Inclusive mathematics education in the United States and Spain: a comparative qualitative study on policies, pedagogical practices and teacher training

Educación matemática inclusiva en Estados Unidos y España: un estudio cualitativo comparado sobre políticas, prácticas pedagógicas y formación docente

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ABSTRACT

This study offers a comparative qualitative analysis of inclusive mathematics education in the United States and Spain, aiming to uncover similarities and differences between educational plans, teaching strategies, teacher training, and the experiences of key stakeholders in inclusion processes. The research was conducted over a year and a half using a qualitative design based on semi-structured interviews, classroom observations, document analysis, and focus groups with teachers, administrators, special education professionals, educational planners, students, and parents. The findings reveal that both countries have legal frameworks supporting inclusive education; however, a significant gap exists between these regulations and their implementation in classrooms. In the United States there was greater integration of Universal Design for Learning, diverse strategies, and available technologies; while in Spain, more traditional methodological approaches and less curricular flexibility were observed. Furthermore, both contexts revealed challenges in initial and ongoing teacher training for integrating mathematics and inclusive practices. The conclusion indicates that inclusive mathematics education needs to strengthen the link between educational policy, teacher professional development, and teaching strategies based on collaboration, flexibility in curriculum planning, and the active participation of students and parents.

Keywords: inclusive education, Mathematics pedagogy, disability studies, comparative education

RESUMEN

Este trabajo ofrece un análisis cualitativo comparado de la educación matemática inclusiva en Estados Unidos y España para descubrir semejanzas y diferencias entre los planes educativos, las tácticas didácticas, la formación del profesorado y las experiencias de los miembros clave de los procesos de inclusión. Se llevó a cabo durante un año y medio utilizando un diseño cualitativo basado en entrevistas semiestructuradas, observaciones áulicas, análisis de documentos y grupos focales dirigidos a maestros, directivos, profesionales del aprendizaje especial, encargados de planificación educativa, estudiantes y padres. Los hallazgos revelan que ambos países poseen reglas legales que respaldan la educación inclusiva; aunque existe una brecha entre estas normas y su aplicación en las clases. En Estados Unidos se apreció una mayor incorporación del diseño universal del aprendizaje, estrategias distintas y tecnologías disponibles; mientras que en España se concentran enfoques metodológicos más

clásicos y menor flexibilidad en cuanto al currículo. En ambos contextos se encontraron dificultades en la formación inicial y continua del profesorado para integrar matemáticas y prácticas inclusivas. La conclusión indica que una educación matemática inclusiva necesita fortalecer la vinculación entre la política educativa, el desarrollo profesional del docente y las estrategias de enseñanza basadas en la colaboración, la flexibilidad en la planificación curricular y la intervención de los estudiantes y los padres.

Palabras clave: educación inclusiva, pedagogía de las matemáticas, estudios sobre la discapacidad, educación comparada

INTRODUCTION

Inclusive education, or the philosophy that guarantees equal opportunities for all students, irrespective of their differences or handicaps, has also been prominent in the discussion of education policy debates of the last decades (Calderón *et al*., 2021). The key concern here involves the commitment not only to the inclusion of diverse students in the general educational class, that is, the cognitive, sensorial, emotionally, or behaviorally diverse ones, but also the successful inclusion of these students in mathematics educational classes that act as the "gateway subject" for success at the next level of education (Chinlli-Choglo, 2026).

As math is acquired by the cognitive process of humans, involving complex processes such as logic, problem-solving, and working memory, the task associated with math is a universal task for persons requiring special needs (Escobedo, 2025). This aspect of inclusive math education is a pressing need in education circles, relating closely to the concepts of education equity and justice. Despite their differences, Spain and the United States have both shown mammoth advancements in the realm of inclusive education (Cupitra, 2025).

The effectiveness of the aforementioned developments that have been successfully incorporated for the inclusive teaching and learning of mathematics is an issue that demands argumentation and must therefore be researched (Gordillo & Prado, 2024). For instance, in the United States, the Individuals with Disabilities Education Act reacts that persons with disabilities must be taught in the least restrictive environment, ideally with non-disabled persons (Díaz & Delgado, 2024). Again, response to intervention and Universal Design for Learning are encouraged for the creation of the differentiated learning curriculum. In Spain, efforts for the adoption of concepts for inclusive education have been directed according to the directives of the European Union aimed at the reduction of barriers for learning, with guidelines from United Nations Educational, Scientific and Cultural Organization (Unesco). Legislative directives like Organic Law of Education (LOE) and its change by LOMLOE manifestly reveal the readiness for inclusive education with changes in the teaching curriculum for special needs learners.

