knowledge of computing and other technological tools, as advocated by Tedesco (1998) and Kenski (2001).

Specialized literature suggests that access to and adoption of DICT have enormous potential to integrate and accelerate educational development. However, it is crucial to monitor the expansion of access to DICT, their use in educational settings, and the process of developing public policies that can help foster and improve their implementation and modes of use.

Brazilian education scholars have focused on the importance of incorporating DICT into the school context and its implications for pedagogical practice. However, according to these scholars, the use of DICT can indeed contribute to improving the quality of education, but only if carried out critically and reflectively, considering the specificities of each school context and the needs of students (Barbosa; Moura; Barbosa, 2004; Brazil, 1997; 2008; Brignol, 2004; Cani, 2019; Kenski, 1996; 2001).

It was only with the implementation of emergency remote learning in Brazil that schools faced the necessary integration of technologies into their curricula in a desperate attempt to continue the teaching and learning process. Amidst this struggle, it became apparent that there is a significant deficiency, especially in public schools, in terms of pedagogical innovation when attempting to effectively use digital technological resources or tools in the educational setting. In this context, it became evident that DICT alone do not improve education, but rather how DICT are

integrated into various learning activities is crucial. This integration depends on the teachers and their teaching methods in presenting knowledge, as Cani (2019, p. 22) emphasizes, stating that “it is urgent, then, to consider how to bring pedagogical practices that also incorporate digital technologies into the classroom, [...] even though encouraging the use of DICT is not synonymous with significant results [...]”. In the use of DICT by teachers, the challenge lies in knowing how to adequately explore the possibilities of integrating these resources into the teaching process as pedagogical support for the content to be presented.

According to de Almeida (2008), it is also necessary to teach DICT skills in a way that raises students' awareness of the benefits and potential of these tools to support their work, as it is difficult to teach using DICT tools without a well-defined context of use. Thus, DICT should serve as bridges for constructing new learning environments or even reconstructing educational systems capable of fostering student autonomy in their learning process. Both aspects must be taught simultaneously: content based on DICT (e.g., accounting) and effective DICT skills (e.g., how to use Excel).

With the help of the internet and the World Wide Web, a variety of learning materials on practically any subject and in all media are now accessible to an unlimited number of people at any time of the day. This is particularly important for many schools in developing countries, where library resources are limited and outdated, and even some in developed countries. Teachers and students no longer need to rely solely on library storage of printed books and other physical media (and in limited quantities) to meet their needs.

Today, continuing the natural process of evolution in how information is accessed or transmitted, new possibilities for disseminating knowledge have emerged with the advent of new technological devices for processing images and sounds. Instead of hand-drawing, photographs can be used to illustrate a study subject, such as in biology or physics classes. Through audio recordings, students studying foreign languages can listen to native speakers and practice their speech at their convenience, and chemistry classes can be illustrated through visual transcripts of complex experiments (De Almeida, 2008).

With computers, along with the rapid expansion of the internet, vast new applications and uses of tools in education have opened up. The rapid development of digital information and communication technology (DICT) is shaping a new world in

which education at all levels is no longer confined to a group of students listening to a teacher in a classroom or reading a book. From this realization, learning is shifting from teacher-centered to student-centered and can occur anywhere, from classrooms to homes and offices (Barbosa; Moura; Barbosa, 2004).

It is well known that the effective and innovative use and integration of DICT in education is a complex and multifaceted issue (Brignol, 2004). According to Galvão Filho (2002), the complexity lies in the intertwining of technology, pedagogy, user adoption, and institutional policy. However, there is no denying that computers and other contemporary inventions provide students with a flexible and personalized way of learning, offer the opportunity to learn on demand, and can significantly reduce the costs of teaching and learning for those who previously had no access to knowledge.

4. TEACHER TRAINING FOR THE USE OF DICT IN THE TEACHING AND LEARNING PROCESS

Teachers are essential agents of change within the academic work environment. They are the primary drivers of educational change. Therefore, it is important to consider the factors that influence teachers' attitudes toward the use of technology in schools: available and easy-to-use digital resources, incentives and support from colleagues and school administrators, and public policies. Moreover, as Silva (2011) aptly points out:

For the use of technologies in the teaching-learning process to overcome the barriers of technicism and trends, it is necessary to have clarity regarding pedagogical intentions and objectives, that is, the intentionality of the ideologies that structure Pedagogical Projects and determine pedagogical praxis. Teachers must understand the importance of their social role and take control of their pedagogical actions, incorporating both innovation and the necessary changes to assimilate it in a selective and critical manner (Silva, 2011, p. 541).

However, contrary to the above assertion, a study conducted by Schuhmacher, Alves Filho and Schuhmacher (2017) identified significant barriers to the integration of Digital Information and Communication Technologies (DICT) in teaching: (i) lack of infrastructure, (ii) insufficient knowledge and skills in DICT among teachers, and (iii) challenges in integrating DICT into the classroom in a meaningful way.

Among these barriers, the lack of computers stands out as a primary issue; without access to adequate equipment, the use of DICT in the teaching and learning process is compromised. This barrier pertains not only to the absence of equipment in educational

institutions but also to students' lack of access to devices at home. Regarding the second point, the authors emphasize that for DICT to be effectively utilized in education, teachers must be well-prepared to use these technologies, enabling them to guide their students appropriately. Furthermore, the study highlights the importance of integrating DICT into the classroom in a relevant manner, ensuring that these technologies are used coherently with pedagogical objectives and genuinely contribute to enhancing the teaching and learning process.

In Brazil, incorporating technological tools into schools has been a focus of concern, as evidenced by official documents like the Plano Nacional de Educação (PNE) [National Education Plan], established by Lei nº 13.005/2014 Palácio do Planalto, which aims to:

universalize, by the fifth year of this National Education Plan (PNE), access to high-speed broadband internet and, by the end of the decade, triple the computer-to-student ratio in public basic education schools, promoting the pedagogical use of information and communication technologies (Brazil, 2014, Goal 7, Strategy 15).

Despite these official efforts and the recognition by teachers of the urgent need for pedagogical practices that incorporate DICT, educators often overlook the full potential of these technologies to enhance the learning environment. This is supported by Citelli (2000), who states:

the teacher speaks of the urgency in taking advantage of the wealth of information made available by the media and the lack of preparedness to use it correctly and effectively. He acknowledges the inevitability of integrating computer technology into schools but also reveals a certain detachment from the system and admits that computers are complex machines to operate (Citelli, 2000, p. 218).

In the Netherlands, for example, a study conducted in primary schools showed that between 60% and 80% of the sampled teachers had never used CD-ROM encyclopedias or conducted information searches on the web. In another study at higher education institutions, 51% of teachers believed that the quality of student learning in their courses did not improve with the use of the internet; 27% believed that e-learning environments did not contribute to their courses (Shiroma; Lima Filho, 2011).

According to Tajra (2011), it is a fact that teachers can achieve satisfactory results after receiving basic technical training, as by interacting with such tools, educators also position themselves as members of the social environment that students already belong to. However, beyond equipping schools with high-speed broadband internet, computers, and state-of-the-art equipment, the use of DICT (Information and Communication Technologies) by teachers in education cannot be limited to technology-related factors. Beyond factors related to technological resources and educational management, the belief in the effectiveness of using DICT for teaching and learning is fundamental and must be fully considered. For teachers to adopt this new perspective, they primarily need a broader and deeper understanding of the expectations for integrating DICT in the classroom, which aligns with the remarks of Geraldi and Bizelli (2015), who noted that "those teachers who have never set aside the chalkboard and chalk must assume new teaching conceptions characterized by innovative projections that are not part of their time" (Geraldi; Bizelli, 2015, pp. 122- 123).

Regarding the use of new technological tools by the teacher—when it occurs — the issue is that, in some cases, teachers, despite their initial interest in a particular technology, begin using the tool to develop activities that often lack educational objectives; that is, there is no necessary pedagogical integration between the technological apparatus used and the learning object. In this sense, according to Moura (2010), it is essential to first choose the tool, and then conduct teacher training. In this way, the teacher, armed with the chosen tool and the learning objectives they wish to achieve with their students, should outline the didactic path necessary to convey the desired knowledge. Through this practice, teachers can use technology in education in ways that are more adaptable to their students and develop the habit of sharing intelligibly in the language of contemporary students. The contribution of education to the productive inclusion of students in a technological culture requires, as noted, prior learning on the part of teachers, as it is not sufficient to simply use computers, the internet, and other digital devices as applications or to invite students to access websites without promoting their proper inclusion in digital culture with the primary aim of stimulating their learning. Alternatively, it is necessary to understand the basic requirements of digital culture that are appropriately conducive to education. In the words of Kenski (2001), the use of technological tools should not clash with pedagogical traditionalism, but should indeed serve as support and enhance various teaching and learning situations.

According to Karsenti, Villeneuve, and Raby (2008), trainee teachers who have greater capacity to use technologies in a pedagogical context are more likely to make use of these tools and to encourage their students to use them at school. Additionally, fostering experimental behavior among teachers and training them in DICT skills oriented toward pedagogy can be a significant determinant in their adoption in teaching (Sténico; Silva, 2014). Although the methods for integrating technological innovations may vary, there is consensus that teacher adoption is essential for these changes to be implemented in education. As noted by Nóvoa (1997), without the participation and engagement of teachers, significant innovations in the educational context are unlikely to occur. According to the author, it is improbable that DICT will be considered viable resources or strategies for classroom use unless there is adequate training aligned with the new principles of education, and teachers have confidence in their ability to use these resources. Furthermore, the knowledge and skills that teachers need to master vary according to the teaching content and educational objectives. This can range from improving the efficiency of learning in school subjects to promoting the development of specific skills, such as lifelong learning and learning how to learn (Tajra, 2011). Therefore, in addition to promoting programs and actions that enable access to digital technologies in schools, training courses aimed at equipping teachers for the effective integration of technological resources into the school curriculum must consider each school context. Thus, the teacher ceases to be merely a transmitter of knowledge and becomes a mediator in learning environments. There is still limited understanding among teachers regarding how to integrate DICT into their teaching practice. Dore and Lüscher (2011) conducted research with primary school teachers in Belgium and discovered that, despite government curricula emphasizing the integrated use of these tools in teaching, primary school teachers predominantly prioritized the development of technical skills for their use. A probable cause of this is what Papert (2008) argues when stating that, instead of simply teaching teachers how to use technology, it is important to empower them to develop teaching strategies that promote significant changes in pedagogical practices for the benefit of students. Thus, the author emphasizes the importance of investing in teacher training so that they can understand how technology can be used as a learning tool and, from this understanding, develop new teaching strategies that promote more effective and transformative education (Papert, 2008).

According to Technical Note No. 8, prepared by the Center for Innovation in Brazilian Education (CIEB) published in November 2017 and updated in February 2019, the following Digital Competencies for Teachers are required for the use of DICT:

***Pedagogical:** Effectively using educational technologies to support the teacher's pedagogical practices.

***Digital Citizenship:** Utilizing technologies to discuss societal life and debate ways to use technology responsibly.

***Professional Development:** Using technologies to ensure the continuous updating of the teacher and their professional growth. (CIEB, 2019, p. 11).

As observed, teacher training for the management of DICT (Digital Information and Communication Technologies) encompasses not only technical preparation but also necessary dimensions that involve the pedagogical significance of their use, including evaluation, teachers as content creators, responsible use, and prioritizing safety and critical engagement with information. What is often noted is that the training provided serves merely as a workshop aimed at equipping teachers to use the machines. Formation programs should not focus solely on the instrumental training of future teachers for technology use but should consider how these tools integrate into the development of knowledge and the professional identity of these educators. Furthermore, "teachers are trained without a deeper understanding of the use and manipulation of educational technologies, leading them to feel insecure about using them in their classes" (Kenski, 1996, p. 136).

In contrast to the observations made above, the new BNCC (Base Nacional Comum Curricular) (Brazil, 2018) suggests that it is necessary to:

Understand and use digital information and communication technologies critically, meaningfully, reflectively, and ethically in various social practices (including school settings) to communicate through different languages and media, produce knowledge, solve problems, and develop both individual and collective projects. (Brazil, 2018, p. 65).

According to the aforementioned document, "by harnessing the communication potential of the digital universe, schools can establish new ways to promote learning, interaction, and the sharing of meanings between teachers and students" (Brazil, 2018, p. 61).

In addition to this, it is essential to embrace the peculiarities of the Information Age, understood as a phenomenon based on mobility, dynamism, fluidity, and

collaboration in the construction of messages that are produced and circulate across all social spheres, including education. Thus, it is imperative to revisit learning theories and apply them within the context of digital technologies, so they continue to serve as a foundation in teaching and learning processes in a technological and digital environment, without neglecting the human aspects of relationships formed in any social spaces (Aguiar, 2013).

5. FINAL CONSIDERATIONS

The importance of DICT – Digital Information and Communication Technologies – in education can be observed through the literature review conducted for the development of this work. In teaching practice, they bring great dynamism, bridging the gap between theory and practice and potentially facilitating student learning. However, in addition to mastering the content being taught, teachers need to undergo both initial and ongoing training on how to apply DICT in their practice, helping them construct and organize strategies to make the most of these technological tools available to schools. With the support of DICT, knowledge can be acquired through internet access, the use of educational software, and devices such as tablets, computers, or smartphones, as well as various digital applications. More specifically, with the internet and the tools that have emerged—and continue to emerge—since its advent, students can access and review content in multiple ways: through audio, text, video, and animation. Technology can even engage students with certain disabilities and expand the possibilities for a comprehensive and inclusive education. For parents, electronic communication allows them to monitor their children's performance, attendance, and routine care without leaving home or work.

However, public policies aimed at digitizing schools are not enough without the critical planning necessary to integrate technology into teaching strategies aligned with well-defined objectives. It is essential to include training on DICT in education programs within teacher preparation courses. For experienced teachers already working in schools, continuous training is urgently needed to help them overcome the monotony of linear pedagogical traditionalism, which views students as passive beings, waiting to copy what is written on the board and memorize and repeat the teacher's words. Therefore, state-of-the-art computers connected to high-speed internet in air-conditioned laboratories, managed by a single "specialist" in educational technology, are no longer

sufficient. More than boasting about equipping schools with laptops and tablets, it is necessary to acknowledge that many computer labs lack clear objectives. Faced with this uncomfortable reality, the search for solutions to redefine the purpose and benefits of integrating DICT into schools becomes imperative. The notion that the mere adoption of digital technologies in the classroom will, by itself, transform the teaching process is rejected. Instead, it is crucial that teachers have both the time and motivation to familiarize themselves with DICT, with initial training being a key part of this process. During this phase, pre-service teachers should be encouraged to reflect on the advantages and limitations of technology, carefully considering when, if, and how it should be used for pedagogical purposes.

Given all this, the conveniences brought by the use of DICT in the school context demand their place, not as a replacement for analog media and tools—such as books, chalk, blackboards, and others that remain present in classrooms—nor as a substitute for the teacher. The goal is simply to show that the times, spaces, and learning styles have expanded beyond the linear and singular sequence of producing and transmitting knowledge.

In summary, DICT has the potential to bring new enthusiasm to education by combining social responsibility and curriculum within pedagogical practice. It can also significantly impact students' relationship with knowledge, challenging outdated conceptions and creating new expectations for the role of the school.

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CHAPTER 8

INBOUND LEARNING: REVOLUCIONANDO PARADIGMAS EDUCACIONAIS

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ABSTRACT: This article explores the transformative potential of Inbound Learning in educational settings, integrating principles of inbound marketing to promote personalized, engaging and effective learning experiences. Through a comprehensive literature review, the study examines the application of Inbound Learning strategies across a range of educational levels and contexts, highlighting significant improvements in student engagement, academic performance and educator satisfaction. The methodology used combines quantitative and qualitative approaches to evaluate the impact of these strategies, revealing a positive correlation between personalized educational content and better learning outcomes. Challenges such as technological access, resource allocation and teacher training are discussed, along with future perspectives that suggest the integration of advanced educational technologies and political support to overcome these barriers. The results highlight the effectiveness of Inbound Learning in meeting the contemporary needs of students and educators, advocating its wider adoption to revolutionize educational practices.

KEYWORDS: Inbound Learning Methodology, Inbound Learning.

RESUMO: Este artigo explora o potencial transformador do *Inbound Learning* em ambientes educacionais, integrando princípios do inbound marketing para promover experiências de aprendizagem personalizadas, envolventes e eficazes. Através de uma revisão abrangente da literatura, o estudo examina a aplicação de estratégias de *Inbound Learning* em diversos níveis e contextos educacionais, destacando melhorias significativas no envolvimento dos alunos, desempenho acadêmico e satisfação do educador. A metodologia utilizada combina abordagens quantitativas e qualitativas para avaliar o impacto destas estratégias, revelando uma correlação positiva entre conteúdos educativos personalizados e melhores resultados de aprendizagem. Desafios como acesso tecnológico, alocação de recursos e formação de professores são discutidos, juntamente com perspetivas futuras que sugerem a integração de tecnologias educacionais avançadas e apoio político para superar essas barreiras. Os

resultados ressaltam a eficácia do *Inbound Learning* em atender às necessidades contemporâneas de alunos e educadores, defendendo sua adoção mais ampla para revolucionar as práticas educacionais.

PALAVRAS-CHAVE: Metodologia *Inbound Learning*, *Inbound Learning*.

1. INTRODUÇÃO

No cenário da educação em rápida evolução, o imperativo de metodologias instrucionais inovadoras que ressoem com os alunos contemporâneos nunca foi tão crítico. O "*Inbound Learning*" surge como uma abordagem transformadora, aproveitando os princípios do inbound marketing para criar experiências educacionais envolventes, centradas no aluno e altamente personalizadas. Esta mudança de paradigma não só atende à natividade digital do corpo estudantil de hoje, mas também se alinha com a crescente demanda por sistemas educacionais que promovam a autonomia, a criatividade e a aprendizagem ao longo da vida.

Historicamente, as metodologias educacionais têm sido predominantemente outbound, caracterizadas por um currículo único entregue através de abordagens centradas no professor. No entanto, esses métodos são muitas vezes insuficientes para dar resposta aos estilos e necessidades individuais de aprendizagem, conduzindo a um desinteresse e a resultados educativos subótimos. O *Inbound Learning*, por outro lado, defende uma mudança deste modelo tradicional para um que é inerentemente orientado para o aluno, onde os alunos participam ativamente na sua jornada educativa, guiados pelos seus interesses e motivações intrínsecas.

O conceito de *Inbound Learning* está enraizado nas práticas mais amplas do Inbound Marketing – uma estratégia projetada para atrair clientes por meio da criação de conteúdo, mídias sociais e otimização de mecanismos de busca adaptados às necessidades e hábitos de consumo do público. Da mesma forma, o *Inbound Learning* se concentra em atrair e envolver os alunos, fornecendo-lhes conteúdo educacional atraente e ambientes de aprendizagem interativos que não são apenas informativos, mas também inerentemente atraentes e relevantes para seus objetivos educacionais e interesses pessoais.

Este artigo tem como objetivo explorar os fundamentos teóricos da *Inbound Learning*, examinar a sua aplicação em vários contextos educativos e avaliar o seu impacto no envolvimento dos alunos e nos resultados da aprendizagem. Ao integrar uma revisão da literatura e pesquisa empírica, este estudo procura fornecer insights sobre como essa abordagem inovadora pode revolucionar as práticas educacionais, oferecendo uma experiência de aprendizagem mais dinâmica, eficaz e personalizada que prepara os alunos para os desafios do século 21.

2. REVISÃO DA LITERATURA

2.1 INBOUND MARKETING E PROGRAMAS EDUCACIONAIS

A aplicação de estratégias de inbound marketing em ambientes educacionais tem mostrado resultados promissores no aumento da demanda por programas de pós-graduação. Bueno, Caro Rodríguez e Gallego (2018) demonstraram como o uso da otimização para mecanismos de busca (SEO) e a criação de conteúdo adaptado aos interesses dos usuários pode aumentar significativamente as taxas de engajamento e conversão para cursos acadêmicos. O sucesso dessas técnicas em um ambiente universitário público fornece uma abordagem fundamental para integrar estratégias de marketing dentro de estruturas educacionais para atrair e reter estudantes (Bueno, Caro Rodríguez, & Gallego, 2018).

2.2 OUTBOUND E A EDUCAÇÃO DE CARÁTER

Paralelamente às metodologias de inbound, a aprendizagem outbound desempenha um papel crítico na educação de caráter. Sayekti et al. (2019) exploraram como as atividades de aprendizagem de saída, como tarefas educacionais ao ar livre, promovem valores essenciais, incluindo cooperação, e autodependência entre alunos do ensino fundamental. Esta forma de aprendizagem não só apoia as realizações acadêmicas, mas também melhora o desenvolvimento social e emocional, ressaltando os benefícios holísticos dos ambientes de aprendizagem experiencial (Sayekti et al., 2019).

