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The Application of the Inclusive Education's Legal Guidelines within the Teaching-learning-assessment of Mathematics: a Case Study

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Abstract

Mathematics is often perceived as a challenging subject, accessible to few, yet essential in society. In Portugal, the 2007 publication of Principles and Standards for School Mathematics (NCTM, 2000) initiated discussions on equity and excellence in Mathematics education for all. This was reinforced in 2014 by Principles to Actions: Ensuring Mathematical Success for All (NCTM, 2014), which also highlighted access and equity as key principles. In 2018, three essential documents were enacted in Portugal: the Legal Framework for Inclusive Education (Decree-Law 54/2018), the Legal Framework for Curricular Flexibility (Decree-Law 55/2018) and the Essential Learning for Mathematics in Basic Education (Dispatch 6944-A/2018). Together, these documents represent essential tools for Mathematics teachers to ensure quality education. This abstract refers to an ongoing doctoral research and investigates teaching-learning-assessment practices deployed in Mathematics lessons, focusing on equity, differentiation and inclusion. By using a qualitative approach within the interpretative paradigm, it employs an intrinsic and explanatory case study in order to understand how the current legal framework for Inclusive Education relates to meaningful learning of the knowledge, skills and attitudes outlined in the Essential Learning for Mathematics. Conducted in a school in Porto, the aforementioned study involves the participation of two Mathematics teachers, of two year 5 and two year 6 lessons, together with their 80 students and a permanent member of the Multidisciplinary Team for Inclusive Education, responsible for implementing and monitoring inclusive practices in the school. We strongly believe that research in this area, still underdeveloped, can significantly contribute to success in Mathematics.

Keywords: *Mathematics Education, inclusion, Equity, Differentiation.*

1. Introduction

Mathematics is commonly characterized as a difficult subject, accessible only to a few, yet widely recognised for its importance in our society. Ponte [15], describes four features of school Mathematics: it serves as a foundation for the development of scientific and technological culture, essential for numerous professions; it works as a selection instrument for many higher education programs; Mathematics education statistics serve as a representation of development and as a political tool; and it promotes the education of young people from a citizenship education perspective.
In 2007, following the publication in Portugal of the book *Principles and Standards for School Mathematics* [11], a profound discussion began among all stakeholders in Mathematics education in the country. This debate revolved around a set of recommendations based on the belief that all students can and should learn Mathematics. In this book's second chapter, six principles are presented, which, according to Santos [17], "should guide high-quality Mathematics education." Among these is the principle of Equity, emphasizing the idea excellence in Mathematics education for all.
In 2014, following its previous work and after more than a decade of implementation and discussion of those recommendations, NCTM published *Principles to Actions: Ensuring Mathematical Success for All* [12]. This document once again enshrined the principle of Access and Equity, highlighting that a high-quality Mathematics programme of study must ensure that all students have access to a strong curriculum, effective teaching and learning practices, high expectations, and the necessary support and resources to maximise their learning potential.
Following this line of thought, three documents of fundamental importance emerged in 2018 in pursuit of the overarching goal of quality education for all in Portugal: The *Essential Learning for Mathematics in Basic Education* [2] (revised in 2021 for phased implementation starting in the 2022/2023 academic

year); The *Legal Framework for Inclusive Education*, established by Decree-Law 54/2018 of July 6 [6] and *the Legal Framework for Curricular Flexibility*, set forth in Decree-Law 55/2018 of July 6 [7]. These three documents, complementary in their approach, constitute powerful educational tools. The first is exclusively dedicated to Mathematics teachers, while the latter two support all educators, including those teaching Mathematics.

Unlike in Anglo-Saxon countries, Inclusive Mathematics Education remains an underdeveloped field in Portugal. This domain is rooted in the fields of Mathematics Education and Inclusive Education, focusing on the study of teaching-learning-assessment practices in Mathematics, with an emphasis on the concepts of equity, differentiation, and inclusion - in other words, within a Mathematics for all perspective. Research in this field appears to be highly relevant, as it may significantly contribute to improving student success in Mathematics.