Despite all these legislative and policy efforts, however, some challenges are experienced when it comes to the adoption of inclusive mathematics education in both nations. In the United States, inequalities exist within institutions, districts, and states concerning the inputting of resources and the use of evidenced-based processes. Inequality within the learning process is reflected through the high number of minorities enrolled in special education and the lower performance in the standardized mathematics assessment tests (Castro & Torres, 2017; Silva-Hormazábal *et al*., 2022). Likewise, despite the fact that the advocacy for inclusive learning is always in place, the successful delivery is blocked through the inability to input support services, larger classrooms, and the diminished availability of teacher staff development time in Spain. Additional mathematics learning and assessment standards, high-stakes tests, and evaluations also pose a negative impact through the exclusion of students characterized by mathematics and learning disabilities (Valbuena & García, 2021).

Although there has been an increase in recent years in the number of studies on inclusive mathematics education, with emphasis on effective strategies such as cooperative learning, manipulatives, visual displays, and technology-supported learning, critical knowledge gaps still exist. First, very few relative studies exist with regard to the effect of national settings on inclusive mathematics education. Second,

there is a lack of knowledge about the effect of variations in cultural, institutional, and settings factors on attitudes, conceptions, and practices with regard to mathematics held by teachers. Finally, a necessity arises for a study to incorporate the viewpoints of more than one actor such as students, teachers, administrators, and even parents, from which factors influencing or rather hampering inclusive instructions in mathematics can be fully understood.

Inclusive math education has increasingly become an important area of study in international research during the last decade because it is necessary to ensure equal access to learning for children with special needs. The current literature suggests that inclusion legislation has achieved success; nevertheless, there are still certain difficulties connected with the conversion of regulation into effective practice in the mathematics classroom.

It should be noted that some research demonstrates that the use of approaches that are grounded on the principles of Universal Design for Learning, differentiated instruction, cooperative learning, and use of assistive technologies contributes to the engagement and learning of students with special needs. At the same time, it can be stated that the implementation of these approaches depends on many factors.

Similarly, international agencies such as Unesco and the Organisation for Economic Co-operation and Development (OECD) have stated that achieving an inclusive education system necessitates improving the preparation of teachers, fostering an inclusive culture in schools, and ensuring appropriate alignment between educational policies and practices carried out at the school level.

Despite the growth in research regarding inclusive education and mathematics instruction, comparative studies that explore educational policies, teaching practices, teacher training, and the experience of various educational stakeholders in national settings with different models of inclusion are scarce. This is the main contribution of the current study, which aims to provide comparative evidence in order to identify factors that facilitate or hinder the implementation of inclusive mathematics education in the US and Spain.

In this context, it is important to note that in order to address these gaps, there shall also be a comparison involving the process of inclusive mathematics education practiced in both Spain and the United States of America. In undertaking this task, it is also hoped that by being able to compare both, it is possible to come up with an understanding of both sets of problematics and, by extension, their corresponding solutions. This is also in view of making use of, and not lacking in, the opportunities hidden in both failure and success.

Despite the great disparities between the United States and Spain in terms of their educational systems, legal frameworks, and sociocultural environment, both countries represent international examples in the formulation of policies of inclusive education. Such a comparison is not an attempt to formulate the better model of educational policy but to examine similarities, differences, and conditions of implementation of inclusive mathematics education. From such perspectives, the current study is going to examine four aspects of inclusive mathematics education: legal framework, teaching practice in class, teacher preparation, and attitudes of stakeholders in the field of education. Such a focus will help generate comparative data and use it to develop educational policies.

The novelty of the research is the combination, within the framework of one comparative design, of the analysis of educational policy, pedagogy, teacher education, and the experience of teachers, students, families, and educational administrators in two countries with distinct histories and models of inclusion. Unlike other studies, which usually limit their scope to a single country or some particular aspect of inclusion, the research provides a multidimensional approach to the problem, thus enabling the discovery of common and contextual factors affecting the process of implementing an inclusive mathematics education.

The primary goals of the research are to:

- Discuss ways in which Spain differs from the USA regarding framework on inclusive mathematics education.
- Discuss pedagogical practices or methods currently in use in Spain and USA regarding

teaching mathematical skills in children with varying needs.
- Evaluate the level and nature of teachers' training and staff development in terms of mathematics education for inclusion.
- Investigation of the views and experience of teachers, pupils, and others regarding the concept of mathematical education in an inclusive manner.
- Inclusive mathematics, outstanding practices, concerns, and areas of improvement with respect to applying inclusive mathematics practices can be searched.

These aims will be guided by the following research questions:

- What is the comparative strength and diversity of policy structures for inclusive Mathematics education in the United States and Spain?
- How are Mathematics teachers in both countries responding to the reception of disabled and learning disability students in Mathematics education?
- What support and development program do Mathematics teachers have towards training students with inclusive education?
- How do students with disability feel about learning Mathematics in an inclusive class and the effect of that feeling on performance?
- What are the key factors that can support or hinder the development of inclusive Mathematics education?
- What implications does this comparative study carry for future education policy and practice nationally and international?
- What are the implications of this comparative study for practice on inclusive Mathematics education in both the US and Spain?