2.3 REDES DE APRENDIZAGEM PROFISSIONAL (PLNS) PARA PROFESSORES

A evolução das Redes de aprendizagem profissional (PLNs) representa uma mudança significativa na educação contínua de professores. Trust (2012) destaca como as PLNs facilitam o desenvolvimento profissional contínuo por meio da colaboração e do compartilhamento de melhores práticas entre educadores. Ao conectar professores globalmente, as PLNs permitem a troca de estratégias

pedagógicas inovadoras e apoiam o crescimento profissional de educadores em diversos ambientes educacionais (Trust, 2012).

2.4 APRENDIZAGEM EM CASA PARA IDOSOS

No contexto da educação inclusiva, o conceito de oportunidades de aprendizagem em casa, conforme discutido por Penning e Wasyliv (1992), aborda as necessidades educacionais para idosos que são incapazes de participar de ambientes tradicionais de aprendizagem. Este estudo apresenta um modelo em que os programas educacionais são personalizados e entregues diretamente nas residências de idosos sem mobilidade, garantindo acessibilidade e engajamento por meio de conteúdo e métodos personalizados (Penning e Wasyliv, 1992).

2.5 MOBILIDADE DE ENTRADA E DESEMPENHO DE PESQUISA ACADÊMICA

O impacto da mobilidade de entrada no desempenho de pesquisa na academia fornece insights sobre como novos conhecimentos e expertise podem revigorar ambientes educacionais e de pesquisa existentes. Slavova, Fosfuri e Castro (2015) descobriram que a mobilidade de entrada de cientistas melhora significativamente a produção de pesquisa da equipe titular ao introduzir novas perspectivas e expertise, promovendo assim um ambiente de maior inovação e colaboração (Slavova, Fosfuri e Castro, 2015). Esta revisão de literatura integra uma variedade de perspectivas sobre aprendizagem de entrada e estratégias educacionais relacionadas, fornecendo uma visão completa das práticas atuais e seus efeitos em diferentes níveis e configurações educacionais.

3. FUNDAMENTOS TEÓRICOS E METODOLÓGICOS

A estrutura do *Inbound Learning* é construída sobre uma mistura de teorias educacionais estabelecidas e práticas pedagógicas inovadoras, enriquecidas ainda mais pelos princípios do inbound marketing adaptados para uso educacional. Esta seção descreve os fundamentos teóricos e as abordagens metodológicas que formam

o núcleo do *Inbound Learning*, fornecendo uma base para sua aplicação e avaliação em ambientes educacionais.

3.1 ENQUADRAMENTO TEÓRICO

3.1.1 Construtivismo

Em sua essência, o *Inbound Learning* baseia-se fortemente em princípios construtivistas, que postulam que a aprendizagem é um processo ativo e construtivo onde os alunos constroem novas ideias sobre a base do conhecimento prévio. Esta teoria enfatiza a importância de ambientes onde os alunos possam testar ideias e abordagens, permitindo a reflexão e reavaliação à luz de novas experiências e informações. O *Inbound Learning* aproveita isso criando cenários educacionais que incentivam a exploração e a interação, espelhando a natureza envolvente e dinâmica de estratégias eficazes de inbound marketing.

3.1.2 Teoria da Aprendizagem Social

A Teoria da Aprendizagem Social de Albert Bandura também desempenha um papel fundamental na formação de estratégias de *Inbound Learning*. Esta teoria destaca a importância da aprendizagem observacional, imitação e modelagem, sugerindo que as pessoas aprendem dentro de um contexto social. Da mesma forma, o *Inbound Learning* incorpora projetos colaborativos e plataformas de mídia social no processo de aprendizagem, facilitando interações entre pares e tarefas coletivas de resolução de problemas que são essenciais para experiências de aprendizagem abrangentes.

3.1.3 Personalização na Educação

O movimento em direção à aprendizagem personalizada é informado pela compreensão de que os alunos se envolvem mais profundamente quando o conteúdo e as estratégias instrucionais ressoam com seus objetivos individuais, interesses e conhecimentos prévios. A personalização, um princípio central do inbound marketing,

é igualmente fundamental no *Inbound Learning*. O conteúdo educacional é adaptado para atender a diversos estilos e necessidades de aprendizagem, com a tecnologia desempenhando um papel fundamental na entrega de experiências de aprendizagem adaptativas que se ajustam em tempo real ao ritmo e progresso de cada aluno.

3.2 ABORDAGENS METODOLÓGICAS

3.2.1 Instrução orientada por dados

O *Inbound Learning* emprega uma abordagem baseada em dados para adaptar as experiências educacionais às necessidades dos alunos. Assim como o inbound marketing analisa o comportamento do consumidor para otimizar as estratégias de marketing, o *Inbound Learning* usa dados das interações dos alunos dentro de plataformas educacionais para refinar e personalizar as instruções. Esta abordagem garante que as atividades de aprendizagem não são apenas envolventes, mas também eficazes na consecução dos objetivos educativos.

3.2.2 Integração de Tecnologia

A integração tecnológica é fundamental para o *Inbound Learning*, servindo como canal para experiências de aprendizagem personalizadas e adaptativas. Ferramentas como Learning Management Systems (LMS), aplicativos interativos e ambientes de realidade virtual são empregados para criar experiências de aprendizagem imersivas e interativas. Essas tecnologias facilitam uma combinação perfeita de aprendizagem em sala de aula e on-line — semelhante ao modelo de aprendizagem mista — permitindo que os alunos se envolvam com o material em seu próprio ritmo e em seus termos.

3.2.3 Loops de feedback contínuo

Refletindo a natureza iterativa do inbound marketing, o *Inbound Learning* enfatiza a importância dos ciclos de feedback contínuos. Esses ciclos permitem que os educadores forneçam feedback oportuno por meio de plataformas digitais,

permitindo que ajustes sejam feitos em tempo real. Da mesma forma, os alunos são incentivados a refletir sobre a sua aprendizagem e fornecer feedback, o que informa os ajustes de curso em curso e as estratégias de ensino, promovendo assim um ambiente de aprendizagem responsivo.

3.2.4 Nutrição Estudantil

No contexto do *Inbound Learning*, a "nutrição do aluno" enfatiza a promoção da motivação intrínseca, do desenvolvimento holístico e do sucesso acadêmico. Ao criar um ambiente que apoia as necessidades emocionais e intelectuais individuais do aluno, o *Inbound Learning* incentiva os alunos a se apropriarem de sua jornada de aprendizagem, resultando em um envolvimento mais profundo e melhores resultados de aprendizagem.

3.2.5 Centros de Aprendizagem de Alto Desempenho

O papel dos centros de aprendizagem de alto desempenho no *Inbound Learning* envolve alavancar ambientes projetados para maximizar a excelência acadêmica por meio de recursos aprimorados, mentoria e ofertas curriculares avançadas. O *Inbound Learning* integra esses elementos para promover um ambiente onde o alto desempenho é apoiado e incentivado.

3.2.6 Inteligências Múltiplas

A Teoria das Inteligências Múltiplas de Howard Gardner alinha-se estreitamente com a *Inbound Learning* ao apoiar a ideia de que a educação deve ser personalizada para atender a diferentes inteligências. Esta abordagem permite conceber experiências de aprendizagem que respondam a necessidades variadas dos alunos, tornando a educação mais inclusiva e eficaz.

3.2.7 Princípios Pedagógicos de Célestin Freinet

Incorporando os princípios educacionais de Célestin Freinet, o *Inbound Learning* promove a autonomia e a expressão criativa dos alunos. A ênfase de Freinet na aprendizagem experiencial e na participação ativa está espelhada nas estratégias do *Inbound Learning*, que priorizam o envolvimento dos alunos e a aprendizagem prática.

3.2.8 Montessori Educação e Aprendizagem Inbound

Os paralelos entre a educação Montessori e o *Inbound Learning* são evidentes em sua ênfase compartilhada na autonomia e aprendizagem personalizada. Ambas as abordagens promovem ambientes de aprendizagem que incentivam os alunos a explorar com base nos seus interesses e ao seu próprio ritmo, melhorando a experiência de aprendizagem e os resultados.

3.2.9 Construtivismo e *Inbound Learning*

A integração de princípios construtivistas do *Inbound Learning* enfatiza a construção ativa do conhecimento através de experiências e interações do mundo real, tornando a aprendizagem mais significativa e contextualmente relevante.

3.2.10 Teoria da Afetividade de Henri Wallon

O foco de Wallon nos aspectos emocionais da aprendizagem enriquece a *Inbound Learning* ao criar ambientes educacionais emocionalmente favoráveis. Esta abordagem não só melhora o desenvolvimento cognitivo, mas também garante o bem-estar emocional dos alunos, reconhecendo a interação entre as emoções e a aprendizagem.

3.2.11 Teoria dos Juros

A teoria do interesse sugere que alinhar o conteúdo educacional com os interesses dos alunos pode aumentar significativamente o envolvimento e a

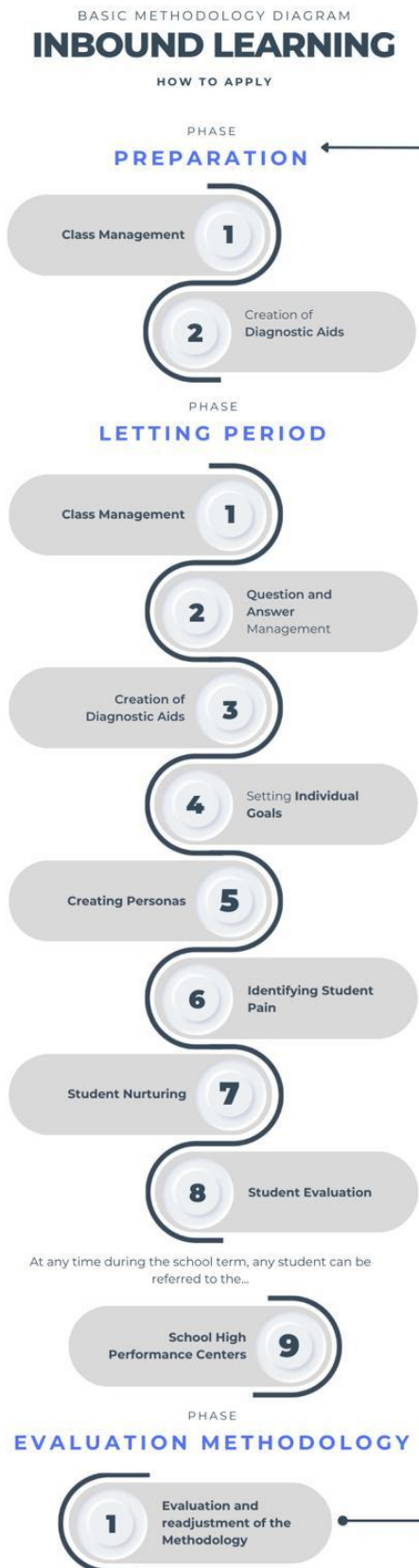
motivação. O *Inbound Learning* aproveita isso incorporando os interesses dos alunos no currículo, tornando a aprendizagem mais relevante e envolvente.

3.2.12 Desconexão Digital e Aprendizagem

Na era digital, os períodos de desconexão digital são parte integrante do *Inbound Learning*, proporcionando aos alunos oportunidades para se envolverem em atividades de aprendizagem reflexivas e off-line que podem melhorar o desenvolvimento cognitivo e social sem as distrações constantes dos dispositivos digitais.

Esta visão abrangente dos fundamentos teóricos e metodológicos estabelece um quadro robusto para a implementação e compreensão do *Inbound Learning*, destacando o seu potencial para transformar as práticas educativas, tornando-as mais personalizadas, envolventes e eficazes. Incorporámos estas fundações num quadro que estamos agora a implementar em aplicações-piloto:

Figura 1 – Diagrama Metodológico



Fonte: Crivosoft

4. METODOLOGIA

Este projeto de pesquisa emprega uma abordagem de métodos mistos para investigar a eficácia das estratégias de *Inbound Learning* em vários contextos educacionais. O objetivo é avaliar de que forma estas estratégias aumentam o envolvimento dos alunos, melhoram os resultados da aprendizagem e promovem ambientes educativos adaptáveis e reativos às necessidades dos alunos modernos.

4.1 DESENHO DE INVESTIGAÇÃO

O desenho da pesquisa integra metodologias quantitativas e qualitativas para fornecer uma análise abrangente do impacto do *Inbound Learning*. A componente quantitativa envolve a utilização de avaliações pré e pós-intervenção para medir as mudanças no envolvimento dos alunos e no desempenho académico. O componente qualitativo inclui revisão de literatura, grupos focais e observações em sala de aula para obter insights mais profundos sobre as experiências de educadores e alunos com *Inbound Learning*.

4.2 AMOSTRA E CONFIGURAÇÃO

O estudo visa uma gama diversificada de instituições de ensino, incluindo escolas públicas e privadas, universidades e plataformas de aprendizagem online. Os participantes consistem em educadores e alunos dessas instituições, selecionados por meio de uma técnica de amostragem estratificada para garantir uma mistura representativa de níveis de ensino, disciplinas e localizações geográficas.

4.3 RECOLHA DE DADOS

4.3.1 Sondagens

Os inquéritos por questionário são administrados a alunos e professores antes e depois da implementação de estratégias de *Inbound Learning*. Estes inquéritos são

concebidos para avaliar as mudanças nos níveis de envolvimento, a satisfação com o processo de aprendizagem e as percepções do ambiente de aprendizagem.

4.3.2 Entrevistas e Focus Groups

Entrevistas semiestruturadas e grupos focais com alunos e educadores são conduzidos para coletar dados qualitativos sobre as experiências pessoais e os benefícios percebidos do *Inbound Learning*. Estas discussões têm como objetivo descobrir insights sobre a adaptabilidade das práticas de ensino e a eficácia de percursos de aprendizagem personalizados.

4.3.3 Observações em sala de aula

As observações em sala de aula são realizadas por membros da equipe de pesquisa, que usam um protocolo de observação padronizado para registrar práticas de ensino, interações aluno-professor e a dinâmica geral da sala de aula. As observações centram-se na implementação de estratégias de *Inbound Learning* e no seu impacto no envolvimento na sala de aula e nas atividades de aprendizagem.

4.4 ANÁLISE DE DADOS

4.4.1 Análise Quantitativa

Os dados quantitativos de inquéritos e avaliações são analisados utilizando métodos estatísticos para avaliar as mudanças no desempenho e no envolvimento dos alunos. Técnicas como testes t pareados e análise de regressão são empregadas para determinar a significância e a magnitude das mudanças observadas.

4.4.2 Análise Qualitativa

Dados qualitativos de entrevistas, grupos focais e observações em sala de aula são analisados usando análise temática para identificar temas e padrões comuns relacionados às experiências e resultados da *Inbound Learning*. Esta análise ajuda a

contextualizar os resultados quantitativos e fornece uma compreensão mais profunda de como as estratégias de *Inbound Learning* são implementadas e recebidas em diferentes contextos educacionais.

4.4.3 Considerações éticas

Todas as atividades de pesquisa são conduzidas de acordo com padrões éticos para proteger os direitos e a privacidade dos participantes. O consentimento informado é obtido de todos os participantes e a confidencialidade dos dados é mantida durante todo o estudo. O protocolo de pesquisa é revisado e aprovado por um comitê de revisão institucional (IRB) antes do início do estudo.

4.5 RESULTADOS OBTIDOS

Os resultados da revisão da literatura revelam um impacto significativo das técnicas de *Inbound Learning* no envolvimento dos alunos, no desempenho acadêmico e na satisfação do educador em uma variedade de ambientes educacionais. Esta seção sintetiza os resultados em diferentes estudos, destacando a eficácia e adaptabilidade do *Inbound Learning* na abordagem dos desafios educacionais contemporâneos. Outras fases do projeto de pesquisa produzirão mais dados quantitativos, o que certamente permitirá uma análise mais aprofundada.

4.6 REFORÇO DO ENVOLVIMENTO DOS ALUNOS

Vários estudos relataram um aumento acentuado no envolvimento dos alunos após a implementação de estratégias de *Inbound Learning*. Isto foi particularmente evidente em ambientes onde foram enfatizados percursos de aprendizagem personalizados, permitindo aos alunos explorar assuntos alinhados com os seus interesses pessoais e objetivos de carreira. Por exemplo, o uso de conteúdo personalizado reduziu significativamente as taxas de abandono e melhorou a assiduidade, à medida que os alunos se sentiam mais conectados às suas experiências de aprendizagem.

4.7 MELHORIA DO DESEMPENHO ACADÊMICO

A literatura indica que as técnicas de *Inbound Learning* têm um efeito positivo no desempenho acadêmico, especialmente em disciplinas que tradicionalmente apresentam níveis mais baixos de desempenho dos alunos. Os alunos expostos às estratégias de *Inbound Learning* pela experiência dos autores tiveram melhor desempenho. A melhoria foi atribuída às componentes de aprendizagem ativa e à integração da tecnologia, que proporcionou aos alunos feedback imediato e permitiu uma experiência de aprendizagem mais cadenciada.

4.8 AUMENTO DA SATISFAÇÃO DO EDUCADOR

Os educadores relataram níveis mais elevados de satisfação no trabalho e realização profissional em ambientes onde as técnicas de *Inbound Learning* foram implementadas. Este aumento esteve ligado à autonomia que os educadores experimentaram na concepção de currículos e aos métodos de ensino inovadores facilitados pelos quadros de *Inbound Learning*. Além disso, os educadores apreciaram as oportunidades de desenvolvimento profissional contínuo que faziam parte da abordagem *Inbound Learning*, que os dotou de novas habilidades e métodos de ensino alinhados às demandas educacionais modernas.

4.9 DESAFIOS E LIMITAÇÕES

Apesar dos resultados positivos, a literatura também identifica desafios na implementação de técnicas de *Inbound Learning*. Estes incluem o custo inicial da integração tecnológica, a necessidade de desenvolvimento profissional extensivo para os educadores e o potencial para questões de exclusão digital em que os alunos podem não ter acesso igual às tecnologias necessárias. Além disso, alguns estudos observaram que, sem treinamento e suporte adequados, a eficácia do *Inbound Learning* poderia ser limitada, já que os educadores podem não utilizar totalmente as ferramentas e estratégias disponíveis.

4.10 DISCUSSÃO SOBRE ABORDAGENS METODOLÓGICAS

Os resultados também destacaram a importância do rigor metodológico na avaliação do impacto do *Inbound Learning*. Estudos que empregaram abordagens de métodos mistos forneceram percepções mais abrangentes sobre como e por que as estratégias de *Inbound Learning* impactaram os resultados educacionais. Essas abordagens permitiram uma compreensão mais matizada da interação entre o envolvimento dos alunos, materiais de aprendizagem, práticas do educador e ferramentas tecnológicas.

5. DESAFIOS E PERSPETIVAS FUTURAS

Embora o *Inbound Learning* tenha demonstrado um potencial significativo na transformação de experiências educacionais, sua implementação não está isenta de desafios. Esta seção discute esses desafios e explora perspectivas futuras para a pesquisa e a prática educativa, sugerindo caminhos para superar obstáculos e maximizar o potencial dessa abordagem inovadora.

5.1 DESAFIOS NA IMPLEMENTAÇÃO DO *INBOUND LEARNING*

5.1.1 Limitações tecnológicas e de recursos

Um dos principais desafios é a exigência de infraestruturas e recursos tecnológicos substanciais. A implementação bem-sucedida do *Inbound Learning* depende fortemente do acesso a ferramentas e plataformas digitais, o que pode ser uma barreira significativa em escolas ou regiões com poucos recursos. (2018) observam, os custos iniciais de configuração e manutenção contínua de ambientes digitais de aprendizagem podem dissuadir instituições com orçamentos limitados de adotar estratégias de *Inbound Learning* ([Bueno, Caro Rodríguez, & Gallego, 2018](#)).

5.1.2 Desenvolvimento Profissional e Prontidão do Professor

Outro desafio é a necessidade de um desenvolvimento profissional abrangente para os educadores. O *Inbound Learning* exige que os professores adotem novos métodos pedagógicos e se tornem proficientes no uso de tecnologias avançadas. Trust (2012) destaca a lacuna na literacia digital e na flexibilidade pedagógica entre os professores como um obstáculo significativo na adoção de metodologias de *Inbound Learning* ([Trust, 2012](#)).

5.1.3 Equidade e Acessibilidade

Garantir o acesso equitativo às oportunidades de *Inbound Learning* é crucial. As disparidades socioeconômicas podem exacerbar o fosso digital, em que os alunos oriundos de meios desfavorecidos podem não ter acesso à Internet em casa ou dispositivos digitais, limitando a sua capacidade de participar em atividades de *Inbound Learning* de forma eficaz. Penning e Wasyliw (1992) discutem a importância de abordar essas questões de acessibilidade para garantir que a *Inbound Learning* não amplie as desigualdades educacionais existentes ([Penning & Wasyliw, 1992](#)).

5.2 PERSPETIVAS FUTURAS E DIREÇÕES DE INVESTIGAÇÃO

5.2.1 Avanços em EdTech

Olhando para o futuro, o avanço contínuo em tecnologia educacional (EdTech) oferece soluções promissoras para alguns dos desafios enfrentados pelo *Inbound Learning*. Inovações em IA, aprendizado de máquina e sistemas de aprendizagem adaptativa podem personalizar ainda mais as experiências de aprendizagem e tornar a tecnologia mais acessível e eficaz para diversas necessidades de aprendizagem.