At present, almost seven years after these documents were enacted and put into practice, it is essential to understand how schools and teachers have appropriated this set of instruments and to reflect on the teaching-learning-assessment process implemented in Mathematics classrooms. This reflection should consider the opportunities and challenges experienced following the implementation of these legal frameworks, which focus on inclusion and equity.

This rationale underpins an ongoing doctoral research at an early stage of development, which will be further detailed in the following sections.

2. The Productive Year of 2018

Ten years after the enactment of Decree-Law 3/2008 [5], it was repealed and replaced by Decree-Law 54/2018 [6], which establishes the new legal framework for inclusive education. In a coordinated procedure, Decree-Law 55/2018 [7] was also published, which sets out the curricula for basic and secondary education and the guiding principles for the assessment of learning. These two new decrees were introduced exactly one year after the approval of Order 6478/2017, better known as the Profile of Students Leaving Compulsory Education (PSLCE) [8], which is the matrix of principles, values, and areas of competence that should guide curricula development.

The 2018 legislative review marks a turning point in inclusive education in Portugal. Decree-Laws 54/2018 [6] and 55/2018 [7] represent an effort to consolidate the principles of inclusion, personalisation, and equity in education. These documents introduced an innovative new conceptual and operational framework, moving away from a segmented view of Special Educational Needs (SEN) in favor of an approach focused on eliminating barriers to learning and participation.

The publication of these legal regulations arose from the need to align the Portuguese educational system with the principles of inclusion advocated in international agreements such as the United Nations Convention on the Rights of Persons with Disabilities and with the highest quality research on inclusion in education.

2.1. Legal Framework for Inclusive Education - Decree-law 54/2018

Decree-Law 54/2018 [6], as stated in its Article 1, “establishes the principles and norms that ensure inclusion, aiming to respond to the diversity of the needs and potential of all students by increasing participation in learning processes and the life of the educational community.” This decree brought significant innovations, redefining inclusion as “the process that aims to respond to the diversity of needs of all students through their greater participation in learning and in their community”, as announced in article 3 [6]. From this perspective, it represents a significant milestone in promoting inclusive education in Portugal.

The methodological approaches underlying this decree-law are based on Universal Design for Learning and on the Multi-tiered System of Supports, as a way to guarantee curricula access. In this regard, it organizes the Learning and Inclusion Support Measures (LISM) into three levels of intervention that differ in terms of type, intensity, and frequency. These levels are flexible and can be mobilised cumulatively to meet the needs and potential of each student: Universal measures, applicable to all students, such as pedagogical differentiation; Selective measures, such as non-significant curricular adaptations, aimed at students facing specific difficulties in order to address needs not met by universal measures; and Additional measures, intended for students who require continuous or intensive support, to address significant and persistent difficulties in communication, interaction, cognition, or learning.

2.2. Legal Framework for Curricular Flexibility - Decree-law 55/2018

Decree-Law 55/2018 [7], published simultaneously with Decree-Law No. 54/2018 [6], establishes the curricula for basic and secondary education and the guiding principles for the assessment of learning, granting schools greater autonomy so that, through curricular flexibility, they can ensure that all students achieve the transversal competencies outlined in the PSLCE [8].
This legislation aims to address the "new challenges arising from accelerating globalisation and technological development" [7], promoting inclusive, equitable, and quality education. The granting of autonomy and flexibility to schools to adapt curricula to the specifics of their educational contexts is presented as the most relevant dimension of this decree. It further encourages interdisciplinarity and the articulation between different areas of knowledge, aiming to foster the development of the competencies defined in the PSLCE [8]. It promotes greater alignment between the three cycles of basic education and secondary education, with a view to managing the curricula in an integrated, articulated, and progressively sequenced manner. Thus, it values the complementarity between internal and external assessment.