This research is significant to some extent in adding to the global conversation on inclusive education through a detailed exposition of a topic in mathematics education. While it is true that intellectual abilities are essential in education, analytical skills will come a long way in making people responsible and productive members of society. The promotion of high-quality education in mathematics is a significant aspect that will lead to making sure students with disabilities are well integrated into education. The research will be significant in providing evidence on how reforms in education policy should be by doing this research in the United States and Spain, which support students with disabilities in education through innovative and pro-enforcement policies on inclusive education.

It will attempt to indicate the significance of inclusive education in quality mathematics towards realizing a real progress within the education sector. With regard to the current study, innovative educative progress within the education sector will have to take place if the provision of quality education to the students with disabilities is to be ensured.

This paper corresponds to the existing research on inclusive mathematics education and comparative education since it presents empirical data on the conditions which favor or restrain the introduction of inclusive approaches within different systems of education. Thus, the results of the research make an important contribution to the existing international discussion on how to develop policy, pedagogy, and training programs in order to provide quality mathematics education for all students.

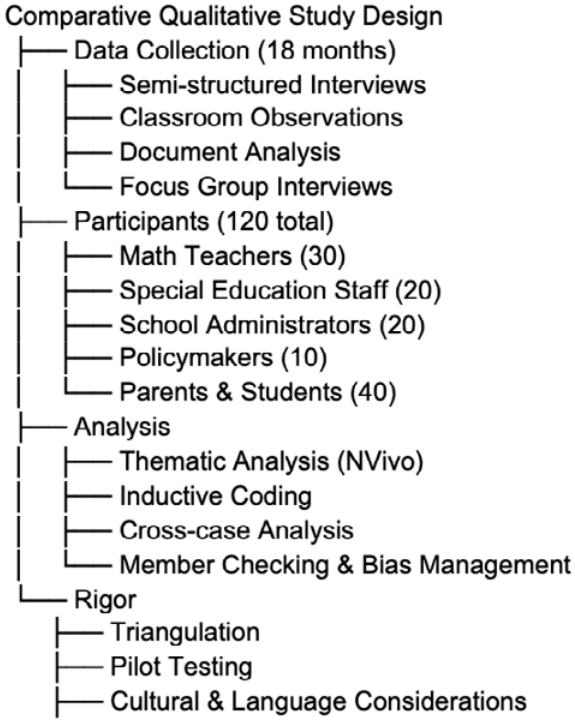
METHOD

The study adopted a comparative qualitative study design, whose aim was to understand the policies, practices, and experiences that do and take place in the realm of mathematics education for all within the United States of America and Spain. The total period taken to acquire the data was 18 months.

A comparative qualitative research design was used, which is suitable for comprehending the complexity of educational phenomenon from the standpoint of stakeholders and comparing and contrasting differences and similarities between national contexts (Creswell & Poth, 2018; Merriam & Tisdell, 2016). It was through the use of this approach that it became possible to take into account a variety of information sources and understand the implementation of inclusive mathematics education in the US and Spain.

Analysis of the collected data was performed by means of thematic analysis, involving a series of activities including open coding, categorizing, comparison and interpretation of findings. In order to increase methodological rigor, such measures as triangulation of data sources, member checking, peer review and development of analytical memoranda were used during the course of analysis.

Figure 1. Methodological design diagram



Participants

There had to be a certain level of cooperation when accessing some of the stakeholders, such as special education experts, math teachers, and school administrators. There is a type of sampling technique applied when recruiting participants to take part in a study. For this study, the technique involved was purposive sampling.

A total of 120 subjects were considered for this study. The subjects were considered to consist of 30 math teachers, with 15 from each country, 20 special education staff, 20 school administrators, 10 policymakers, and finally, 40 parents and students. The subjects were considered from urban, suburban, and rural areas. This would present a chance for richness within the data. The study for this proposal considers the process of acquiring ethics approvals from review boards within institutions of both countries. Consent from the subjects was also considered.

Data Collection

Four major qualitative methodologies were employed in this study to triangulate sources:

1. Semi-structured

- Technique: In-depth interview.
- Tool/Instrument: Semi-structured Interview Guide
- Procedure: Procedure was used and the aim of the study was to develop description and conceptualize the perception, practice, and concern of the teachers, policy makers, and the researchers regarding inclusive mathematics education. The time duration of the interview ranged from 45 minutes to 90 minutes. Audio tapes were recorded, and the transcript was taken and edited.