5.2.2 Investigação Integrativa e Interdisciplinar

Pesquisas futuras devem adotar uma abordagem integrativa, combinando insights da psicologia educacional, tecnologia e desenvolvimento curricular para

aumentar a eficácia do *Inbound Learning*. Estudos interdisciplinares podem fornecer uma compreensão mais profunda de como diferentes alunos interagem e se beneficiam de ambientes de *Inbound Learning*.

5.2.3 Desenvolvimento de Políticas e Quadros

É essencial desenvolver políticas e quadros abrangentes que apoiem a implementação da *Inbound Learning* a nível institucional e governamental. Estas políticas devem abordar o financiamento, a formação de professores e o desenvolvimento de infraestruturas, garantindo que as estratégias de aprendizagem contínua são sustentáveis e escaláveis em vários contextos educativos.

5.2.4 Colaboração Global e Partilha de Conhecimento

Melhorar a colaboração global e o compartilhamento de conhecimento entre educadores e pesquisadores pode acelerar a adoção e o refinamento das práticas de *Inbound Learning*. As parcerias internacionais podem também ajudar a ultrapassar as limitações de recursos através da partilha de conhecimentos especializados e recursos, promovendo uma abordagem mais inclusiva da educação.

Esta seção não apenas destaca os desafios enfrentados na implementação do *Inbound Learning*, mas também descreve as perspectivas futuras para superar esses desafios e aprimorar a abordagem. Ao abordar estas áreas, os educadores e os decisores políticos podem trabalhar no sentido de um panorama educativo mais eficaz e equitativo que aproveite plenamente o potencial da *Inbound Learning*.

6. CONCLUSÃO

A exploração do *Inbound Learning* ao longo deste artigo reafirma sua importância como catalisador para a transformação educacional. Esta abordagem não só atende às demandas em evolução da era digital, mas também se alinha estreitamente com as necessidades dos alunos modernos, fornecendo uma estrutura para uma educação mais envolvente, personalizada e eficaz.

O *Inbound Learning* demonstrou seu potencial para revolucionar o cenário educacional, acomodando os estilos e preferências individuais de aprendizagem dos alunos. Ao alavancar tecnologias que facilitam percursos de aprendizagem personalizados e conteúdos envolventes, esta abordagem garante que a educação é acessível e relevante para todos os alunos. Os resultados discutidos por Bueno *et al* (2018) ilustram como o *Inbound Learning* pode aumentar a retenção e a satisfação dos alunos, tornando a aprendizagem mais relevante e adaptada aos interesses individuais (Bueno, Caro Rodríguez, & Gallego, 2018).

No entanto, a implementação bem-sucedida do *Inbound Learning* requer a superação de desafios significativos, incluindo barreiras tecnológicas, a necessidade de formação extensiva de educadores e a garantia de acesso equitativo aos recursos de aprendizagem. Como observado por Trust (2012), a adoção de metodologias de *Inbound Learning* requer uma mudança nas práticas de ensino e um aprimoramento na alfabetização digital entre os educadores (Trust, 2012).

O futuro do *Inbound Learning* envolve não apenas enfrentar esses desafios, mas também expandir a pesquisa sobre seus impactos de longo prazo nos resultados educacionais. É essencial desenvolver políticas sólidas que apoiem a integração da *Inbound Learning* nos sistemas de ensino regular, bem como promover uma cultura de melhoria contínua e inovação nas práticas educativas.

Em conclusão, o *Inbound Learning* se destaca como uma ferramenta poderosa na busca por modernizar e personalizar a educação. Seu foco na aprendizagem centrada no aluno e na integração de tecnologia torna uma abordagem ideal para preparar os alunos para as complexidades do mundo contemporâneo, garantindo que eles sejam alunos engajados e motivados. O aperfeiçoamento contínuo e a adoção de estratégias de *Inbound Learning* irão, sem dúvida, desempenhar um papel fundamental na definição do futuro da educação.

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CHAPTER 9

THE THEORETICAL FOUNDATION AND ITS PRACTICAL APPLICATIONS IN THE DEVELOPMENT OF LEARNING

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ABSTRACT: Educational development in Brazil began since the colonial period, and has been developing over the years, albeit slowly when compared to other countries. Brazil continues to occupy low indices in the ranking of international education. Studying the behavior of Educational Development and especially the relationship between theoretical grounding and practical applications, has become fundamental to the evolution of learning. This study aims to present the importance and the link between theory and its practical applications. Quantitative research was built with professionals and students from various areas to better understand the theoretical foundation and its practical applications in the development of learning. The results obtained show that the theoretical deepening and its practical applications should go hand in hand, since one complements the other and contributes towards the construction of knowledge.

KEYWORDS: educational development, theoretical rationale and practical applications.

RESUMO: O Desenvolvimento Educacional no Brasil começou desde o período da colônia, e vem se desenvolvendo com o passar dos anos, embora de forma lenta quando comparado com outros países. O Brasil continua ocupando baixos índices no ranking da educação internacional. Estudar o comportamento do Desenvolvimento Educacional e principalmente o relacionamento entre a fundamentação teórica e as aplicações práticas, tornou-se fundamental para a evolução do aprendizado. Este estudo tem como objetivo apresentar a importância e a ligação entre a teoria e suas aplicações práticas. Foi construída uma pesquisa quantitativa com profissionais e estudantes de diversas áreas para entender melhor a fundamentação teórica e suas aplicações práticas no desenvolvimento da aprendizagem. Os resultados obtidos mostram que o aprofundamento teórico e suas aplicações práticas deveriam caminhar juntos, pois um complementa o outro e contribuem para a construção do conhecimento.

PALAVRAS-CHAVE: desenvolvimento educacional, fundamentação teórica e aplicações práticas.

1. INTRODUCTION

The theoretical basis is of fundamental importance for the implementation of the applications. Theories and applications go hand in hand contributing to educational and professional development. The importance of identifying, analyzing and searching for theories for a given subject makes the understanding of students and professionals more assertive, creating more solid knowledge. Hoy, W. K *et al* (2015) mentions that theory is directly related to practice in at least 3 ways: the theory forms a reference structure for professional practice, (ii) the theorizing process provides a general mode of analysis of practical facts; and (iii) the theory guides decision making.

Students and practitioners develop more when theory is together with practice because they make learning more dynamic by providing fixation of concepts. And on the other hand, practice without a theoretical basis does not awaken critical thinking about a given subject. Theoretical and methodological knowledge is fundamental for professional practice in several areas. Navarro, J. (2024) built a model linking the concepts of market intelligence, fuzzy logic, data analysis and decision making applied in the area of health for cases of chronic diseases, which made the model applicable in health units.

2. THEORETICAL RATIONALE AND PRACTICAL APPLICATIONS

Theory is the origin of all knowledge, in it we find the basis of a given subject, its concepts and definitions. Today, with the fast and dynamic access of information through the internet, it is possible to consult all the theories related to a given subject and its applications in various areas. Da Silva Filho and Ferreira (2018) cite that theoretical references are rarely considered accurately in the works themselves, sometimes even being impossible to identify them in the methodologies and didactic sequences that give them shape.

An example that theory and practice need to walk together is when a teacher/mentor teaches a theorem, in the vast majority of cases students only fix the content when a practical application is presented. De Almeida, C. O. (2019) shows in his paper the importance of the relationship between theory and practice in which the

central limit theorem enjoys great theoretical power and practical application in various areas of knowledge.

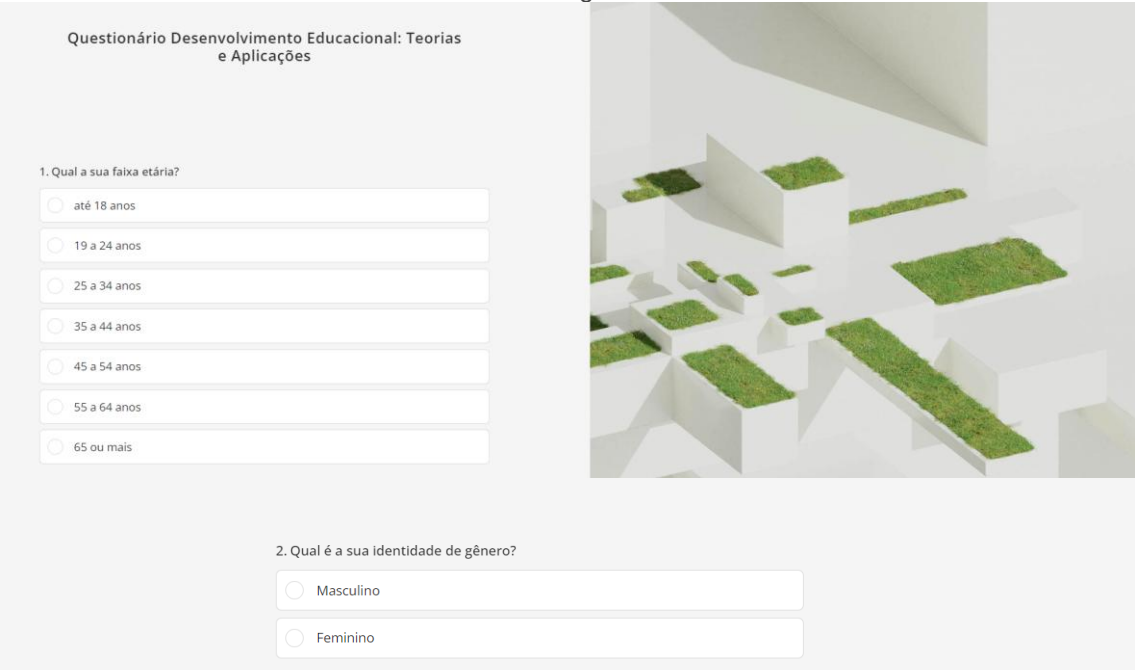
3. SEARCH PROCESS

To support the points raised, a quantitative research was carried out through the elaboration of a questionnaire to measure the benefits of theory and practice together in educational development. The questionnaire was applied and answered by selected professionals and students, who received a link from the Forms.app platform.

The questionnaire was divided into two blocks: the first with questions to understand the profile of the respondents; and the second, with questions relating to the investigation of the variables of the research. For the first block, 5 questions were generated; and for the second block, 10 questions were elaborated on a five-point Likert scale with scores for each question ranging from 1 to 5. With a score of 1 to totally disagree and 5 to totally agree.

The questionnaires were made available in Portuguese and answered between 16 and 30 September 2024. The survey questionnaire was organized as shown in the form of Figure 1:

Figure 1



The image shows a screenshot of a digital questionnaire titled "Questionário Desenvolvimento Educacional: Teorias e Aplicações". The first question, "1. Qual a sua faixa etária?", offers seven age range options with radio button selection: "até 18 anos", "19 a 24 anos", "25 a 34 anos", "35 a 44 anos", "45 a 54 anos", "55 a 64 anos", and "65 ou mais". The second question, "2. Qual é a sua identidade de gênero?", provides two options: "Masculino" and "Feminino", also with radio button selection. To the right of the questionnaire interface is a 3D architectural rendering of a modern building with white geometric forms and green grass-like textures on its surfaces.

3. Qual é o seu nível de escolaridade?

- ☐ Pós-graduação completa
- ☐ Pós-graduação incompleta
- ☐ Ensino superior completo
- ☐ Ensino superior incompleto
- ☐ Ensino médio completo
- ☐ Ensino médio incompleto

4. Em qual categoria você se enquadra atualmente?

- ☐ Profissional
- ☐ Estudante
- ☐ Profissional/Estudante

5. Em qual segmento você atua ou estuda?

- ☐ Público
- ☐ Privado
- ☐ Público/Privado

6. Em uma escala de 1 a 5, conhecer a fundamentação teórica o ajuda a entender as aplicações práticas?

1	2	3	4	5
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7. Em uma escala de 1 a 5, você costuma procurar um embasamento teórico para entender as aplicações práticas?

1	2	3	4	5
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8. Em uma escala de 1 a 5, enquanto professor/mentor, você costuma apresentar somente a teoria para um determinado assunto?

1	2	3	4	5
---	---	---	---	---

9. Em uma escala de 1 a 5, enquanto professor/mentor, você costuma mostrar exemplos práticos para os alunos?

1	2	3	4	5
---	---	---	---	---

10. Em uma escala de 1 a 5, enquanto professor/mentor, você acredita que os alunos têm um melhor desempenho quando é apresentados exemplos práticos?

1	2	3	4	5
---	---	---	---	---

11. Em uma escala de 1 a 5, enquanto professor/mentor, você percebe um interesse do aluno em buscar a fundamentação teórica de um determinado assunto apresentado?

1	2	3	4	5
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12. Em uma escala de 1 a 5, enquanto aluno, você fixa melhor o aprendizado quando busca aplicações práticas?

1	2	3	4	5
---	---	---	---	---

13. Em uma escala de 1 a 5, enquanto aluno, você fixa melhor o aprendizado quando estuda aplicações práticas?

1	2	3	4	5
---	---	---	---	---

14. Em uma escala de 1 a 5, enquanto aluno, você tem interesse em conhecer a teoria que envolve um determinado assunto?

1	2	3	4	5
---	---	---	---	---

Source:

4. STATISTICAL RESULTS AND ANALYSIS

The sample was composed of eighteen respondents from different areas between professionals and students. Analyzing the research report, in relation to the profile of the respondents, 58% are female and 42% are male, with 33% having completed graduate studies, 33% having completed tertiary education and 33% having completed high school.

From this analysis, we observed that 58% of the respondents are professionals; 25% are students, and 17% are professionals and students. 24% are between 25 and 34 years of age; 42% between 35 and 44 years of age; 25% between 45 and 54 years of age and 8% over 55 years of age. 66% work or study in the private area; 17% in the public area and 17% in the private and public area simultaneously.

In the view of teachers and/or mentors few students seek a theoretical grounding of a given subject presented, only 40% of teachers and/or mentors perceive this interest, on the other hand, 92% of students responded that they have an interest in knowing the theory that involves a given subject.

It should also be noted that 80% of teachers and mentors usually show practical examples to students and 100% of them believe that students perform better when practical examples are presented. 100% of students responded that they better fix learning when studying practical applications. 30% of teachers and mentors usually present the student only with the theory for a given subject.

Most respondents believe that knowing the theoretical basis helps to understand the practical applications and 100% usually look for a theoretical basis to understand the practical applications.

5. CONCLUSION

Finally, the theoretical deepening and its practical applications should go hand in hand, since one complements the other, stimulates growth and contributes significantly to better educational and professional development.

Through applied research we can observe that 100% of respondents stated that practical applications improve their development and 100% intend to continue using practical applications to better understand the theory.

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CHAPTER 10

LOSS AVERSION AND OVER-CONFIDENCE IN DECISION-MAKING: CASE OF EMPLOYEES OF A HIGHER EDUCATION INSTITUTION IN MOZAMBIQUE

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RESUMO: Os vieses comportamentais constituem um dos campos férteis de estudo nas finanças comportamentais. Conhecida como teoria de perspectiva defende que os indivíduos/investidores têm uma tendência maior a evitar perdas do que a adquirir ganhos de valor equivalente. Ou seja, a dor de perder é psicologicamente mais intensa do que o prazer de ganhar. Este artigo/ensaio examina a aversão a perdas e o excesso de confiança dos colaboradores de uma instituição de ensino superior. Ou seja, como esses fenómenos comportamentais que influenciam na tomada de decisões sobre investimentos. A partir de uma abordagem descritiva quantitativa, com uma amostra de 20 colaboradores, discutiu-se as teorias por detrás desses fenómenos e como eles afectam as decisões de investimento dos colaboradores. Concluiu-se que os colaboradores têm um nível moderado tanto de aversão a perdas e de excesso de confiança nas tomadas de decisões.

PALAVRAS-CHAVE: aversão a perdas, excesso de confiança, tomada de decisões.

ABSTRACT: Behavioral biases are one of the fertile fields of study in behavioral finance. Known as perspective theory, it is argued that individuals/investors have a greater tendency to avoid losses than to acquire gains of equivalent value. That is, the pain of losing is psychologically more intense than the pleasure of winning. This article/essay examines the loss aversion and over-reliance of employees of a higher education institution. Or that is to say, how these behavioral phenomena influence

decision-making about investments. From a quantitative descriptive approach, with a sample of 20 collaborators, we discussed the theories behind these phenomena and how they affect the investment decisions of the collaborators. It was concluded that employees have a moderate level of both loss aversion and overconfidence in decision-making.

Keywords: loss aversion, overconfidence, decision-making.

1. INTRODUCTION

Loss aversion and overconfidence of individuals are two behavioral phenomena widely studied in behavioral finance theory, which seek to explain certain patterns of behavior observed in decision-making. As can be seen in the positioning of Lobão (2012), which states that decisions made by individuals, investors or economic agents are actually affected by psychological factors, and that behavior can change much of what is assumed in the traditional field of finance theory.

Researchers such as Kahneman and Tversky (1979), considered the precursors of behavioral finance, have proposed economic models that consider the fact that humans are not completely rational, whose great challenge is confronted with the vast complexity of human irrationality. Based on this assumption of limited rationality, various behavioral biases arise, such as optimism, overconfidence, anchoring, representativeness, among several others that can influence, both positively and negatively in the decision-making process, or even not influence.

Lobão (2012, cit. in Nunes, Flores & Silva, 2018) defends over the last decades there has been a growth of economic markets, hence the relevance of investor participation and the development of new financial products is the incentive to study the way in which economic operators decide. Also, according to the author, the importance of the study of individual financial decisions is stimulated by two hypotheses. The first is that there are many circumstances in which individuals make decisions in isolation, without any help. The second is that behavioral finance argues that agents with limited rationality can influence the market.

How behavioral finance can be understood is a field of study that analyzes how individuals make decisions, considering their emotions, looking at neuroeconomics and the types of cognitive biases. It can also be said that they function as tools for the brain to make decisions, which means that decisions are not always rational.

Thus, there is room to discuss the influence of this human behavior in financial decision-making, which encompasses a number of behavioral factors of extreme importance for the understanding of the market as a whole and, so the decisions of employees of a Higher Education Institution (HEI) that has the mission to empower individuals so that they can take informed. According to Kahneman and Tversky (1979), people are short-sighted, accept satisfactory rather than optimal solutions, do

not look long-term, and are influenced greatly by emotional and psychological factors. These factors, also known as behavioral biases, can be grouped into: loss aversion bias, overconfidence bias, and herd behavior bias*. HEIs employ individuals who earn a particular salary and salary on a monthly basis, the way these people make their financial decisions and the types of influence they suffer. In this context, it is important to answer the following research question: **What is the impact of aversion to losses and over-reliance on decision-making by HEI staff?**

In order to answer the question raised, the study presents the following general objective to analyze the aversion to losses and excess confidence of employees in financial decision making. In specific terms, the study has the following objectives:

- identify the best known behavioral and heuristic biases, their characteristics and their causes;
- understand the impact of behavioral biases (loss aversion and overconfidence) of the employees of the institution studied.

A better understanding of cognitive errors/emotions that affect the behavior of employees and/or individuals forms an essential argument for clarifying financial phenomena (conducting the study). Such as, in the elaboration of public policies and also substantiate the implementation of action strategies for employees, because better financial decisions impact positively quality of life (Caetano, Mate & Macane, 2021). In this way, the present study seeks to contribute to the area of behavioral finance, presenting empirical evidence and reflections on the behavior of employees/investors in financial decision making, thus constituting a bibliographic reference for future studies.

In terms of structure, this article, besides this contextualization, presents the literature review, the methodological procedures, the results and finally the final considerations.

* This will not be reviewed in this survey.

2. LITERATURE REVIEW

2.1 BEHAVIORAL FINANCE

The Modern Theory of Finance (TMF) considers that in the market only rational agents survive, and irrational ones are expelled from the market by rational ones. To align this thinking with that of traditional finance that presupposes the rationality of investors, the Theory of Behavioral Finance arises, assuming that economic agents possess a limited rationality. The basic idea of behavioral finance is not to reject all aspects of modern or traditional finance, but rather to perfect financial models by incorporating behavioral trends detected in humans (Macedo Jr., Kolinsky & Morais, 2011).

Halfeld and Torres (2001) state that Behavioral Finance emerged in the late 1970s when Kahneman and Tversky (1979) published their studies on human behavior and decision-making in risky situations. This work created one of the main concepts of Behavioral Finance, loss aversion. Behavioral Finance emerged as a way to perfect the Modern Model of Finance, tying to it the behavior and irrationality of man (Halfeld & Torres, 2001).

The main concepts of the Modern Finance Model are the Efficient Markets Hypothesis (HME) and the rationality of decision makers (Silva, Lagioia, Maciel & Rodrigues, 2009). The work of Kahneman and Tversky (1979), however, pointed out the flaws in this model, presenting several factors that influence the decision-making of the man (*homo economicus*), such as loss aversion, excessive self-confidence about reaction to the novelties of the market.