2.3. The Essential Learning for Mathematics in Basic Education - Dispatch 6944-A/2018

The Essential Learning (EL) for Mathematics in basic education [2] represents a set of skills, knowledge, and attitudes that students must acquire throughout basic education. In the context of Mathematics, this learning constitutes a fundamental pillar for mathematical education, ensuring that all students have access to a solid and balanced foundation of mathematical knowledge. The EL are defined by the Ministry of Education and aim to promote a flexible curriculum, adaptable to the specific needs of students and the educational context. In other words, this curricular document is of extreme importance as it is based on the principles of equality and equity, seeking to ensure that all students learn mathematics. It promotes the development of transversal skills such as logical reasoning, problem-solving, and critical thinking, aims to prepare students for their academic and professional future, relies on the concepts of flexibility and adaptation to meet the diversity of learning experiences and ensure that all students can progress at their own pace. Additionally, it values interdisciplinarity, promoting more meaningful and contextualised learning. By establishing a solid foundation of knowledge and skills, the EL for Mathematics in basic education [2] promotes equity, inclusion, and preparation for the future, aiming to ensure that all students have the opportunity to reach their full potential in Mathematics and in life. As Serrazina [18] defends, this document presents "a strong and inclusive idea, expressly stating that learning Mathematics is for everyone, justifying it from a personal and social perspective. It assumes that everyone has the right to enjoy the cultural aspects that mathematical knowledge provides and the personal and cognitive development resulting from the experiences that learning Mathematics offers.".

3. The Ongoing Research

3.1. Initial Question

For this research, we defined the following initial question: Considering the pedagogical practices implemented in Mathematics classrooms, how does the current legal framework for Inclusive Education relate to meaningful learning of the knowledge, skills, and attitudes outlined in the Essential Learning goals for Mathematics?

3.2. Motivations and Relevance

The experience as teachers of Mathematics and Special Education Needs, combined with the scarcity of studies connecting these two fields of knowledge (Mathematics Education and Inclusive Education), are the two main reasons that motivated us to pursue this path.
Understanding the relationship between these two areas of study, the pedagogical practices employed to bridge them, and the simplification of procedures to make them more efficient and effective, with a tangible impact on Mathematics teachers' work, justify the relevance of this research.
We are absolutely convinced that the results of this investigation can contribute to improve Mathematics teaching practices and foster the success of all students in the subject, thereby promoting the development of a more inclusive school environment.

3.3. Main Objectives

In order to obtain one or more answers to the initial research question, we broke it down in the following guiding questions:

(1) How are teachers mobilizing the Learning and Inclusion Support Measures in Mathematics lessons?
(2) What is the relationship between the Learning and Inclusion Support Measures mobilized in Mathematics lessons and students' learning?

and from these, we outlined the following specific objectives:

(1) To understand the perceptions of educational actors (teachers and students) regarding the implementation of the Learning and Inclusion Support Measures, considering each level of intervention;
(2) To analyse teachers' perceptions of the most appropriate teaching-learning-assessment strategies/approaches, taking into account each level of intervention;
(3) To identify the contribution of a specific evaluation tool, created by the researchers, for assessing the implementation of Learning and Inclusion Support Measures in the evaluation of student´s learning;
(4) To analyse students' perceptions of the strategies used by teachers to help them learn Mathematics.

We would like to highlight that the objectives listed above concern to an ongoing doctoral research project, therefore, subject to possible amendments. Despite this variety of objectives, this is intentional as we pretend to demonstrate an interconnectedness between them, relevant to the research itself.

3.4. Research Methodology

This study adopts a qualitative approach within the framework of the interpretive research paradigm. It employs the case study method, characterised as explanatory and intrinsic.

According to Creswell [3], "qualitative research is emergent and flexible, allowing for adjustments to the research plan based on the data that emerge". This adaptability is crucial for exploring dynamic and complex phenomena, where variables and contexts may change over time.