Kahneman (2012) explains that human beings have systematic biases in their own judgments that override rationality, that is, intuitions prevail to reason. The author mentions two ways in which the human brain works, calling them System 1 and System 2, respectively. "System 1 continuously generates suggestions for System 2: impressions, intuitions, intentions and feelings. If endorsed by System 2, impressions and intuitions become beliefs, and impulses become voluntary actions" (Kahneman, 2012, p. 24). In the context of Behavioral Finance, loss aversion, the main concept of the area, refers to the fact found by

Kahneman and Tversky (1979) state that for most people the pain from financial loss is greater than pleasure from an equivalent gain, and that risks are taken only to minimize losses.

Similarly, Lobão (2012) points out that behavioral finance, rather than defending an idealized view of the predicted reality in the field of traditional finance, suggests a more realistic view of the decisions taken by economic agents and investors.

According to Statman (2014), behavioral finance is under construction and expands the field of traditional studies, as it establishes links between theory, evidence and practice. In the study of this behavior, we frequently go to other sciences, in particular psychology, considering that the decisions taken by economic agents are affected by psychological and sociological factors (Kimura, 2003).

In short, it seeks to study how and why economic agents behave in the way they do. That is, identifying how emotions and cognitive errors can influence investor decision-making and how these patterns of behavior can determine market changes.

Several authors point to several patterns of behavior, the most cited being aversion to loss, excessive self-confidence, exaggerations as to optimism and pessimism, and reaction to new market developments. The following sections discuss the loss aversion and overconfidence biases that are the focus of this article.

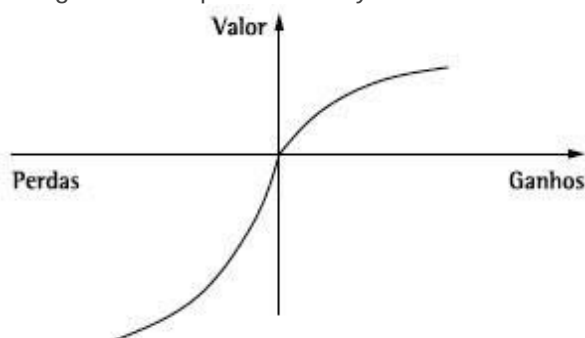
2.2 LOSS AVERSION

Loss aversion is the main concept of Behavioral Finance, according to Reikenthaler (1998), is loss aversion; first proposed by Kahneman and Tverski (1979), this concept is based on the finding that people feel much more the pain of loss than the pleasure gained from an equivalent gain. This thesis contradicts the microeconomic precept known as the Theory of Expected Utility (TUE), which assumes that the investor assesses the risk of an investment according to the change it brings in its level of wealth; this precept, being an integral part of the Modern Model of Finance, works with a perfectly rational investor concept.

In other words, loss aversion states that individuals have no aversion to risk but loss. Investors/individuals prefer not to suffer the pain of loss than the pleasure of an equivalent gain, that is, the person prefers not to lose 1,000.00 meticaís to gain

1,000.00 meticaís. They also take risks when they are losing, but are totally averse to risk when they are winning (Araújo & Silva, 2007).

Figure 1: Prospectus Theory Value Function



Source: Kahneman and Tversky (1979)

Lobo, Pimenta, Borsato and Lopes (2011) state that behavioral finance highlights loss aversion as opposed to economic concepts that hold that investors should risk while winning and should be against risk when losing. According to them, loss aversion is one of the most important concepts discussed by Behavioral Finance among distinct anomalies tested and studied by researchers in this area.

2.3 OVERCONFIDENCE

The theory of overconfidence, argues that the individual overrelies in an exaggerated/excessive way on his own opinions and knowledge, and maximizes his contribution to decision-making, possessing the tendency to believe that he is always correct in his choices and attributes the errors to external factors (Nunes, Flores & Silva, 2018). That is, individuals identify themselves as better than others, also known as the *overconfidence* theory.

Ferreira, Yu, Sá de Oliveira, de Oliveira Siqueira, Zimmer and dos Santos (2003) reiterate that the excess of trust is caused by different cognitive errors made by individuals in the decision-making process, in which these errors make individuals evaluate decision-making situations in an unreal way.

Weinstein (1980) in his study revealed that over 90% of people fantasized about their abilities and possibilities too much, believing they could do better than they actually did. In this direction, overconfidence is a trait associated with the optimism

bias (Schrand & Zeckman, 2012) which is confidence in what is to come, believing that everything will work out in the best possible way.

In the words of Barros and Silveira (2008), the phenomenon of over-confidence tends to disappear or even to be inverted (excessively low confidence) when the questions presented are very easy and the tasks involved are very predictable, repetitive, and about their results there is quick and precise *feedback*. Major corporate decisions, such as selecting investment projects, certainly fall into the category of high complexity tasks and slow, often ambiguous *feedback*.

In empirical terms, one can point to the impact of the above mentioned phenomena with studies by: Costa, Teixeira, Santos and Santos (2021) that found that people with the loss aversion bias tend to make riskier choices, when there is the possibility of losses, and become averse to risk, in situations where comparable gains are presented. Yeh (2022) advocates that people with low financial knowledge are predisposed to present decision bias, and confirmed from an empirical study that respondents with lower financial literacy manifested a higher degree of loss aversion bias.

Regarding over-confidence, Gervais and Odean (2001) developed a model that describes the process by which investors learn about their capabilities and how a bias in this learning can create overly confident investors. The expected level of overconfidence of a *trader* increases in the early stages of his career. Then, with more experience, he starts to recognize his own ability better. Huisman, Van der Sar and Zwinkels (2012) presented an alternative method of measuring investor overconfidence, using unique survey data on investor forecasts in the stock market. They apply the Parkinson's estimate based on extreme limits around the stock forecast to deduce investor confidence. The results support overconfidence.

Similarly, Ricciardi and Simon (2000) mention that overconfidence is a bias that humans tend to overestimate their own abilities and predictions of success. When it comes to investments, overconfidence is identified when investors rely ostensibly to reduce the risk of losses in unpredictable situations (Yang, Mamun, Mohiuddin, Al-Shami & Zainol, 2021).

Ateş, Coşkun, Şahin and Demircan (2016) conducted research focusing on investor behavior, and argue that people who suffer from this bias either overestimate the likelihood of a favorable outcome occurring, or underestimate the chance of a negative outcome occurring. According to Barber and Odean (2001), over-reliance on

one's own knowledge or ability to be concerned can lead to excessive negotiations and lower returns. On the other hand, research has led some psychologists to suggest that overconfidence can be beneficial, serving to promote motivation and persistence in tasks (Clark & Friesen, 2009).

Cossa (2013), in his study analyzing the influence of the behavioral factors of young Mozambicans in financial decision making, concluded that they are averse to risk when they win and risk lovers when they lose, are optimistic about the future and, increase the chances of there being positive events, and have excessive confidence in their decisions.

As can be seen the aversion to losses and excess of confidence can impact the decision making of investors. For example:

- **Increased volatility:** Loss aversion can lead to extreme price movements as investors overreact to market news and events.
- **Bubbles and crashes:** Excessive investor confidence can contribute to the formation of bubbles, where asset prices are inflated beyond their real value. When reality imposes itself, this can lead to *market crashes* when prices correct to more realistic levels.
- **Market inefficiencies:** Both loss aversion and overconfidence can lead to inefficiencies in the market, where asset prices do not fully reflect all available information. This can create opportunities for skilled investors to exploit price discrepancies and make profits.

3. METHODOLOGICAL PROCEDURES

In order to achieve the objective, a descriptive quantitative study was used. Gil (2008) points out that research of this type has as its main objective the "description of the characteristics of a given population or phenomenon or the establishment of relations between variables" (p.28). In this case, this study proposed to verify whether employee/investor decisions are influenced by loss aversion biases and overconfidence, considering the frequency with which people usually make decisions.

The choice of quantitative approach is considered appropriate for this research considering that the intention is to capture the phenomenon through numbers and quantifications. The quantitative approach "considers that everything can be

quantifiable, which means translating into numbers opinions and information to classify and analyze them" (Prodanov & Freitas, 2013, p. 69).

As a data collection tool, a structured questionnaire was applied, made in google form and then sent the *link* to the respondents.

The population of this research comprises the collaborators Catholic University of Mozambique Nacala and Xai-Xai Extensions, which add up to 63 collaborators. We obtained a sample of 20 employees, representing a confidence level of 83% and the results were processed using the *software* SPSS 20.0

3.1 PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

The study was done with a total of 20 respondents, these had as the common characteristic have already had an experience or investment decision, because they are part of a class of collaborators of a higher education institution (are salaried). Of this age figure 65% finds if in the range of 26-35 years, an age group considered young. In Mozambique, every individual between the ages of 15 and 35 is defined as a young person (National Youth Policy). Details on the profile of respondents are presented in Table 1.

Table 1: Profile of respondents in the variables: Gender, Age, Marital Status and Education

Variable	Options	Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Male	12	60.0	60.0	60.0
	Female	8	40.0	40.0	100.0
	26-35 years	13	65.0	65.0	65.0
Age	36-45 years	7	35.0	35.0	100.0
	Single	9	45.0	45.0	45.0
	Married	8	40.0	40.0	85.0
Marital Status	Union de Facto	3.	15.0	15.0	100.0
	Medium	4.	20.0	20.0	20.0
	Degree	10	50.0	50.0	70.0
Schooling	MSc	6	30.0	30.0	100.0

Source: Research Results (2024)

In terms of gender, it can be seen that most respondents (60%) are male, marital, single (45%) and married with 40%. Next, it was sought to know about the level of schooling, and it was found that the most referenced level was the degree (50%) followed by a Master's degree (30%).

After analyzing the sample profile of the study, the questions about the biases aversion to loss and excess of confidence of the respondents were analyzed. First the loss aversion bias and then the overconfidence bias were analyzed according to Tables 2 and 3 respectively.

Table 2: Loss Aversion Results

Issue	Options	Frequency	Percent	Valid Percent	Cumulative Percent
Reaction to Losing Money	I Get Very Upset And Try To Avoid Thinking About It	3.	15.0	15.0	15.0
	I accept Loss and move on	13	65.0	65.0	80.0
	Motivated to invest more to recover the loss	3.	15.0	15.0	95.0
	Another option	1.	5.0	5.0	100.0
Investment Performance	Seeing Immediately to avoid further losses	3.	15.0	15.0	15.0
	I'll wait a little while to see if it gets better	11	55.0	55.0	70.0
	Invest more in the belief that performance will improve	6	30.0	30.0	100.0
Financial Decisions	Avoid Losses	4.	20.0	20.0	20.0
	Balance Gains and Losses	10	50.0	50.0	70.0
	Earn	6	30.0	30.0	100.0
Postponement Investment	Yes, often	4.	20.0	20.0	20.0
	Sometimes	11	55.0	55.0	75.0
	No, I always follow my plan	5	25.0	20.0	100.0
Choose from options	The guaranteed option to earn 500MZN	9	45.0	45.0	45.0
	a 50 % chance to win 1000	10	50.0	50.0	95.0
	It depends on my mood at the moment	1.	5.0	5.0	100.0

Source: Research Results (2024)

By reading the results on loss aversion, through the results presented in Table 2, on question 1, reaction to losing money, most respondents (65%) said accept the loss and move on and, the options get upset and avoid thinking about it and get motivated to invest more to recover the loss got weights of 15% each, which shows that respondents do not feel much pain for losing (absence of loss aversion bias), this can be motivated by the low values involved in respondents' transactions.

On question 2, poor investment performance, 55% of respondents said that if performance is low than expected, waits to see if there are improvements, 30% says investing even more believing in improved results and 15% of respondents said sell immediately to avoid further losses.

In question 3, it was sought to know in the act of financial decision making what aspects the respondents considered, the majority with weight of 50% said fight always to balance the losses and gains, 30% of the respondents said have as their mission to obtain gains and 20% avoid having losses in the investments made.

In questions 4 and 5, on the other hand, in which an attempt was made to find out whether they would postpone investment if they realized that the time was not ideal and on the choice of options respectively, 55% said that they sometimes postponed investment because they felt that it was not the right time. And, 50% prefers a 50% *chance* of winning 1000 meticals and 45% prefers the guaranteed option of winning 500 meticals.

As can be seen the responses presented on loss aversion bias (Table 2) show that the respondents of this study do not demonstrate the presence of this bias, that is, do not have much pain in losing what they invest, as already mentioned this can be influenced/motivated by the low values applied.

These results corroborate the results found by Nunes, Flores and Silva (2028), who concluded in their study that the management students (group studied by the authors) did not present loss aversion bias. However, it contradicts the results of Kahneman and Tversky (1979) which hold that individuals feel much more pain from loss than pleasure from winning. As well as with the results of Hash (2020) which points out that people feel the loss with greater intensity of losses than they feel satisfaction with similar gains.

Table 3 presents the results of the respondents' overconfidence bias.

Table 3: Results of Interviewees' Overconfidence Bias

Issue	Options	Frequency	Percent	Valid Percent	Cumulative Percent
Investment Skills	Below Average	5	25.0	25.0	25.0
	On Average	14	70.0	70.0	95.0
	Above Average	1.	5.0	5.0	100.0
Adjustment of Financial Forecasts	Rarely	5	25.0	25.0	25.0
	Periodically	10	50.0	50.0	75.0
	Constantly	5	25.0	25.0	100.0
Trust Intuition	No, I always follow data and analysis	5	25.0	25.0	25.0
	Sometimes	10	50.0	50.0	75.0
	Yes, Often	5	25.0	25.0	100.0
Investment Certainty	Yes, Several Times	3.	15.0	15.0	15.0
	Sometimes	14	70.0	70.0	85.0
	Rarely or never	3.	15.0	15.0	100.0
Reaction when the Forecast is wrong	I get Upset and doubt my Skills	1.	5.0	5.0	5.0
	I accept the mistake and try to learn from it	17	85.0	85.0	90.0
	I believe it was an isolated event and that my prediction was correct	2.	10.0	10.0	100.0
Query Sources for Decisions financial	Never	5	25.0	25.0	25.0
	Sometimes	12	60.0	60.0	85.0
	Frequently	3.	15.0	15.0	100.0

Source: Research Results (2024)

When asked about investment skills in relation to others (investors) 70% replied that they have skills on average, 25% below average and only 5% said they are above average, which reveals that respondents have moderate overconfidence in the skills they have over others.

On the frequency of adjustment of financial forecasts, the majority with a representation of 50% said to make financial forecasts periodically, options rarely and constantly had 25% of respondents each, it is also understood that there is moderate excess of confidence regarding the financial forecasts of respondents.

Questions about intuition in making financial decisions and making sure investments and eventually not working, presented greater respondents with the times (50%) and sometimes with 70% respectively, revealing a moderate level of confidence in the decisions of the respondents.

About if the prediction is wrong, 85% said that they accept the error and try to learn from it, 10% said they believe it is an isolated error and that their prediction was correct and finally 5% is frustrated and doubts their predictive skills. For the forecasts, it was sought to know if they consulted some sources or not and, the answers obtained were: 60% said sometimes resorts to sources to make forecasts and 25% never consult, these results show that the respondents show a moderate level of confidence.

As can be seen, respondents have a moderate level of confidence in financial decisions.

These results do not align with those of Cossa (2013) who work with a sample of young Mozambicans found the presence of over-confidence as to the financial decisions they make. This may be motivated by the times when the studies were done. In 2013, Mozambique's national economy was booming, and by 2024, the level of the economy was low.

Xia, Wang and Li (2014) argue that overconfidence in financial knowledge is closely linked to participation in the stock market, which may explain the moderate level presented by the respondents of this study, who never participated in the stock market.

Already Silva, Del Corso, Silva and Oliveira (2008) assert that excessive self-confidence triggers in investors a conviction that their decisions/information are better and more reliable than that of others who act in the same market.

4. FINAL CONSIDERATIONS

The study had the objective of analyzing the biases of aversion to losses and excess of trust of the collaborators of a Higher Education Institution. In terms of socio-economic characteristics, he found that the majority have the upper level (degree) and are young. On the biases the results showed that the collaborators/respondents present a low level of loss aversion and also a moderate level of overconfidence in financial decisions, thus counteracting the results of how in the studies of Kahneman and Tversky (1979). This may be motivated by the low monetary values that respondents apply to their investments and also by the low level of financial literacy.

The study makes a contribution in that it provides elements that can create an understanding about the behavioral profile of the decision maker and the prone investor (behavioral finance), something still explored in an incipient way in Mozambican literature.

As to the limitations of this research: the first of them concerns the group of individuals who participated in the research. Depending on the number of participants, this may not reflect on the composition of the population/collaborators of the university studied. Another aspect refers to the almost non-existence or non-publication of similar studies in Mozambique especially with collaborators of IES, this prevents limited discussion of the results, making contradictions or confirmations about the results to support the results found in this study.

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CHAPTER 11

REIMAGINING NEO-CHINESE INTERIORS VIA THE LENS OF SEMIOTICS

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ABSTRACT: Globalization has inevitably disrupted the sanctity of the local culture of countries in the world under the impact of dominant foreign culture. Ignoring the preservation of domestic culture will lead to cultural homogenization and loss of identity. Attributable to this, protecting local culture has become one of the most crucial agendas in many countries' cultural development planning, including China. One of the most potent approaches to this is through design. The emergence of Neo-Chinese interior design in China has created a window to forward new interpretations and meanings while preserving the Chinese culture through contemporary interior design. The study attempts to formulate a new design model by interpreting and conveying meanings of Chinese traditional culture through the material form using semiotics. Meanings from Chinese traditional paintings will be decoded to help formulate the structures for the new proposed model of the Neo-Chinese interior design. They will serve as the research variable and the basis of the study. The outcome of this research can be helpful to Chinese interior designers while also acting as a reference for other countries to maintain and develop the nationality of their design.

KEYWORDS: neo-chinese interior design, semiotics, chinese traditional culture, chinese traditional painting, design methodology.

RESUMO: A globalização inevitavelmente rompeu a santidade da cultura local dos países do mundo sob o impacto da cultura estrangeira dominante. Ignorar a preservação da cultura doméstica levará à homogeneização cultural e à perda de identidade. Atribuído a isso, a proteção da cultura local tornou-se uma das agendas

mais cruciais no planejamento de desenvolvimento cultural de muitos países, incluindo a China. Uma das abordagens mais potentes para isso é através do design. O surgimento do design de interiores neo-chinês na China criou uma janela para encaminhar novas interpretações e significados, preservando a cultura chinesa através do design de interiores contemporâneo. O estudo tenta formular um novo modelo de design interpretando e transmitindo significados da cultura tradicional chinesa através da forma material usando semiótica. Significados de pinturas tradicionais chinesas serão decodificados para ajudar a formular as estruturas para o novo modelo proposto do design de interiores neo-chinês. Eles servirão como variável de pesquisa e base do estudo. O resultado desta pesquisa pode ser útil para os designers de interiores chineses, ao mesmo tempo em que atua como uma referência para outros países manterem e desenvolverem a nacionalidade de seu design.

PALAVRAS-CHAVE: design de interiores neo-chinês, semiótica, cultura tradicional chinesa, pintura tradicional chinesa, metodologia de design.

1. INTRODUCTION

Today's world has entered a new era of economic globalization and cultural diversity. Regional economic exchanges not only bring development opportunities to countries but also impacted the local culture of countries. Since opening herself up to outside world in 1978, China has been participating in increasing international economic and cultural exchanges. Foreign cultures have progressively influenced the country's local culture. Many Chinese people have greatly admired mainstream Western culture, resulting in the gradual decline of traditional Chinese culture. In this context, a group of Chinese designers began to integrate traditional Chinese culture into modern designs, aiming to maintain contemporary Chinese design's nationality and avoid losing local Chinese culture. The Neo-Chinese style emerged in this period and spread widely in the interior design field.

Chinese interior designers often label designs containing forms and elements of traditional Chinese cultural symbols and characteristics as Neo-Chinese. However, when approaching the design containing traditional cultural elements in modern interior spaces, many Chinese designers choose the most superficial ways to frame the decorative elements, focusing only direct and superficial adaptations of traditional symbols and elements within the design. The actual values and meanings of traditional Chinese culture are not accurately translated within them. The outcomes are pompous and artificial. The designs produced are rigid, lacking innovation and inharmonious with the essence of traditional culture within modern forms.

Semiotics is a subject that studies how "*signs*" create and convey meaning. The core objective of Neo-Chinese interior design is to interpret and represent the connotation of traditional Chinese culture in modern architectural spaces. Hence, from the perspective of cultural interpretation and representation, semiotics would be an ideal theoretical tool for analyzing the process of representing traditional Chinese culture with modern design language in Neo-Chinese interior design.

This paper aims to state the feasibility in applying semiotic theory to Neo-Chinese interior design. Based on this objective, this paper will answer following question: What is the feasibility of applying semiotic theory to Neo-Chinese interior design? To answer the question, this paper makes an analysis to the formation and composition of Neo-Chinese

style through the semiotic point of view, and explains why certain semiotic theories are selected to formulate the Neo-Chinese interior design methodology.

2. LITERATURE REVIEW

2.1 PREVIOUS RESEARCHES ON NEO-CHINESE STYLE

Along with the increasing number of Neo-Chinese interior projects, Chinese scholars and professionals began to focus on the study of Neo-Chinese interior style. This theme has become the central attention in the academic circle of Chinese interior design recently. The following is a brief introduction to some relevant research which were published in recent years.

In her paper titled *Research on Neo-Chinese Style in Architecture*, Zhou (2012) proposed that the Neo-Chinese style should not base their design solely on traditional forms, but explore new interpretation and manifestation of the design by using spiritual and traditional meanings. She believes that the highest stage of Neo-Chinese style designing is innovation, which is the “nirvana” of excellent Chinese traditional architecture. Even though it is one of the earliest papers that discuss the Neo-Chinese style and has certain theoretical foresight, this article only analyzes the characteristics and development direction of the Neo-Chinese style from the architectural vision. It lacks a vision from outside of architecture such as literature, painting, music, drama, clothing, religion, folk customs and so on. Neo-Chinese architecture should not be bound to the influence of Chinese traditional architectural civilization but should look at the whole Chinese traditional cultural system and draw inspiration from it.

Chen Han, in his paper titled *Zhonghe Beauty: Aesthetic View of Neo-Chinese Style Design* (2016) puts forward that the Neo-Chinese interior design should aim to express the aesthetic pursuit of ancient Chinese literati, namely the pursuit of harmony between man and self, as well as the harmony between man and nature. The *Zhonghe Beauty* is an aesthetic theory of “neutralization” that values internal harmony and gentleness. It was put forward by Confucius and had greatly influenced the orthodox aesthetics of ancient Chinese society. At the end of his article, Chen draws a conclusion that the aesthetic concept of *Zhonghe Beauty* is still in the mainstream position in contemporary China (Chen, 2016), which is the reason why the Neo-

Chinese style has been flourishing for a long time. Although this article discussed the methods and principles of applying *Zhonghe Beauty* in Neo-Chinese interior design, there are limitations in his studies, where its basic is still in generalities and its focus is only on one kind of Chinese traditional aesthetic thought.

In his paper titled *The Influence of Chinese Traditional Culture on Interior Design*, Xiong (2019) proposed a method to refine the art form of traditional Chinese poetry, calligraphy, and painting and apply it to interior design. This requires the designer to fully understand the art forms of traditional Chinese poetry, calligraphy, and painting, as well as modern art forms, then harmoniously integrate these elements in their practical designs. For example, traditional Chinese calligraphy and painting emphasize freehand brushwork. Even a few strokes can fully show an artistic conception of concise, which is similar to a well known modernism design concept "*Less is more*". Xiong (2019) has shown broad cultural vision, and its innovation lies in taking into account other art categories in traditional Chinese culture except for architectural art. As well as putting forward a constructive idea on how to apply them concretely. However, it is a pity that the author prolongs this idea furthermore.

Zhang siqi, in her paper titled *The Aesthetic Orientation of Song Dynasty Literati Embodied in Contemporary Neo-Chinese Style Interior Design* (2019) points out the formalism that Chinese interior designers often showed in Neo-Chinese interior designs, and advises contemporary Chinese interior designers to learn from the spacial concept of Chinese traditional painting. Zhang (2019) states that compared with the precise of space, the organization and arrangement of position in Chinese traditional painting is a poetic creation. The line of sight in Chinese painting follows the methods of "*Three distance*", which are flowing and turning, from high to deep and from deep to near, becoming a rhythmic movement. It is the spatial concept contained in the aesthetic orientation of literary men during the Song Dynasty, and it should be studied by contemporary Chinese interior designers. Zhang's point of view coincides with that of this paper, but she only proposes a research direction in her paper without carrying out any in-depth theoretical or practical research (Zhang, 2019).

Through the review of the above literature, it can be seen that scholars in the field of Chinese interior design have reached a consensus, that is, Chinese traditional culture is an important content of the study of Neo-Chinese interior design. For how to express Chinese traditional culture in the Neo-Chinese interior, scholars also put

forward research ideas and methods from different angles. However, in the existing research results, there are few scholars involved in the research of Neo-Chinese interior design methodology, which is the focus for this paper. By applying semiotic theories, this research will formulate a methodology model for Neo-Chinese interior design to help Chinese interior designers express the essence and charm of Chinese traditional culture in modern interior space.

2.2 WESTERN STUDY OF APPLYING SEMIOTICS TO ARCHITECTURE

The study of applying semiotics to architecture has gone a long way in the Western world. In fact, the structuralist linguistic view (Puech, 2004) initiated by Ferdinand de Saussure has a profound influence on the generation and development of architectural semiotics. Ever since the introduction of semiotics to architecture in Italy in the late 1950s, a lot of famous architects have developed their architectural theories based on semiotics.

In 1969, Charles Jencks, an American architectural critique who invited semiotics into architecture with English, published his book *Semiology and Architecture*. He stated, the bottom-most concept of semiotics and architecture is that any form in the environment or any symbol in the language is active and can be activated. In 1978, Jencks wrote his book *Post-Modern Architectural Language*. He put forward a series of design principles for modern and postmodern architecture in this book. These principles are equivalent to the rules of linguistic semiotics: the organization of grammar and semantics, and initially formed a scientific thinking method to grasp design rules from the architectural language system. In his essay titled “13 Propositions of Post-Modern Architecture”, Jencks presented that all of the architecture is created and felt through the code (Jencks, 1978), the double code of architecture is a common code that exists between the experts and the folks.

Since 1977, American architect C. Alexander has successively published several notable books that has push forward the idea of semiotics into architecture. Three important books namely *The Oregon experiment* (Alexander, Silverstein, Angel, Ishikawa, & Abrams, 1975), “*A pattern language: towns, buildings, construction*” (Alexander, 1977) and *The timeless way of building* (Alexander, 1979) explored how to form a complete set of “*architectural language*”.

In *The Timeless Way of Building*, Alexander argued that architecture should be as unpretentious as nature, what he called its "*nameless quality*." In achieving this "*nameless quality*," he proposes a must in creating a dynamic pattern language. Once we have mastered the method of discovering which patterns are alive, we can create language for ourselves through the current building process. Although Alexander's discourse does not directly refer to semiotics, his extensive use of the word "*language*" in his discussion reflects that semiotics has widely participated in the analysis of his theories on architecture and city (Alexander, 1979).

2.3 CHINESE STUDY OF APPLYING SEMIOTICS TO INTERIOR DESIGN

Compared with the Western academic circles, semiotics research in China started relatively late and the introduction of semiotics into various fields only gradually emerged at the end of the 20th century. Nowadays, as a methodological science semiotics has been applied by many Chinese scholars in their academic research within many fields, such as linguistics, philosophy, literature, culture, art, communication, folklore, etc. However, semiotics research in the field of interior design is relatively rare. Among them, there are even fewer applied researches that focus on semiotics' application in Neo-Chinese interior design.

In her paper titled *Research on the Leading Role of the Aesthetic Value of Semiotic Form in Current Chinese Interior Design*, Liu (2012) puts forward that semiotic techniques can be adopted to communicate emotions and create an artistic atmosphere through interior design. The paper focuses on the abstract and simplified characteristics of symbols and only puts forward the important theoretical guiding value of semiotics for interior design on the forms and design techniques.

In *A Study of Neo-Chinese Style Interior Design Based on Semiotic Theory*, Zhu (2016) asserts that semiotic theory could provide a novel thinking mode for interior design, and designers could explain the meaning of the interior environment through the selection, planning, arrangement, and combination of symbols. This paper points out the important theoretical value of semiotics for interior design from the perspective of methodological research but only stops here without in-depth study.

Zhang (2017) proposed that interior design involves many products and contents, which is the same as industrial design in her paper titled *Research on Interior*

Design Method under Semiotic Theory. She explained that the colors, materials, plane forms, space structures, furniture, and light environment in interior design will all affect the final result of interior design. This paper analyzes the guiding value of pragmatics and semantics in semiotics toward interior design methods, but lacks in-depth and specific methodological research work (Zhang, 2017).

3. METHODOLOGY

This paper employs a qualitative approach based on theoretical research. The study engages fundamental semiotic theories to analyze the ideographic process of Neo-Chinese interior design, using Chinese traditional painting as a sign vehicle. And here, the Chinese traditional painting acts as a representation of the category of traditional Chinese culture. The study will explore the connections and commonalities between them.

Among the various categories of traditional Chinese culture, Chinese traditional painting is one of the most significant visual art categories. The visual image elements presented by it can be intuitively perceived, and the meaning it points to is therefore easy to be interpreted by readers. In his illumination on this subject, Wang (2020) asserts that:

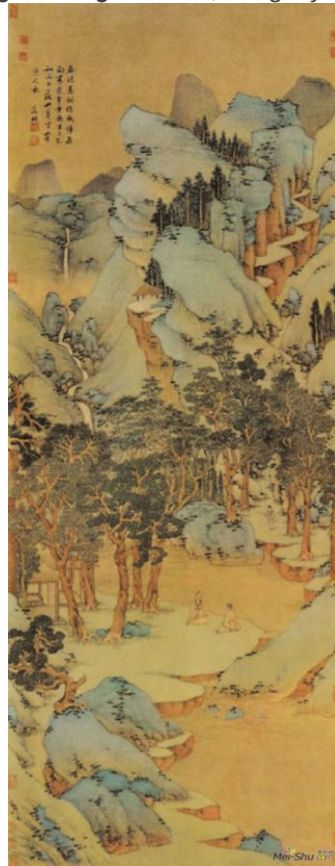
"In the early 19th century, the American semiotician Charles Sanders Peirce believed that images in real society are a kind of symbol, which appear in the form of images and have certain symbolic meanings."

As one of the most important components of the Chinese traditional paintings, the Chinese literati paintings were created by ancient Chinese literati (You, 2018). Although the themes of these paintings were mainly scenery, figure, or animal, they also contained the aesthetic feelings and worldviews of the artists on the Chinese culture. Moreover, as the elites of past Chinese dynasties, the ancient Chinese painters will inevitably reflect the cultural characteristics of their times in their paintings. For example, Wen Zhengming (a famous representative of the Wumen School of painting in the Ming Dynasty) painted the beautiful scenery of mountains and forests in spring in his famous drawing *"Late Spring and High Trees"* (shown in Figure 1). Besides showing the natural scenery of the mountain and trees, the painting also shows two persons sitting leisurely on the ground in front of their wooden cottage. In

addition to the exquisite artistic expression of the painting, this painting also reflects the cultural and spiritual environment of the Ming society, that is the pursuit of the philosophical thought "*Harmony between man and nature*" (Fang, 2015). Hence, Chinese traditional paintings can provide visual art materials and philosophical thought nutrients for Neo-Chinese interior design. Based on the above reasons, this paper takes Chinese traditional painting as the variable to help formulate the design methodology model for Neo-Chinese interior design.

However, traditional Chinese culture is comprised of multiple categories including literature, painting, music and so on. It is arduous to do an analysis that covers all of these cultural categories. This research would only choose selected categories of traditional Chinese culture as the variables, which will be put into the methodology model to realize the aim in this paper. Hence, the applicability of this research's outcome might be limited in some facets, and the application effect can only be predicted theoretically while the variables are changed to other categories of traditional Chinese culture.

Figure 1. "*Late Spring and High Trees*", Ming Dynasty, Wen Zhengming



Source: <http://www.mei-shu.com/art/20180516/32726.html>

Applying semiotic theories to formulate a methodology model for Neo-Chinese interior design is not to make the designs stylized and dogmatic. In lieu of this, Neo-Chinese interior design is **perceived** as a symbolic system or a narrative text, which symbolizes traditional Chinese culture. The process of applying semiotic theories to the Neo-Chinese interior design is equivalent to the process of compiling explanatory texts of the Neo-Chinese style. In this process, the application of semiotic theories can help Chinese interior designers to grasp the theme of design and express it more accurately. It can also help Chinese designers to find the most appropriate designing vocabulary or construction grammar when interpreting traditional culture with modern design language.

4. FINDINGS

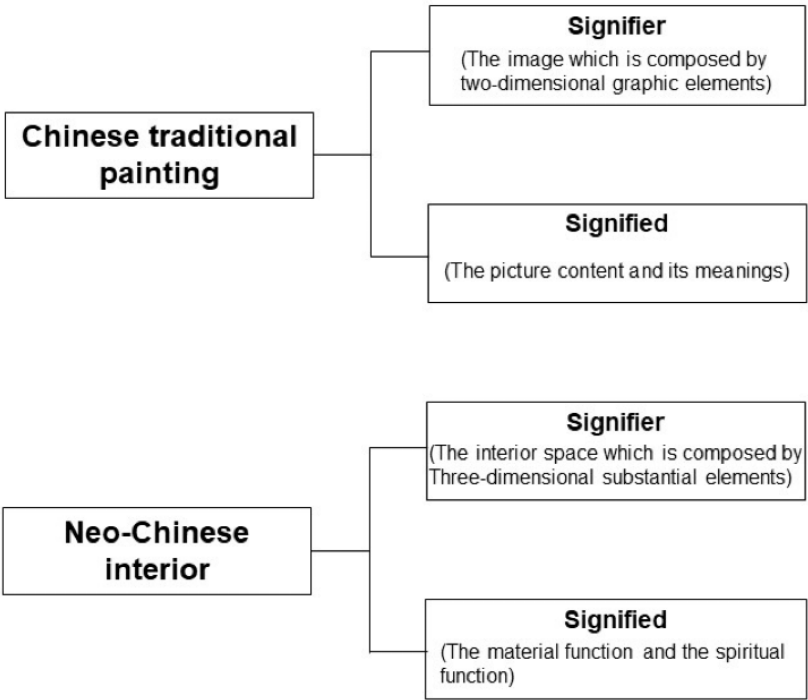
4.1 SAUSSURE'S SEMIOTIC THEORY: "SIGNIFIER" AND "SIGNIFIED"

In this research, *"Neo-Chinese interior design"* and *"Traditional Chinese painting"* are both studied by using Saussure's semiotic theories. The justification to this approach is based on the view that Neo-Chinese interior design and Chinese traditional painting are both symbolic systems, and they could be read in a structured-like manner. They both have the semiotic characteristics which Saussure named: *"signifier"* and *"signified"*.

Saussure used a *"dyadic"* approach derived from ancient Greek and developed by Rene Descartes in his semiotic analysis. The *"Dyadic"* is a philosophical theory that takes the diverse world as two primordials, independent of each other, existing and developing in parallel. In explaining the double-sided structure of symbols, he drew an analogy: a linguistic symbol is like a piece of paper that has two sides, with the thought as the front and the sound as the back. The front of the paper cannot be cut without cutting the back. So do the two sides of a symbol. Thus, the sign is a bipartite two-sided mental entity, which is composed of concepts and sound. Saussure uses the terms *"signified"* (concept) and *"signifier"* (sound) to refer to these two sides, respectively, which form a sign. (Guo, 2008) However, the dyadic approach is not a new idea of Saussure. The conception of 'Yin' and 'Yang' in traditional Chinese culture was also discussed a lot in the book of *'Yi Jing'*. Therefore, from the ideological basis,

the dyadic approach in traditional Chinese culture is the same as that in Saussure's semiotics. This study uses Saussure's semiotic theory of "*signifier*" and "*signified*" to analyze traditional Chinese culture (taking Chinese traditional painting as an example), and also uses this theory to analyze Neo-Chinese interior design. In this way, two dualistic semiotic structures are formed respectively, and the comparative analysis of them is as the diagram shown below.

Figure 2. The double-sided symbolic structures of "Chinese traditional painting" and "Neo-Chinese interior design"



Source: author's own scheme.

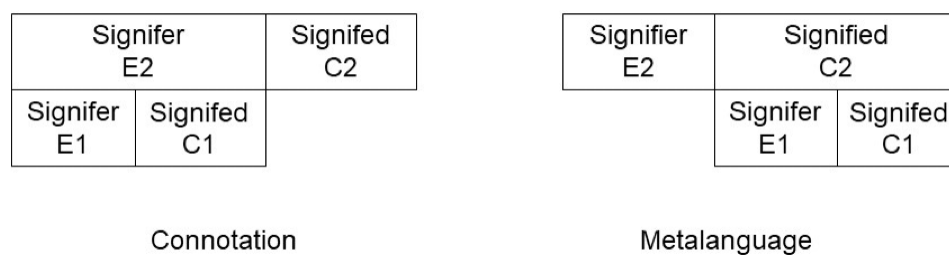
As shown in Figure 2, the two-dimensional graphic elements such as scenes, objects, and figures in Chinese traditional paintings have the function of expressiveness, which can be understood by the readers. These graphic elements together make up the "*signifier*" (mental object) as Saussure mentioned, and the concepts they refer to (the picture content and its meaning) are "*signified*" (mental concept). The Neo-Chinese interior is a modern indoor environment with Chinese aesthetic characteristics, which is constructed with various materials. In Neo-Chinese interior space, all the three-dimensional substantial elements (architectural components, furniture, ornaments, etc.) together make up the "*signifier*", and the concepts they refer to (the material function and the spiritual function) are the "*signified*".

The above is a comparative analysis of the semiotic structure of "*Chinese traditional painting*" and "*Neo-Chinese interior*" from the overall perspective. If we descend a level and analyze them from the perspective of parts and elements, each element that makes up the Chinese traditional painting and the Neo-Chinese interior can be regarded as a symbol. It is because they all have visual forms (signifier) that can be perceived by people and functions (signified) that refer to certain concepts and meanings. Hence, it can be derived that each Chinese traditional painting is a cluster of symbols that is composed of two-dimensional image symbols namely symbolic discourse. As an example of this, the two-dimensional image symbols in traditional Chinese painting mainly include the following types: rocks, trees, clouds and water in landscape painting; Face, body posture, clothes and ornaments in figure painting; Flowers, birds, insects, etc in flower-and-bird paintings. These two-dimensional image symbols are expressed through lines, ink, brush strokes and other techniques, which form the unique artistic style and expression techniques of Chinese traditional painting. Similarly, each Neo-Chinese interior space is also a cluster of symbols which is composed of three-dimensional substantial symbols, namely symbolic discourse.

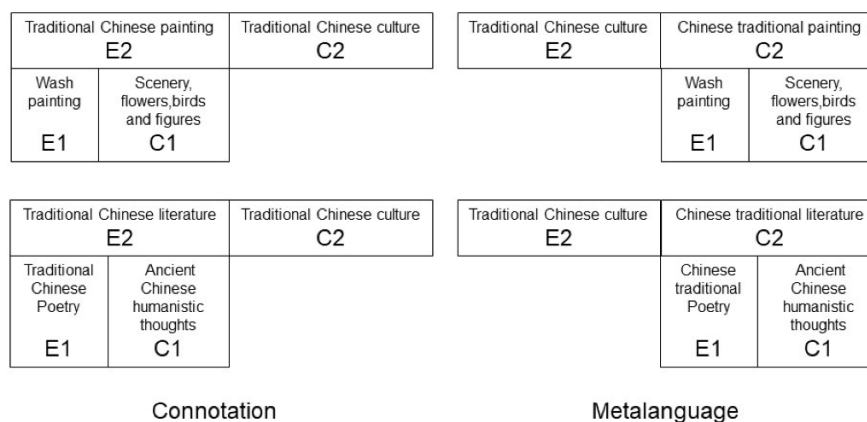
4.2 ROLAND BARTHES' SEMIOTIC THEORY: CONNOTATION AND METALANGUAGE

Barthes' theory involves the process of the reading of signs is very innovative, where his signification approach focuses on culturally significant signs. His works center on interpretations of different cultures or societies, which escalated through the process of the second level of connotation (which brings about "MYTH"). In his book *Mythologies*, Barthes (1972) claims that: "*Myth is a peculiar system, in that it is a second-order semiological system.*" He explained that in the first system a sign is composed of its image (*signifier*) and concept (*signified*). In the second system, the first system becomes a mere image (*signifier*) that points to the concept (*signified*) of the second system. Barthes defined the symbolic system as E "expression" (or signifier), R "relation", and C "content" (or signified). This symbolic system can be one of the components of a more complex symbolic system. If the content of this symbolic system is extended, it (E1, R1, C1) will become the expression part (signifier) of a new symbolic system: E2 (=E1, R1, C1), R2, C2. In this case, the primary symbolic system is denotative and the secondary

is connotative. As an example, Barthes (1972) peruses a photograph on the cover of a French magazine showcasing a black African in a French military uniform saluting the French flag, which is C1. But there was another implication (C2) beyond the original symbol: France was a large colonial empire with a loyal black army. The primary symbolic system can also extend its expressive components. In this case, the primary symbolic system becomes the object to be explained, and the secondary system becomes the meta-language, as shown in Figure 3.



According to Barthes' theory of "*connotation and metalanguage*", any "signified C2" can be resolved to its next level "signifier E1" and "signified C1" and explained by the cluster they constitute. Here, we select the relationship between "ancient Chinese literature", "Traditional Chinese painting" and "Traditional Chinese culture" as research examples to verify the application of Barthes' theory of "*connotation and metalanguage*", as shown in Figure 4.