Precisely due to its flexible nature and its ability to accommodate adjustments throughout the research process - an aspect particularly important in dynamic educational settings, where situations may evolve and new relevant aspects may emerge - we consider this the most effective approach for observing and analysing the dynamics and interactions between students, teachers, and the learning environment. This is essential for understanding how LISM are implemented and adapted in daily teaching practices. From our perspective, the qualitative approach appears to be crucial for capturing the complexity of our object of study and providing a detailed and contextualized understanding of the relationship between LISM and the development of EL in Mathematics [2].

Aligning this research with the assumptions of the interpretive paradigm appears to be the most appropriate course of action, as it provides the tools necessary to explore, in detail and from the perspective of those involved in the educational process, how inclusive practices impact on students' learning in Mathematics. More specifically, it will enable an in-depth understanding of the interactions and dynamics established within the specific classroom context, as well as an examination of the personal interpretations of teachers and students regarding the implementation of support measures for learning and inclusion in response to the diverse diagnosed needs. On this regard, Guba and Lincoln [9] highlight that the interpretive paradigm is particularly useful for exploring complex phenomena in dynamic social environments, where variables are difficult to isolate and control. In educational studies, Merriam and Tisdell [10] state that "interpretive qualitative research is particularly effective in exploring how students and teachers interpret and make sense of their educational experiences".

The use of a case study methodology in our research is particularly justified by the need to gain an in-depth understanding of the relationship between the inclusive practices mobilised in classroom and the effective learning of the outcomes listed in the EL for Mathematics [2]. Ponte [16], states that qualitative case studies have been playing a significant role in advancing knowledge in Mathematics Education and that those adopting the interpretive paradigm have "become increasingly common".

In light of this facts, we consider this research methodology is the most appropriate not only to observe and analyse, in detail and within context, the dynamics and interactions between students, teachers, and the learning environment, but also to understand how LISM are implemented and adapted in daily teaching practices, as well as their specific effects on students' progress.

3.5. Participants

The study takes place in a primary school within a school cluster in the Greater Porto area and involves the participation of two Mathematics teachers - one teaching two year 5 classes and other teaching two year 6 classes - as well as approximately 80 students from the four classes involved. Additionally, a permanent member of the school's Multidisciplinary Team for Inclusive Education (MTIE), responsible for implementing and monitoring inclusive practices in the school. also takes part in this study.

3.6. Data Collection

In this research, we have been using the following data collection procedures:

- Non-participant Observation

In this type of observation, the researcher maintains a deliberate distance from the environment and the subjects being observed. This separation helps minimise the researcher's influence on the participants, preserving the naturalness of the behaviour observed [14]. In this specific case, we believe that it is of utmost importance for a deeper understanding of how the different LISM are mobilised by teachers, as well as the teaching-learning-assessment strategies/options they implement in the classroom context.

- Participant Observation

Spradley [19] describes participant observation as a process in which “the researcher adopts the role of an insider while maintaining an external perspective.”. In our study, participant observation is fundamental, concerning the pillar of monitoring the implementation of the LISM. Also, being present and assist teachers in understanding and interpreting the new assessment instrument is essential for it to be used appropriately and to produce the desired effects.

- Semi-structured Interviews

Merriam and Tisdell [10] state that “interviews are essential for capturing personal stories and the meanings individuals assign to their experiences.”. Interviews, in this research, aim to allow the construction of detailed narratives that vividly and engagingly illustrate the processes and experiences of the participants, more specifically how they perceive the mobilisation of the LISM in their classes, the contribution of the new instrument for their assessment, and the effectiveness of the adopted methodologies and strategies.

- Questionnaire

Bryman [1], in line with Yin [20], emphasises that “the combination of questionnaires with other qualitative methods can enrich the researcher's understanding, providing multiple perspectives on the studied case.”. We believe it to be an asset for our research, particularly for understanding students' perceptions of the methodologies and strategies used by their Mathematics teachers to facilitate their learning.

- Document Collection

The use of documentary sources is also widely justified in this study. The school policies, the guidelines issued by the leadership team and by the MTIE, all the school documents related to Inclusive Education, the lesson plans used by the participant teachers, the self-assessment records of students in Mathematics, among others, are decisive for a good understanding of the context, the work developed, and the monitoring of the implemented LISM.