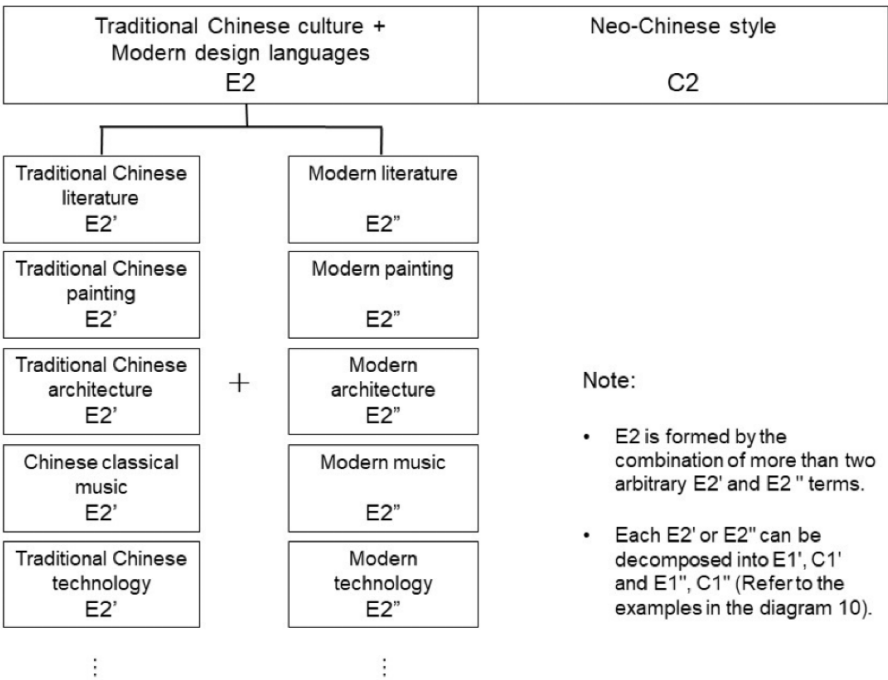


Source: author's own scheme.

Therefore, Barthes' theory of "*connotation and metalanguage*" can be extended to the "*signifier-signified*" structure of any symbolic system. In any symbolic system, "*connotation*" can be understood as how the symbol contains implications beyond the surface meaning. On the contrary, "*metalanguage*" can be understood as how the complex (multiple) meanings are interpreted by the symbolic codes below. In this research, the formula of "*metalanguage*" will be used to analyze the "*Neo-Chinese style*", a symbol system that has complex (multiple) meanings and many symbolic codes below it. Meanwhile, to ensure the meaning produced will not go astray, the symbol system will do a cording job here to control the "*metalanguage*" of the design practice.

Assuming that the formula "Neo-Chinese style = Traditional Chinese culture + Modern design language" is valid, then "Neo-Chinese style" in the formula is regarded as C2—"signified", and "Traditional Chinese culture + modern design language" in the formula is regarded as E2—"signifier". Since E in this formula is composed of two terms, we can decompose it into $E2 = E2' + E2''$. According to Barthes' "*connotation and metalanguage*" theory, the $E2'$ and $E2''$ can be decomposed into the lower metalanguage $C1' + E1'$ and $C1'' + E1''$. Therefore, based on his theory, the semiotic system of the "Neo-Chinese style" is analyzed and shown in Figure 5.

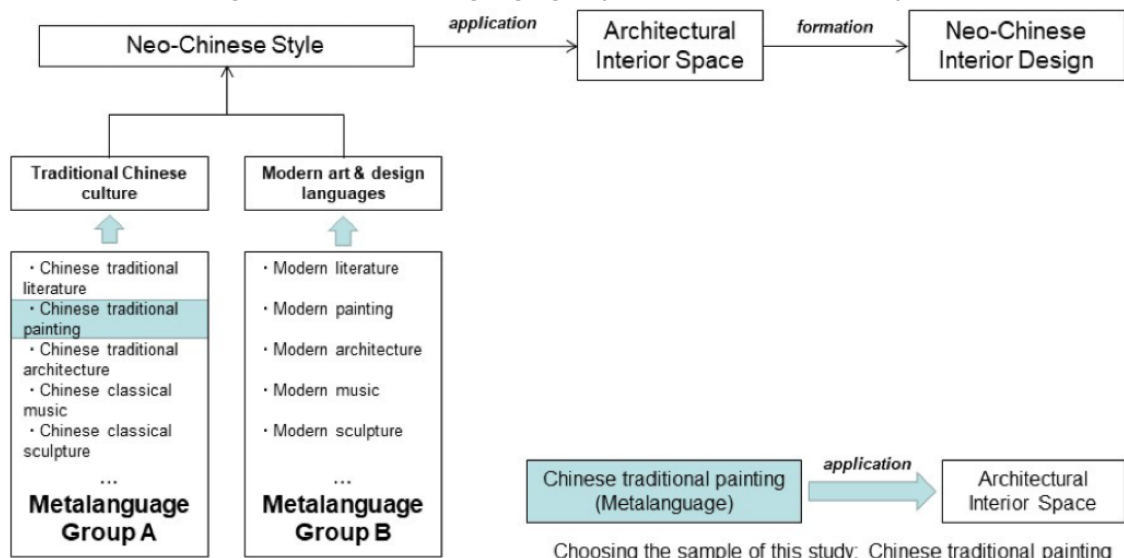
Figure 5. The symbolic system of "Neo-Chinese style" -A



Source: author's own scheme.

As shown in Figure 5, many branches of cultural categories help to build the Neo-Chinese style. Here, each Chinese traditional culture (E2') is one of the elements that make up "*Chinese traditional culture*", and any of them can combine with modern design language (E2'') to form the *signifier* (E2) in the "*Neo-Chinese style*" symbolic system. Among these cultural categories, Chinese traditional architecture and Chinese traditional paintings have the greatest influence on Neo-Chinese interior design. During the past years, many scholars in China had made in-depth research and practice in this field through the view of Chinese traditional architecture. However, these researches are limited to the architectural perspective and seldom pay attention to other categories of traditional Chinese culture. Therefore, this research takes Chinese traditional painting as the entry point and analyzes the relationship between "image" (*signifier*) and "artistic conception" (*signified*) based on semiotic theories, as shown in Figure 6. By exploring the law of Chinese aesthetics and arts which is rooted in Chinese traditional paintings, the methodology model for Neo-Chinese interior design will be formulated.

Figure 6. The metalanguage groups of the Neo-Chinese style

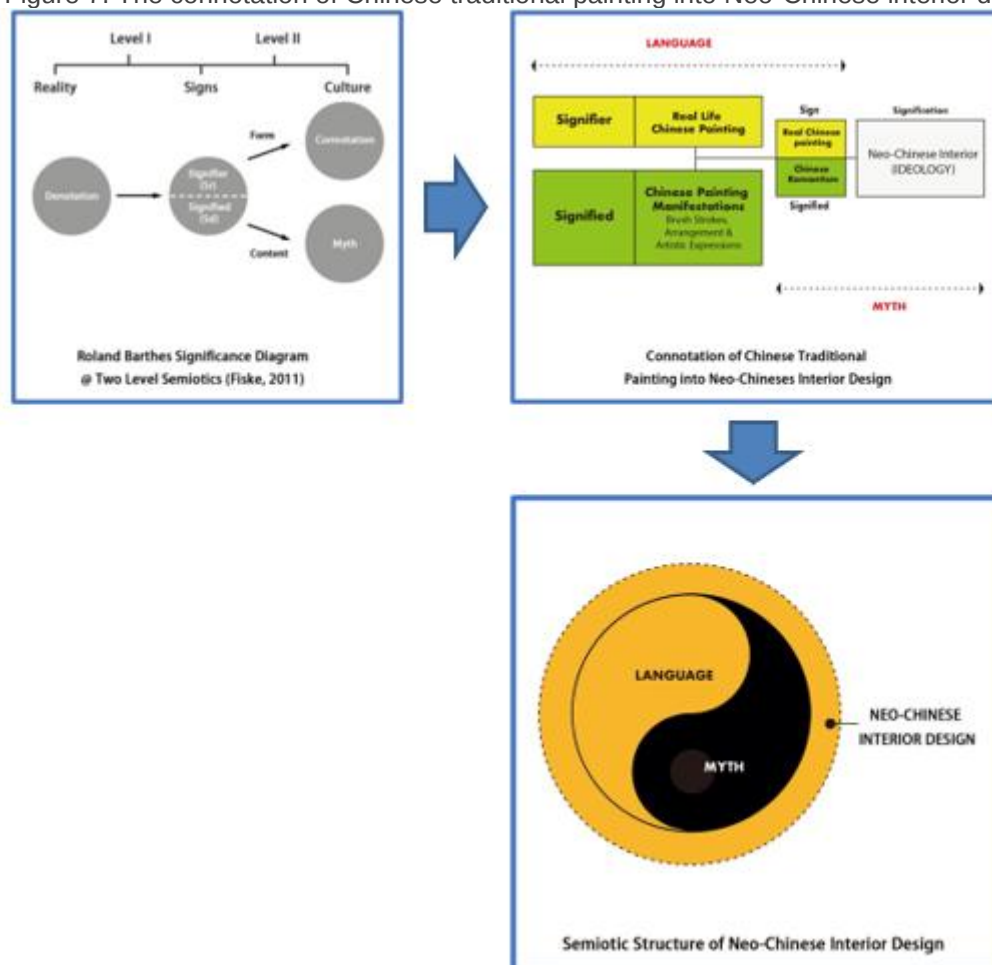


Source: author's own scheme.

According to the former analysis of Saussure's theory adaptation in Neo-Chinese interior design, it can be sure that the "Neo-Chinese interior" can be regarded as a discourse composed of symbols. Thus, it can also be analysed using Barthes' theory of *Mythology*, which is used by him to analyze mythical speech. In his book

Mythologies Barthes states that "Myth is a type of speech, everything can be a myth provided it is conveyed by a discourse. Myth is not defined by the object of its message, but by the way in which it utters this message, ... It can consist of modes of writing or of representations: not only written discourse, but also photography, cinema, reporting, sport, shows, publicity, all these can serve as a support to mythical speech". (Barthes, 1972) Barthes analyzes textual symbols into two stages: the first stage is called the primary order, which belongs to the natural domain. In this stage, the symbol is in the surface layer, and it produces the meaning (denotation). The next stage is called the secondary order, which belongs to the cultural domain (Guo, 2008). In this stage, the symbol becomes a mere signifier of a greater symbolic system that will produce connotations and generate the "myth". Therefore, the "Neo-Chinese interior design" can also be analyzed by Roland Barthes' theory of *Mythology* as Figure 7 shows.

Figure 7. The connotation of Chinese traditional painting into Neo-Chinese interior design



Source: author's own scheme.

Chinese traditional painting contains profound Chinese aesthetics and cultural deposits, which also have a profound influence on other Chinese traditional arts. Based on the Chinese calligraphy, we can see that the strokes of painting are skillfully applied in the strokes, which makes the calligraphy works have both the meaning of the words and the beauty of the picture. In ancient Chinese ceramic decoration, the elements of Chinese traditional painting are often integrated into it to make the ceramic ware both functional and aesthetic. In ancient Chinese architecture and garden design, the composition principle of Chinese traditional painting is often used to guide the spatial layouts, so that the buildings and gardens conform to the concept of "*Harmony between man and nature*" in traditional Chinese philosophy. This research will analyze the semiotic similarity and relevance between Chinese traditional painting and Neo-Chinese interior design, to help Chinese designers to build a theoretical bridge for applying "tradition" to "contemporary". Furthermore, semiotics is helpful for Chinese designers to grasp and extract the aesthetic rules and spiritual connotations which are contained in Chinese traditional paintings, and then reproduce them in modern design language.

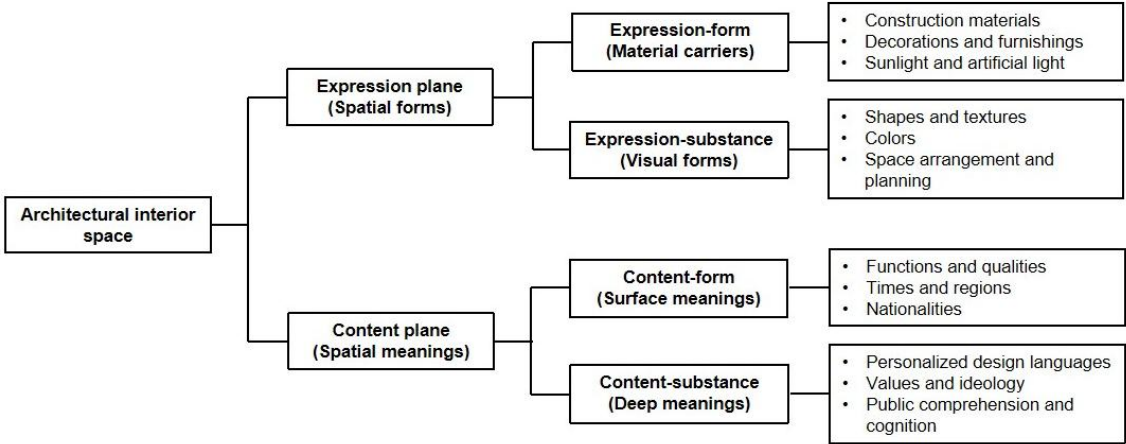
4.3 HJELMSLEV'S SEMIOTIC THEORY: TWO PLANES OF THE SIGN

This study regards "Neo-Chinese interior design" as a representative symbol containing multiple and complex meanings. As explained earlier, Roland Barthes' theory of *Connotation and Metalanguage* has revealed the multiple and complex code structures hidden under the symbol's surface structure level. Hence, Neo-Chinese interior design can be analyzed by decoding its representation. In this circumstance, the semiotic theory of Louis Hjelmslev's "*expression plane and content plane*" can be used to decode the Neo-Chinese interior design from the sense of cultural expression.

Hjelmslev proposed that the internal structure of a symbol consists of two elemental planes, namely, the "expression plane" and "content plane". The "expression plane" can be divided into two planes: "expression-form" and "expression-substance", while the "content plane" could also be divided into two planes: "content-form" and "content-substance". This research adapts the internal structural layers of this theory into the symbolic structure analysis of Chinese traditional painting and architectural interior space. Meanwhile, this research will examine the similarities and relationships

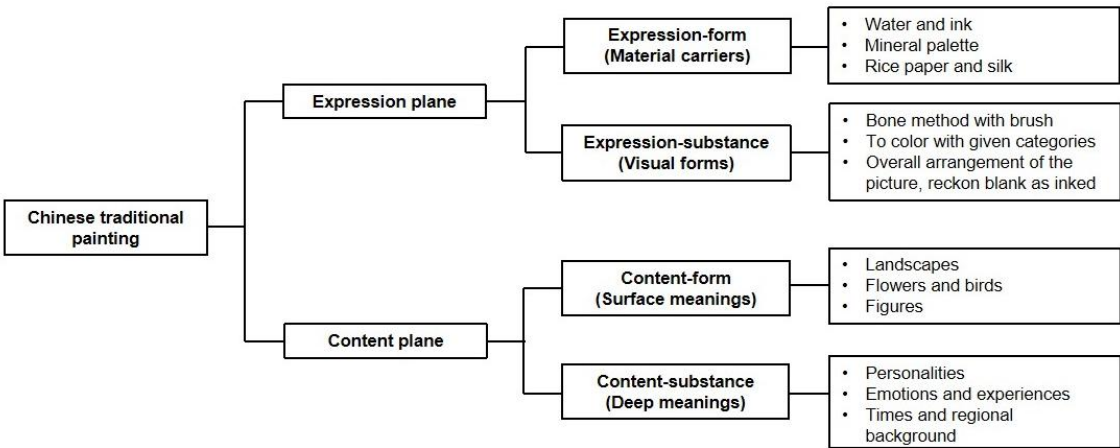
between Chinese traditional painting and Neo-Chinese interior design by Hjelmslev's theory, as shown in Figure 8 and 9, which will assist in constructing the Neo-Chinese interior design methodology.

Figure 8. The two symbolic planes of Architectural interior space



Source: author's own scheme.

Figure 9. The two symbolic planes of Chinese traditional painting



Source: author's own scheme.

As mentioned above, Neo-Chinese interior design aims to express the connotation of Chinese traditional culture in modern architectural space. This research takes Chinese painting as the variable to formulate a methodology model for Neo-Chinese interior design. Therefore, here we take an example that we need to express the cultural connotation of a traditional Chinese painting in Neo-Chinese interior design. In this case, we can apply Hjelmslev's theory to deduce which design elements should be used in the design and how to use them.

As can be seen in Figure 9, the "content substance" of this particular painting is its deep meaning, which covers various information such as the artist's personality, emotions, experience, and cultural background of the era in which he lives. The "content substance" of this painting defines the specific scope of the cultural connotation to be expressed in the Neo-Chinese interior design, and the designer's job is to determine this scope through the analysis of the "content substance" of this painting. The "content form" of this painting is its surface meaning, which is the concrete expression of the two-dimensional image on the picture. These contents can be used as a reference range for selecting the expression content of visual objects in Neo-Chinese interior design. The "expression form" and "expression substance" of this painting directly or indirectly provide the aesthetic language for the Neo-Chinese interior designers as a reference, influencing the visual aesthetics such as modeling features, color matching, texture, and spatial composition.

5. CONCLUSION

Semiotics is a capable theoretical instrument that would be applied to aid the process of interpreting traditional Chinese culture into modern Chinese interior designs. The approach in constructing a methodological model for Neo-Chinese interior design does not intend to make Chinese interior design stylized and dogmatic. Instead, Neo-Chinese interior design is here seen as a symbolic system or a narrative text, which symbolizes traditional Chinese culture. The process of applying semiotic theories to the Neo-Chinese interior design is equivalent to the process of compiling explanatory texts of the Neo-Chinese style. In this process, the application of semiotic theories can help Chinese interior designers grasp the theme of design and express it more accurately. It can also help Chinese designers find the most appropriate design vocabulary or construction grammar when interpreting traditional culture with modern design language. The following research objective of this research will focus on the formulation of a methodology model for Neo-Chinese interior design.

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CHAPTER 12

DEVELOPMENT OF AN APPLICATION FOR ENDOSCOPIC SURGERIES WITH DIRECT VISUALIZATION IN REAL TIME USING 3D GLASSES

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ABSTRACT: General surgery has undergone a significant transformation over time, thanks to the introduction and improvement of minimally invasive techniques. These techniques are notable for reducing post-operative morbidity and speeding up the recovery process compared to conventional open surgery approaches. Endoscopy has emerged as one of the most prominent surgical modalities, representing a fundamental technique in contemporary medicine. By providing an internal view of the body, endoscopy has revolutionized the surgical approach, contributing significantly to advances in the medical field. This study therefore aims to present the development of software for managing endoscopic surgeries, using 3D glasses for real-time visualization. The purpose of the management software is to simplify the surgical process, allowing surgeons to focus directly on the surgical area while viewing the transmission through the glasses, avoiding the need to turn their heads towards a monitor. The software development process went through several stages, including customization and pilot tests with doctors in different locations. The system works with a mixed reality helmet connected to an optical camera, allowing the surgeon to view the surgical field and the patient through the glasses. In addition, the doctor can broadcast the procedure to other doctors via the internet. The adoption of this technology could reduce hospitalization time and costs, as well as facilitating surgery with greater precision and favoring a better ergonomic posture. This technology also has the potential to be used in classes and surgeries with real-time remote monitoring.

KEYWORDS: virtual reality in surgeries, 3D glasses for medical procedures, endoscopic surgeries, anatomy, endoscopy.

RESUMO: A cirurgia geral tem passado por uma transformação significativa ao longo do tempo, graças à introdução e aprimoramento das técnicas minimamente invasivas. Essas técnicas são notáveis por reduzirem a morbidade pós-operatória e acelerarem o processo de recuperação em comparação com as abordagens convencionais de cirurgia aberta. A endoscopia tem se destacado como uma das modalidades cirúrgicas mais proeminentes, representando uma técnica fundamental na medicina contemporânea. Ao fornecer uma visão interna do corpo, a endoscopia tem revolucionado a abordagem cirúrgica, contribuindo significativamente para os avanços na área médica. Assim, este estudo tem como objetivo geral apresentar o desenvolvimento de um software para gerenciamento de cirurgias endoscópicas, que utiliza óculos 3D para visualização em tempo real. A proposta do software de gerenciamento é simplificar o processo cirúrgico, permitindo que os cirurgiões foquem diretamente na área cirúrgica enquanto visualizam a transmissão através dos óculos, evitando a necessidade de desviar a cabeça para um monitor. O processo de desenvolvimento do software passou por várias etapas, incluindo customização e testes piloto com médicos em diferentes locais. O sistema funciona com um capacete de realidade mista conectado a uma câmera óptica, permitindo que o cirurgião visualize o campo cirúrgico e o paciente através dos óculos. Além disso, o médico pode transmitir o procedimento para outros médicos através da internet. A adoção dessa tecnologia pode reduzir o tempo de internação e os custos, além de facilitar a cirurgia com maior precisão e favorecer uma melhor postura ergonômica. Essa tecnologia também tem potencial para ser utilizada em aulas e cirurgias com acompanhamento remoto em tempo real.

PALAVRAS-CHAVE: realidade virtual em cirurgias, óculos 3D para procedimentos médicos, cirurgias endoscopias, anatomia, endoscopia.

1 INTRODUCTION

Nowadays, the impact of technological innovation on various areas and specializations within the health field is clearly perceptible, whether through the availability of more advanced equipment or the emergence of new care approaches. This impact is directly reflected in clinical and epidemiological knowledge, in mental health, in the understanding of the cultural dimension related to the health-disease process and in the models for organizing and managing work in this area (Souza, 2021, Costa et al., 2024).

Over time, general surgery has undergone a significant transformation with the introduction and improvement of Minimally Invasive Techniques (MITs). These techniques are notable for reducing post-operative morbidity and speeding up the recovery process compared to conventional open surgery approaches. Over time, endoscopy has emerged as one of the most prominent surgical modalities. Endoscopy is a fundamental technique in contemporary medicine, revolutionizing the approach by providing an internal view of the body. This advance has significantly transformed the way many diseases are diagnosed and treated, contributing to a more efficient and less invasive medical practice (Ghellere et al., 2023). Since its inception, endoscopy has progressed from basic procedures to complex interventions capable of replacing invasive surgery. This has had a positive impact on the treatment of various diseases (Ghellere et al., 2023).

To visualize the images in endoscopic surgery, devices called endoscopes are used. An endoscope is a flexible or rigid medical instrument with a camera attached to its end. It is inserted into the body through small incisions or natural orifices, allowing doctors to see internal structures in real time (Lee et al., 2011).

During endoscopic surgery, the endoscope's camera captures internal images of the body and transmits them to a video monitor in real time. In this way, the surgical team can view the images and orient themselves during the procedure (Lee et al., 2011).

Endoscopes can vary in size, shape and functionality, depending on the specific type of surgery and the structures that need to be visualized. In addition, endoscopic technology continues to evolve, with features such as high-definition images, the ability

to view in 3D and advanced imaging systems, which can provide more detailed visualization during endoscopic surgeries (Matos, 2017).

Beyond simple observation, modern endoscopes make it possible to perform therapeutic procedures, considerably increasing their clinical relevance (Asge, 2006; Ponsky and Cherullo, 2001). Robotic surgery has emerged as one of the most notable innovations in minimally invasive surgical procedures. By employing advanced systems, such as the Da Vinci Surgical System, surgeons are able to conduct complex operations through reduced incisions, achieving greater precision, flexibility and control compared to conventional methods (Campos et al., 2010; Zucolotto et al., 2023).

The refinement of the robotic surgical technique remains a target for continuous innovation. The implementation of more sensitive robotic systems with improved tactile feedback, for example, enables surgeons to perform sutures with greater precision and manipulate delicate tissues with extreme attention (Diana et al., 2014). In addition, the integration of robotic surgery with advanced imaging techniques enables surgeons to observe three-dimensional anatomical images in real time during procedures, providing a further increase in the safety and effectiveness of operations (Garrow et al., 2021).

In robotic surgery, the image is viewed through a vision system called a surgical console. The surgical console is a workstation where the surgeon controls the robotic arms and has access to the real-time images captured by the robotic system during the procedure (Granell, Fonseca, Navarrete, 2016). The images captured by the camera are sent to the surgical console, where the surgeon can view them on a high-resolution monitor. The surgical console usually offers a 3D stereoscopic image to provide depth perception and a more immersive view of the surgical field. In addition, the surgeon can use the surgical console controls to manipulate the surgical instruments attached to the robotic arms (Matos, 2017).

These instruments have additional degrees of freedom compared to human hands, which allows for greater precision and dexterity during surgery. In summary, in robotic surgery, the image is viewed by the surgeon through a surgical console, where real-time images are displayed on a monitor, providing a magnified and stereoscopic view of the work area. According to Pires (2018), despite the growing interest in three-dimensional technology over the last few decades and the launch of several 3D endoscopes by various companies, its adoption is still not widespread. This is due to

the lack of sufficient comparative data between the results of procedures performed with two-dimensional endoscopes compared to three-dimensional ones.

Para Morrell *et al.*, (2021) the progression and future of robotic technology will probably be based on the continuous improvement of hardware and software. Robot-assisted surgery is currently used in various surgical disciplines. Future prospects include technologies that seek to reduce the size of instruments and stations, facilitate and speed up docking, provide automatic instrument exchange, offer tissue feedback technology, integrate with radiological imaging and incorporate artificial intelligence. Over the last 20 years, the most widely used robot in robotic-assisted surgery has been the Da Vinci, developed by Intuitive Surgical (Morrell *et al.*, 2021).

Still to Morrell *et al.* (2021) although Intuitive Surgical is the central figure in this scenario, the evolution of robotic surgery is far from complete, with several potential competitors on the horizon that are pushing the boundaries of ideal technology. The quest for the improved interface between surgeons and robots will not only be achieved through new tools, but through the integration of artificial intelligence and a new approach to interpreting modern surgery. This paradigm shift is worth following and promises to significantly transform surgical practice.

The aim of this study was therefore to develop management software for endoscopic surgeries to visualize the direct image in real time. It proposes a direct view in real time with 3D glasses, as if the endoscopic surgery had an open surgical field, without the surgeon having to turn their head towards the video monitor.

2. METHOD

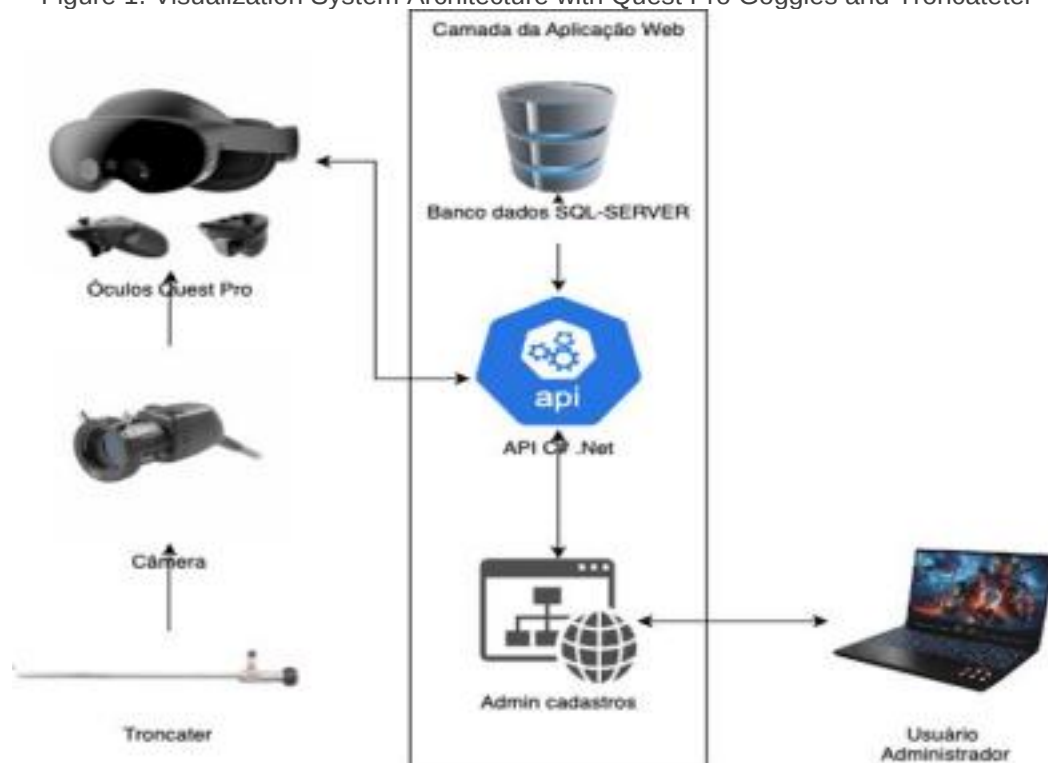
This proposal concerns the development of management software for endoscopic surgeries, with the ability to view the direct image in real time via an optical camera connected to 3D glasses, which is responsible for transmitting the surgical procedure. In addition, the project aims to simplify the handling of the optics, giving the surgeon the possibility of obtaining the endoscopy image by focusing directly on the surgical area, while viewing the transmission in real time through the 3D glasses. This would avoid any unplanned movement on the part of the surgeon due to having to turn their head to view the monitor, as is currently the case in all procedures of this format.

The present invention basically consists of software that has gone through the following stages: (a) development of software compatible with the needs of both better usability of the application and tools, and the technical surgical context; (b) installation of the application on compatible glasses; (c) customizations and necessary adaptations; (d) drawing up a surgical plan with the support of specialists in the medical, technological and educational fields; (e) pilot testing with doctors in other locations; (f) adjusting the software and hardware for surgical planning; (g) presenting the procedure to invited surgeons and (h) presenting surgical techniques to the medical community and those responsible for medical residency programs.

The development of web software and mixed reality requires methodical and agile approaches. To ensure the execution of this highly complex and innovative project, the Scrum methodology was used, a modern agile approach that covered the entire development. The software contains various technologies, distributed according to the layers of action. As illustrated in Figure 1, the software is embedded in the Quest 2 goggles, developed on the Unity3D platform. This software is responsible for capturing the images from the optics and reproducing them in the helmet's virtual environment, as well as connecting to the WebAPI to collect and send the data required for its functionality.

The software was installed on the glasses within the developer's company and can be transferred to the glasses manufacturer's store, depending on distribution needs. The model of glasses used is Meta's Quest 2 Pro. In addition, an accessory was provided to ensure that the connection to the optics cable does not become disconnected during surgery. It was necessary to customize a piece to hold the optical camera cable to the glasses, preventing disconnections during surgery. The tests were carried out by a doctor specializing in orthopaedics, accompanied by the software developer via videoconference. The equipment for the glasses was purchased in Brazil, and the modified USB camera head was developed in China.

Figure 1. Visualization System Architecture with Quest Pro Goggles and Troncateter



Source: Prepared by the authors 2024.

Pilot tests were carried out in different environments: initially in the laboratory; then in a medium-sized hospital; and finally in a large hospital in the interior of Rio Grande do Sul. After these tests, it was observed that some adjustments and customizations to the software are necessary to improve its performance, especially in the area of sharing images via the internet. In addition, we identified the need to improve the design of the cable attachment to the helmet.

The software has a feature in which the administrator registers the surgery with the date, time and e-mail addresses of the guests, who will receive an access link by e-mail. Subsequently, the glasses' software captures images of the surgical procedure in real time and sends them over the internet to the specified addresses, allowing guests to watch the surgery after logging in. It is essential to improve this transmission.

With this software, the surgeon can view the endoscopic surgical field and the patient through the glasses. In addition, the application makes it possible to broadcast the surgical procedure to guest doctors or residents anywhere in the world, using a link provided by email, managed by an online administrator. The implementation of this technology in hospitals can promote a more ergonomic posture for surgeons and offer real-time remote monitoring of both surgeries and classes for residents.

3. RESULTS AND DISCUSSIONS

The research presented here was adapted to the specificities of the surgical context, prioritizing usability and compatibility with existing equipment through close collaboration between a doctor and a software technician. Initially, the experiment required IT support due to its complexity; however, it was rewarding to get it working and identify points for research and improvement. The development of the work involved discussions about the current functioning of the procedures to identify the existing equipment and towers, which allowed us to start planning the scope effectively and ensure that the software met the practical and technical needs of the surgical environment.

Compatibility criteria for installation in 3D glasses were established to ensure successful integration with the software, including the launch of a glasses with an Android device similar to that of a cell phone. The software's flexibility has been tested in various surgical scenarios, allowing customizations to meet the varied demands of procedures. Universal equipment, with changes within medical specialties only in optics, uses a camera that is also universal and receives information from the camera via a cable attached to the helmet. Currently, a Chinese model with a universal coupling for optics is used for these functions. Drawing up the surgical plan involved interdisciplinary collaboration, bringing together specialists in endoscopy, orthopedic doctors and neurologists, with technical support from the software developer. This multidisciplinary contribution was crucial to the software's effectiveness, ensuring that it met the practical and technical needs of the surgical environment.

The testing process in the pilot tests involved the careful selection of doctors, whose feedback was fundamental to the final adjustments to the software and hardware. Initially, tests were carried out which provided adequate responses, but with a constant search for improvements. Collaboration with a university's post-graduate health sciences program, through accessible and competent professors, was essential in refining and improving the system, ensuring its effectiveness and suitability for users' needs.

The software and hardware adjustments implemented based on the insights gained during the pilot tests included improvements to the user interface and integration with medical devices, resulting in a more intuitive and functional system.

These changes have significantly increased the usability and effectiveness of the system. The search for investment is currently underway to continue improving the project. The technical mechanism for transmitting the surgical procedure was developed to guarantee data security, adopting strict security and privacy measures.

Access to the transmission is controlled by an administrator, who sends links by email only to authorized guests. In order to demonstrate the improvement in ergonomics for surgeons and the effectiveness of remote monitoring and learning for residents, the prototype needs to be completed. Only once the prototype is complete will it be possible to present concrete evidence and the associated benefits.

Mixed reality technology, although more than three decades old, is experiencing remarkable growth recently. This is partly due to the initial context of studies in this area, when the equipment essential for its implementation was excessively expensive for a long time, making it difficult to adopt. However, nowadays, thanks to the continuous advance of technology and the IT sector, several companies are focusing on producing specific products for mixed reality (De Campos Filho et al., 2020).

The learning of surgical practices has advanced considerably with the advent of mixed reality (MR) technology and the use of equipment such as 3D glasses. This innovative approach revolutionizes the way healthcare professionals acquire and hone their surgical skills in real time, offering significant benefits to both students and experienced surgeons (Tori et al., 2018). In recent years, medicine has taken advantage of the advances brought about by Mixed Reality. This technology has been used in the process of teaching and learning medicine (Basiratzadeh, 2020; Krösl, 2020).

The main advantage of using MR equipment, such as 3D glasses, is the ability to provide a highly realistic simulation of the surgical environment. These devices allow digital information to be superimposed on the real world, which enables learners to visualize complex anatomical structures in a more detailed and interactive way. For example, during a simulated surgery, students can visualize projections of internal structures of the human body, such as organs, blood vessels and nerves, improving their understanding and spatial perception (Fortmeier et al. 2014). Our project extends the possibility to surgery with direct real-time imaging.

In addition, the use of specific mixed reality software allows for the creation of personalized and adaptable scenarios, meeting the training needs of each student.

These programs offer the opportunity to practice a variety of surgical procedures, from the simplest to the most complex, in a safe and controlled environment, without risk to real patients (Harrison, et al. 2017). Through this project we suggest expanding to real endoscopy surgery with direct real-time imaging through 3D glasses. Another important issue is the need for validation and regulation of these technologies. It is crucial to ensure that goggle endoscopic surgery and devices meet ethical and clinical standards, ensuring efficacy and safety in surgical training (Tori et al., 2018). The discussion on the use of mixed reality equipment and software in the endoscopic performance of surgical practices is exciting, as it offers an innovative and promising perspective for performing minimally invasive surgery. The continuous development of these technologies, combined with a careful approach to the challenges mentioned, can positively redefine endoscopy and the surgical procedure, resulting in better outcomes for patients and significant advances in healthcare.

4. CONCLUSION

The creation of a high-tech system with the potential to revolutionize video surgeries presents an innovative platform that offers advanced features with real-time visualization of the endoscopy procedure for various medical specialties.

Mixed reality technology allows images to be transmitted over the internet to invited doctors and hospitals via a link provided by email. These features represent a significant advance in the field of minimally invasive surgery, allowing surgeons to perform procedures with greater safety, precision and efficiency. The result is a highly effective system that can have a positive impact on the lives of many people, improving their quality of life and well-being. This project allows the images of patients undergoing surgery, captured by endoscopic cameras, to be projected onto the surgeons' glasses, with mixed reality in the form of a hologram.

The system improves medical skills, reducing the need to use proprioception and facilitating the doctor's orientation. This method means that the doctor who is operating has his or her whole body turned towards the surgical field, unlike the common method of looking at the display. There are a number of positive factors associated with using this technology. The portability and comfort provided by mixed

reality glasses, for example, allow surgeons to keep their whole body facing the same direction, which can improve the precision of surgical procedures.

The images generated by the glasses can be transmitted over the internet, which makes this technology a valuable tool for performing minimally invasive endoscopic surgeries, such as spinal endoscopies where the prototype has been successfully tested.

Reducing errors during surgery is another benefit of having an enlarged and detailed view of the surgical field, which can prevent possible complications and increase patient safety. From an ergonomic point of view, the surgeon has a better posture as they don't need to turn their head towards the monitor. These factors combined make mixed reality glasses technology a promising option for the future of medicine. We founded The Cloud Surgery Technologies and presented the prototype at the Gramado Summit 2023 and 2024, the largest brainstorming event in Latin America, with satisfactory results.

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CHAPTER 13

THE MAPUDUNGUN, INTERCULTURALITY AND INCLUSIVENESS IN THE CHILEAN EDUCATION SYSTEM

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ABSTRACT: The mapudungun is one of the heritages that defines the identity of the Mapuche people. Its survival over time is mainly due to the re-registration processes that have occurred in the last decade. However, it is necessary to follow the strategies developed briefly in this work, in order to maintain their validity and revitalization in the Chilean sociocultural context. A maintenance program for this indigenous language must have the proper state support to become a healthy and self-sufficient language. All this will allow the continuation of the way of life of its users, as well as the faithful reflection of its culture within the multicultural world.

KEYWORDS: mapudungun, identity, interculturality.

RESUMEN: El mapudungun es uno de los patrimonios que define la identidad del pueblo mapuche. Su sobrevivencia a través del tiempo se debe, principalmente, a los procesos de re-etnificación ocurridos en la última década. No obstante, es necesario seguir las estrategias desarrolladas brevemente en este trabajo, con la finalidad de mantener su vigencia y revitalización en el contexto sociocultural chileno. Un programa de mantención de esta lengua indígena debe tener el debido respaldo estatal para convertirse en una lengua saludable y autosuficiente. Todo esto permitirá la continuación del modo de vida de sus usuarios, así como el reflejo fiel de su cultura dentro del mundo multicultural.

PALABRAS CLAVE: mapudungun, identidad, interculturalidad.

1. INTRODUCTION

The aim of intercultural education is to respond to the cultural diversity that prevails in developed democratic societies. To do this, it starts from approaches that respect cultural pluralism, as something inherent to current societies, valuing it as a source of wealth for all members of a society. From the pedagogical point of view, cultural differences are understood as an important educational resource. Intercultural Education proposes an educational practice that turns the cultural differences of individuals and societies into the focus of reflection and research.

It should not be forgotten that Intercultural Education is ultimately a form of attention to diversity. From this perspective, its contribution in the educational and social field is much better understood, since it constitutes the final stage in the process of acceptance and evaluation of cultural variables. To understand this better, it is necessary to know what are the existing models in the treatment of diversity, whatever it is, including linguistic and cultural.

We live in a diverse world where biodiversity has long been talked about. On the other hand, diversity is one of the defining characteristics of humanity and, therefore, of our societies. The school is a reflection of this social variability and must deal with all the diversities that come together in it, from cultural to physical or skills. In dealing with this diversity, different budgets have been adopted that cater to ideological and political will. Traditionally, it has been based on two theories: the deficit theory and the difference theory Arroyo González, M^a José. (2012). Both aim to address diversity, albeit from completely different approaches. Each of them has given rise to different educational models to deal with this diversity that is inherent to individuals and societies.

The two theories are based on the close relationship between diversity and inequality, but give completely different solutions to that relationship. Deficit theory proposes to eliminate these differences through educational models based on assimilation and compensation, while difference theory does not propose to eliminate them, but proposes a mutual enrichment by developing concrete educational models: multicultural and intercultural. As noted by Tuts (2007:34)

Intercultural education is too often confused with attention to immigrant students and the vehicular language is imposed as a factor of integration,

forgetting its necessary transformation into a language of communication. Respect for difference often borders on the promotion of cultural relativism, while coexistence is seen as a utopian situation. As for social cohesion, it is often confused with homogeneity, monolingualism or monoculturalism. Therefore, it seems that cultural and linguistic diversity tends to puzzle and cause suspicion.

Intercultural education and inclusion have multiple connections that can and should guide our educational practice. As we will analyze later, intercultural education is a way of doing school and of educating.

2. BACKGROUND CHILE

At present, several indigenous groups in Chile still use their language, which is one of the patrimonies that define their identity, including their way of life, their history, their rituals, their philosophy and their customs.