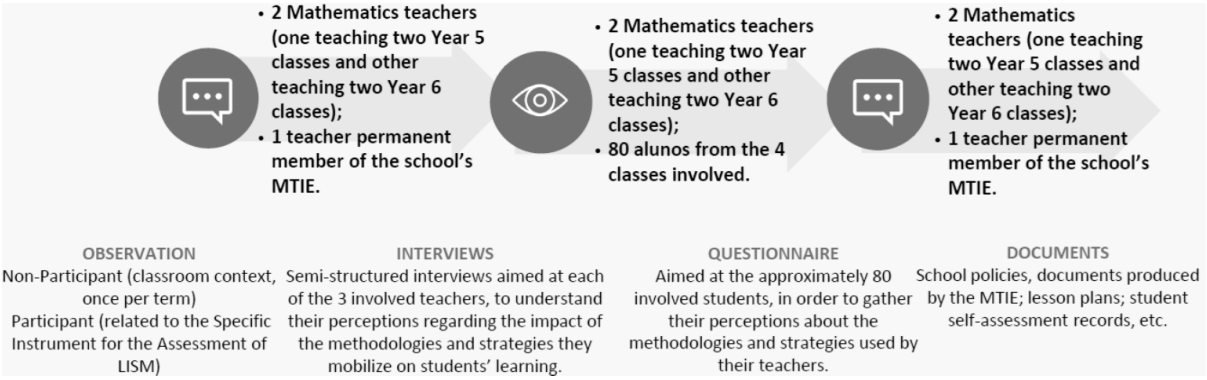

Fig. 1. Participants and Data Collection

3.7. Data Analysis

In our research, we have been using content analysis as the main technique for data interpretation, aligned with the theoretical framework guiding the study. This approach will be applied to different sources, namely interviews, questionnaires, observations, and other relevant documents, allowing for the identification of patterns and categories relevant to understanding the case under study, in light of theoretical assumptions. As Merriam and Tisdell [10] argue, “content analysis allows researchers to structure their data into categories and themes that reflect the main topics and emerging patterns.”.
Thematic analysis will also be applied to the collected data, relating them to each other and to the theoretical framework used, complementing content analysis. As Nowell et al. [13] point out, this technique is an analytical tool that promotes both credibility and reliability, provided it is conducted with transparency and methodological rigor.

4. Expectations

As stated above, the research has already begun and is currently in the phase of conducting interviews with teachers.
We expect that the results can contribute to a better understanding of the relationship between the application of the Legal Framework for Inclusive Education and the outcomes achieved by students in Mathematics.
We strongly believe that an effective assessment of the mobilized Learning and Inclusion Support Measures (LISM) is a precondition for the adoption of more inclusive practices, leading to an improvement in learning outcomes and, therefore, to a more inclusive school.

5. Conclusions

Although we are not yet able to proceed for a detailed discussion of the results due to the early stage of this research, there are, however, some aspects we are confident we may already consider at this point.
Despite of the attempt to promote differentiation, teachers still find it very difficult to reach out to all their students. The shortage of training in inclusive practices, the lack of material and human resources, the lack of time for collaborative work and the excess of bureaucracy are the main difficulties highlighted so far by the surveyed teachers. These challenges trigger a certain resistance to change, making them feel more comfortable using a more traditional approach. In a general study conducted with teachers from various areas, Cosme [4] also highlights “the management of common times for collaborative work” (…), “the lack of material resources” (…), “human resources” (…), “the increase in bureaucracy” (…), “the demotivation and resistance of teachers to change, associated with the need for training” as the main constraints felt by teachers. In this sense, there seems to be some consistency between what happens in Mathematics and in other subjects.
The main changes seem to be occurring at the level of diversification of assessment instruments, resulting in a simplification of the skills, knowledge, and attitudes assessed and an apparent improvement in results.
The data yet to be collected and the analysis yet to be deepened will certainly dictate the consistency or fragility of these preliminary results.

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