Indigenous people in Chile face several linguistic challenges. When they are in the city or in media where Spanish is spoken exclusively, they must adapt to this situation, leaving the native language to communicate sporadically with a member of their group who speaks the language in family or friend meetings. The groups that reside in rural centers maintain to a greater extent their language and culture that allows them to perpetuate some ancestral rituals. However, only older adults speak the native language in many of these places, including the rural areas of Arauco, Malleco, Cautín, Mehuín and Panguipulli, mainly. There are also Mapuche people who speak their language in the cities where a large number of them migrate as temporary or permanent workers, more specifically in Santiago, Concepción and Temuco.

Indigenous languages have been strong enough to survive through time, facing the enormous pressures of assimilation by Spanish as an official language. There is still a significant number of speakers of each of the languages that are still in force, such as Aymara, Rapanui and Mapudungun. The current re-ethnification process has activated the development of the vitality of these languages in several rural and urban communities. Within this motivation, it is necessary to plan the resources available to guide all these efforts under the tutelage of a program with realistic goals and effective procedures. This means obtaining the necessary information to diagnose the conditions in which the language is found, and thus choosing the appropriate intervention strategies leading to its revitalization. Approaches, resources, ideas and

goals should be based on the experiences and knowledge of indigenous groups, as well as the theoretical and practical experiences and knowledge of linguists, educators, anthropologists and other social scientists.

3. INTERCULTURALITY AND EDUCATION

Interculturality is a dimension that is not limited to the field of education, but is present in human relations in general as an alternative to authoritarianism, dogmatism and ethnocentrism. However, the search for more democratic and pluralistic societies involves educational processes that affirm and provide experience of living in democracy and respect for diversity. As educators we have an inescapable responsibility.

Interculturality in education appears closely linked to the new spirit of equity and quality that inspire the current educational proposals, thus overcoming the egalitarian vision that prevailed in the Latin American social scene since the arrival of the first liberal waves to the continent. Interculturality in education implies a double path: inward and outward and that one of the necessary directions to which an intercultural educational project must be directed, particularly when it comes to peoples that have been the object of cultural and linguistic oppression, (like ours) is precisely towards the roots of their own culture and their own world view, to structure or recompose a coherent universe on which it can then be possible to cement from a better position the dialog and exchange with cultural elements that, although alien, are necessary both to survive in today's world and to achieve better standards of living, taking advantage of those advances and scientific – technological developments that are considered necessary.

Intercultural education must be understood in a pedagogical process that involves several cultural systems. It is born from the individual and collective right of indigenous peoples that entails, not only enjoying the right to education as all citizens, but also, the right to maintain and cultivate their own traditions, culture, values, but also the need to develop intercultural competences that allow any citizen of any place in the country that belongs to the hegemonic culture or not, to be able to coexist democratically with others.

From the experience accumulated in the first years of implementation of bilingual intercultural education in the Chilean educational system, and having clarity of the fundamental role of the indigenous language for the recognition, valorization and respect of the culture, worldview and history of the native peoples, the challenge of converting the school into an educational space in which its students are assured the opportunities for learning that language, in a systematic way and pertinent to their reality, is imposed.

Thus, in 2009, the Ministry of Education of Chile, establishes the Fundamental Objectives and Minimum Mandatory Contents for the creation of the Indigenous Language Sector in Basic Teaching; which allowed the design of Study Programs for the Aymara, Mapuzugun, Quechua and Rapa Nui languages to begin. The above, considering at least three different realities of access to the indigenous language by children: those who have as their mother tongue or family language one of these four languages, those who listen to the indigenous language only in their social environment, and those who only listen to it in school.

The Indigenous Language course, with four hours a week allocated, seeks to strengthen the cultural and linguistic knowledge of four indigenous peoples who still maintain their native language: Aymara, Mapuche, Quechua and Rapa Nui. For this, a pedagogical pair is formed, composed of a classroom teacher (who supports in the pedagogical aspects) and a traditional educator, person in charge of imparting traditional knowledge, especially the indigenous language.

The teaching of the Aymara, Mapuzugun, Quechua and Rapa Nui languages was structured around two axes, conceived as complementary:

- Orality: understood as a form of dynamic and contextual knowledge, and recognized as the traditional way of transmission and accumulation of knowledge of the native peoples.
- Written communication: understood as being of great complexity for indigenous languages, due to the history of oral tradition in the transmission of knowledge. However, knowledge of the written code of the indigenous language is promoted through the graphemes of Spanish.

The subject of Indigenous Language has been implemented gradually, starting in 2010 in the first year of basic education to reach by 2018, the teaching and learning of Indigenous languages in eighth basic.

Complementarily, schools can develop their own plans and programs around indigenous knowledge, which are incorporated into the school curriculum as subjects or as extra-programmatic workshops. These initiatives have allowed the educational communities to generate content relevant to their territories and the particularities of their students.

As an example, within the own plans and programs that the establishments develop, there are workshops of ethnic cuisine, of interculturality and development, of worldview and Mapuche-Huilliche language, of traditional Mapuche medicine, and of Chedungun language, among others.

The creation of this subject is based on the following laws and decrees:

- The Indigenous Law (1993) favored the beginning of a systematic process for the teaching of native languages and cultures, by indicating the establishment of a programmatic unit that allows access to this knowledge.
- General Law of Education (2009), which establishes obligations and principles, one of them being that of interculturality, in which it is indicated: “The system must recognize and value the individual in his cultural specificity and origin, considering his language, worldview and history”. Articles 28, 29 and 30 commit the teaching of the Indigenous Language in establishments with a high indigenous population for kindergarten, basic and secondary education.
- Decree No. 280/2009, which incorporates the Fundamental Objectives and Minimum Mandatory Contents of the Indigenous Language Sector for the level of basic education and establishes the obligation to implement this subject in all establishments with a enrollment of more than 20% of indigenous students.
- ILO Convention 169, ratified by Chile in September 2008. Convention on the Rights of the Child, ratified in August 1990. Both normative instruments refer to the right of children belonging to indigenous peoples to receive education and respect their language and culture.

4. INTERCULTURALITY FOR ALL

Interculturality allows us all to know each other, value each other and live with different cultural universes, enriching our experiences as people and as a society. In this sense, interculturality seeks to generate a reflection in the educational system that

makes it possible to recognize, value and understand the richness of the diverse, questioning with it, for example, the imposition and hierarchization of a certain type of knowledge or the establishment of social relations.

In the matter of indigenous peoples, from recognition towards their existence and social, cultural, spiritual, economic development, among others, as cultures that inhabit this territory centuries before colonization, the Mineduc (2015) in a process that aims to be repaying the historical debt that the State has to these peoples, assumes the policy of surveying the languages, cultures, histories and worldviews of indigenous cultures in the processes of educational improvement of integral quality of the establishments of the country, with the objective of promoting an intercultural citizenship. In 2016, 223,087 indigenous students in the school system are identified in 9,335 educational establishments (79% of the total of the schools of the country, according to the Statistical Institute Status (NSI).

Similarly, the Ministry of Education has decided to develop its own concept of interculturality, seeking to reflect the reality and environment in which we are immersed as a society: Interculturality is an ethical-political social horizon under construction, which emphasizes horizontal relations between people, groups, peoples, cultures, societies and with the State. It is based, among others, on dialog from the perspective of otherness, facilitating a systemic and historical understanding of the present of diverse people, groups and peoples who interact permanently in different territorial spaces. Interculturality favors the creation of new forms of citizen coexistence between all and everyone, without distinction of nationality or origin. To this end, symmetrical dialog is possible by recognizing and valuing the richness of linguistic-cultural, natural and spiritual diversity. In the case of indigenous peoples, it reveals their characteristics and different systems that problematize, and at the same time, enrich the constructions of the world, ensuring the exercise of individual and collective rights.

5. BILINGUAL INTERCULTURAL EDUCATION

Children and young people belonging to indigenous peoples have the right to learn in contexts of greater equality, in conditions that fit their cultural particularities, their language, and their way of seeing the world.

As in the rest of the countries of the region, our educational system assumed a role of cultural and linguistic homogenization that left out the discourses of “national identity” an important part of the knowledge, values and ways of life of the native peoples. This pedagogical imbalance over time has had a negative influence on the identity and self-esteem of people belonging to the original peoples, as well as on the possibility of building a multicultural and multilingual country.

In this context, the State assumes the duty to generate the bases to enable bilingual intercultural education that allows children to learn the language and culture of their peoples, through the incorporation, in the national curriculum, of the subject of Indigenous Language (currently in Aymara, Quechua, Mapuzugun and Rapa Nui) for basic education.

This subject, which aims to enable children from indigenous peoples to communicate in their native language, is implemented in educational establishments that want to promote interculturality and in those that have a enrollment equal to or greater than 20% of indigenous students, and is developed by the traditional educator, person responsible for transmitting cultural and linguistic knowledge to the students of the establishment.

The implementation of this subject is not the only way to transmit this knowledge; the school can also develop intercultural workshops, strategies for revitalizing endangered languages and cultures, and linguistic immersion in specific contexts.

6. INTERCULTURALITY TRAINING

Teacher training is a key aspect in the implementation of intercultural education. Chile requires training its teachers as mediators and facilitators of the development of schools that value and integrate the cultural richness of indigenous peoples into the learning experience of their students.

The Ministry of Education has developed a joint work with two universities to strengthen a teacher training plan in Bilingual Intercultural Basic Education Pedagogy. In this sense, it has established collaboration agreements with the Catholic University of Temuco (UCT) and with the Arturo Prat University (UAP) of Iquique.

In the case of the UCT, this plan has two target groups: Mapuche students from the regions of Biobío, La Araucanía, Los Lagos and Los Ríos; and students of the Pedagogy degree in Bilingual Intercultural Basic Education in Mapuche context. Meanwhile, the initial training plan of the UAP of Iquique is intended for Aymara, Licanantai and Quechua students from the regions of Tarapacá, Arica and Parinacota, and Antofagasta.

Other activities within the agreements are also included, such as: developing language immersion activities for students; disseminating the career among middle school students in municipal establishments in communes with a high density of indigenous population; and holding reflection colloquia with students from other careers and schools from other training disciplines, among others.

Likewise, Mineduc aims to strengthen the training in interculturality of teachers from municipal establishments and subsidized individuals through the development of a Postgraduate in Interculturality, and through a B-learning course, in charge of the Center for Improvement, Experimentation and Pedagogical Research (CPEIP).

On the other hand, the Mineduc provides support to traditional educators who implement the subject of Indigenous Language or develop intercultural workshops through a Training Course that aims to deliver tools in the pedagogical, cultural and linguistic aspects to favor the work of this figure within schools.

7. ROLE OF THE TRADITIONAL MAPUCHE EDUCATOR

The first lines of work of the Ministry of Education, in terms of bilingual intercultural education, were linked to community participation, in order to promote meetings and collect knowledge with a territorial approach, from the voice of traditional authorities, communities, families, and indigenous professionals; likewise, it was sought to identify current practices and knowledge in the communities, in order to replicate some of this knowledge in the training of children belonging to these educational communities.

It is in this context that the figure of the Community Cultural Adviser, now known as Traditional Educator (ET), emerges and normalizes; which is initially governed as a binding actor between indigenous communities and educational establishments for the transmission of knowledge about their culture and language.

This figure has been strengthening in educational communities, achieving among other things: recreating learning strategies of their own communities, developing didactics of teaching indigenous languages, collecting oral stories, and systematizing knowledge associated with mathematics, science, cosmogony, among others.

In this context, and from the creation of the subject of Indigenous Language, the ET becomes relevant as it is responsible for concretizing the teaching of the Aymara, Quechua, Rapa Nui and Mapuzungun languages in establishments with 20% indigenous enrollment, or in those who want to promote interculturality through intercultural workshops, bilingualism, or cultural and linguistic revitalization.

Some aspects to consider in the fulfillment of its functions are the following:

- Accredit sufficient linguistic and cultural competences to perform in the teaching of the languages and cultural knowledge of the native peoples. Be validated by the Indigenous Communities or Associations linked to the educational establishment.
- Preparation of teaching, understanding the ability to structure the teaching-learning process with learning objectives to be achieved in schools and students from the point of view of indigenous knowledge,
- Creation of an enabling environment for learning, i.e. the ability to promote conditions in the use of multiple spaces and diverse methodologies, which favor intercultural learning,
- Teaching for the learning of all students, that is, the ability to deliver linguistic and cultural knowledge in diverse realities to achieve the learning objectives and propose strategies according to these.

8. TRAINING AND ACCOMPANIMENT

For more than 15 years, community cultural advisors, in the first instance, and now traditional ones and educators, have received training through training and accompaniment courses in the linguistic, cultural and pedagogical fields, with emphasis on competence development, both at the curricular and extracurricular levels.

The main objective of these training courses is to allow a better performance and an adequate and relevant insertion by traditional educators in the educational system; and therefore, they acquire specific characteristics according to the territory where they are carried out, respecting regional autonomy and promoting their own strategic development.

The trainings, carried out in person and with an average duration of 150 hours, are financed by the Bilingual Intercultural Education Program and developed by three entities according to regional realities: a) universities together with organizations with a focus on indigenous language, b) ministerial regional teams (Ministerials Regional Education Secretariats), and c) consultants and/or independent professionals.

9. CURRENT CHALLENGE

The rescue of native languages is of great relevance, not only because it strengthens the culture and identity of the native peoples who inhabit Chile, but also because it gives identity to our country and allows us to project ourselves as a more democratic, inclusive and respectful society.

The current situation of the languages recognized by indigenous law is critical and represents a complex challenge that calls us all, not only those who belong to a certain native people, since it is society that is responsible for the revaluation of the vernacular languages that we have been relegating to increasingly reduced spaces, to the point of endangering their existence.

The condition in which the different languages of the indigenous peoples that inhabit Chile are found today is complex; even though it is a multilingual and multicultural country, Spanish continues to be the language of communication, teaching, and regulation, which is why it has the greatest number of functions. The studies, research and reports consulted indicate that the main problems identified are the following:

At macro level:

- Lack of status of languages: understood as the possibility of giving functionality to the language in the different institutions and media from which the minority or minority language has been excluded.

- Lack of corpus of languages: referring to a series of actions that are carried out with the aim of normalizing the language, such as defining a graffiti, creating dictionaries, grammars and creating specific entities that deal with the subject (academies), among others.
- In the context of speech and communication, lack of spaces for use and possibilities for use, functionality beyond the local or familiar.
- Spanish is the official language of communication and teaching; this is seen in the hegemony of Spanish in media and transmission of languages: texts, media, arts, among others. The same is true for formal and informal education.

At the micro level, the main obstacles relate to the attitude of speakers, self-discrimination, demotivation to deliver knowledge about the mother tongue to the next generations, adverse local contexts, the decline of communities or speakers in a territory and lack of external support to promote the indigenous language because it is not part of the economy, work, vocational training.

Another challenge in this area relates to the lack of quantitative and qualitative data that would allow us to know more precisely the situation of the languages and speakers of them in today's Chile. Only two official sources with general information on the 9 indigenous peoples are available: CASEN (MIDEPLAN) and CENSO 2002 (INE).

The indigenous languages of Chile that maintain some degree of sociolinguistic vitality are Mapudungun, Aymara, Rapa Nui and Quechua. According to the CASEN 2009 survey, only 24% of the population belonging to these peoples would have some degree of competence in their languages, with important geographical and regional variations in the number and proportion of speakers. (Source NCB)

Year	Speakers	Just understand	Does not speak or understand
2000	14%	13.8%	72%
2003	16.8%	18.9%	64.4%
2006	14.2%	14.1%	71.7%
2009	12%	10.6%	77.3%
2011	11%	10.4%	78.6%
2013	10.9%	10.4%	78.7%
2015	10.7%	10.7%	78.6%

Source: Casen

10. TREATING A DECLINING LANGUAGE

When a language is noticed to be in a state of decline, it is possible to develop a language maintenance program. This depends on the state in which it is located, the historical causes of its decline, access to funds and human and financial resources, and the interest of the community. At first, many members of the group want to develop fluency in the use of the language, thinking that it will be easy to acquire the ancestral language code again. Unfortunately, this is not a task without difficulties, as most indigenous children handle Spanish as their first language and are poorly acquainted with their indigenous cultural traditions.

Therefore, Spanish becomes the model of correctness or naturalness and learning another language causes them difficulty in producing new sounds or combining words in patterns that are different from those of the first language learned. Researchers warn that, after the stage of puberty, it is difficult to process information using different rules and structures in a second language.

In reality, the best way to keep a language alive is through communication with children, using the indigenous language in its first stage of linguistic acquisition. The fact of handling two languages in the family environment allows the child to acquire two language codes simultaneously and without difficulties. Certainly, parents have their own preferences regarding the use of one language instead of another. This can become the setting of rules for children who perceive in what contexts they can speak the indigenous language or Spanish. They usually speak Mapudungun with their grandparents at home, but speak Spanish with their peers in other contexts. Finally, they prefer to use Spanish in all situations.

A language maintenance program should include the goal of gradually increasing the number of speakers. This requires the participation and preparation of teachers who speak the language fluently and handle the difficulties involved in their teaching. It is advisable to locate some members of the indigenous community who are willing to collaborate and submit to an intense stage of preparation, to carry out this task in order to acquire formal knowledge in a process of assessment within the community itself.

The indigenous language maintenance program should also measure the importance of Spanish and the indigenous language. Both languages are essential to

the community. But one should not be neglected or favored to the detriment of the other. Although Spanish is officially taught throughout the Chilean school system, there is some evidence about the type of Spanish spoken by indigenous communities, which differs from the formal dialect accepted in the official medium. The two languages in contact have influenced each other over time.

The family dialect of Spanish, spoken by the adult generations in each indigenous group, has been passed down from generation to generation, becoming a variety with phonological and grammatical features of the indigenous language. This requires a sociolinguistic study that can deliver a lot of knowledge about the difficulties indigenous students face in learning the standard variety of Spanish taught in school. It can also provide a guideline on the differences between indigenous language and formal Spanish.

11. COMMITMENT OF THE CHILEAN GOVERNMENT AND THE MAINTENANCE OF INDIGENOUS LANGUAGES

Scholars agree that the ultimate goal of a maintenance program is to achieve fluency in the use of the indigenous language. If this is not possible, at least a sense of appreciation of the language and its relevance as a means of maintaining cultural identity can be achieved. Factors that determine which goals are realistic and which are difficult to achieve can be known through objective assessment of the needs of each community.

It is known that any language suffers a decrease in its use, due to historical reasons of competition with the language of a group that expands its area of influence through the media and access to material goods. Early contacts between Spaniards and indigenous people were negatively aggressive, due to the purposes of the conquest which included the acquisition of new territories, discovery of precious metals, conversion to a new religious doctrine, and search for labor for forced labor. As a result of this, the indigenous people suffered the decrease of their population and overrun of their culture that originated a feeling of frustration and conquered people that has scarcely been overcome through Chilean history.

12. FINAL REFLECTION

Thinking about interculturality implies deepening the country's political approaches that support the different intercultural and bilingual educational proposals which are generated from different social actors, among which appear national agencies and governments, regional secretaries of education, CONADI, non-governmental organizations, civil associations, movements and ethnic organizations, among others.

Thus, Intercultural Education is not possible through the copying and/or extra-logical adaptation of the identity values and institutionalization devices of Western civilization, because, ultimately, it tends to conceal the continuity of socio-civilizational evangelization, of the cultural control that historically exert over the various peoples of the world and that have enabled the conformation of the current global order; moreover, well, on the contrary, demand no sort of the public recognition of the socio-cultural plurality that forms the very substrate of contemporary social systems, deconstructing the modern ideal of the Nation State. Not only monocultural, but also the historical affirmation of the values inherent in the identity construction of each of the existing communities in the world and, therefore, the values of intercultural interaction.

To legitimize the community's existence and cultural identity based on the similarities that can be discovered, evidenced, assumed and implanted in the development of the particular historical event, with the values and devices of civilizational affirmation of the dominant culture, in the strict sense, does not mean confirming the irrefutable presence of otherness, of the right to difference and, therefore, of the unpostponable need of Intercultural Education. On the contrary, it represents the self-engagement or of camouflaging of such, of prójimo, of the authentic being, that is, illegitimate projection of the civilized, developed society, which for this very reason needs evangelization or cultural development so that it can be fully developed. Thinking about the possibility of Intercultural Education, then, entails the unavoidable requirement to construct new educational concepts that do not disguise the evangelizing pretensions of the dominant culture.

This has been a small reflection on Intercultural Education as a path towards educational inclusion. The aim throughout the article has been to show how both

concepts share a multitude of ideas, and in the background allow very concrete ways of learning and teaching in the classroom. The great challenge at this time in school is to contribute to an intercultural inclusive education, which as García and Goenechea define us (2009: 35).

The recognition of social diversity and multiculturalism demands the transformation of the emergent of the contemporary educational processes, towards the appropriation of the values of identity construction of the context in which individuals develop, so that they can build their personal life project, in addition to participating significantly in the socio-cultural and politico-economics of their community of life, without ignoring the interaction in the order of global society. As soon as contemporary societies are constituted in the recognition of the ontological otherness, therefore, it is required of an education that does not respect it, but also potentiates the identity diversity, within a framework of intercultural dialogue, where all individuals and communities have the right to appropriate their own cultural values, as well as the cultural capital available in the current knowledge society.

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