2. Classroom Observation

- Methodology: In this study, the
- Instrument: Focused observations methods – Field notes.
- Process: Observation procedures were used to help acquire data from comprehensive math classes within the primary and secondary levels. Teaching through inclusive modes was taken into consideration and included aspects such as teaching differentiation, engagement, assistive technology, or collaborative modes of teaching. Field note analysis was used to help acquire patterns or modes of teaching.

3. Document Analysis

- Technique: Content Analysis.
- Instrument: Guide for Document Review, Coding Sheets.

- Procedure: The process was conducted by thoroughly reading national, regional, as well as school policies in forms of policy reports, curriculum plans, teacher's guides, and/or research papers. There was an emphasis placed upon the readings of the papers concerning the implementation of the interventions/programs in the district and school levels.

4. Focus Group Interviews

- Instrument: Focused Group Guide using Specific Semi-Structured Research.
- Procedure: The procedures of the focus group were done among the parents and children with special needs with the objective of obtaining insights from them in regard to the mathematics education. The data recording involved audio, and the texts were anonymized after the transcription process of the audio. The coding of the texts involved themes, which produced the major themes of accessibility and performance.

Table 1. Techniques, participants and instruments

Technique	Participants	Instrument
Semi-structured Interviews	Teachers, policymakers, researchers	Interview guide, audio recordings
Classroom Observation	Math classes (primary & secondary)	Field notes, observation protocols
Document Analysis	National, regional, school policies	Coding sheets, review guides
Focus Groups	Parents & students with disabilities	Semi-structured group guide, audio transcripts

Source: *prepared by the authors*

Information Presentation and Methodological Rigor

For purposes of analysis, thematic analysis was conducted. It was done through the use of a computer-aided software commonly known as NVivo.

Categorization

The coding technique employed the inductive coding technique, which followed the efficient coding technique. The categories employed followed the method where the categories were created from the data obtained from the study instead of the forced coding method. The categories employed followed the theme related to the research study. The research followed the cross-case analysis method. The purpose of the research employed the identification of the aspect of the observations between the US and Spain that may arise. The research followed the analytic memo method. The purpose of the study employed the identification of the idea developed throughout the study process.

- Rigor and Credibility: The current study used a variety of research methods. The application of the research methods was aimed at ensuring that the research was open, rigorous, and reflexive.
- Triangulation: In this study, the type of triangulation used is data source triangulation. It entails the combination of data gathered from personal interviews, observation, record review, and focus group data.
- Pilot Testing: Before widespread application of all tools, pilot test applications were done.
- Member Checking The member checking has been done periodically among the participants to check whether confirmations of understandings on meanings have been reached.
- •Bias Management: The management of the bias of the researcher is taken care of by the coding workshops conducted to deal with the joint effort and peer debriefing.
- Cultural Factors: The cultural factors and language issues were addressed while carrying out the translation and interpretation process in order to ensure a real cross-national comparison.

RESULTS

The results of this comparative qualitative study offer a rich description about the topic of the learning and education of inclusive mathematics education in the USA and Spain. The textural insights are derived from the interviews, observations, and focus group discussions conducted in this study and offer key insights about the aims and research questions of this study, which are outlined in the themes of context, teaching and learning, staff support, experience, and facilitators and constraints listed under the next heading.

The results will be presented in an orderly manner based on the research objectives and the main categories that have emerged based on the thematic analysis. The combination of data collected from semi-structured interviews, classroom observations, focus groups, and document analysis has enabled the researcher to identify similarities and differences between the United States and Spain in terms of educational policies, teaching methods, teacher training, and the experiences of educational stakeholders.

Regulatory frameworks and policies for inclusive mathematics education

In both countries, the participants cited that there exist some policies and legislation that give directives on this issue of inclusive education. In the USA, for example, some of the legislation cited to be key to this right on inclusive education include IDEA and ADA, which included RTI and UDL in every aspect of education. In Spain, it was cited that on this issue of inclusive education, some directives are offered by Organic Law of Education and its reformulation by LOMLOE, based on directives emanating from the European Union and Unesco. In both countries, on this issue of education in mathematics, it is considered to be an ideal and imperative need for every learner.

Nevertheless, there were also widespread differences noticed between practices and policies. For instance, the United States had irregular statewide and district-level implementation, resulting in irregular implementation of inclusive practices. Some educators in the United States reported positively about Individualized Educational Programs, co-teaching approaches, and assistive technology, while others reported disappointingly underfunded initiatives and inadequate support by their respective school administrators. This is also true for the country of Spain, where inclusive practices were superficially implemented at the level of its autonomy regions. Some Spanish educators reported difficulties, un coordination among stakeholders, and inconsistency involving inclusive policies and teaching practices.

Pedagogical practices for inclusive mathematics teaching

Both in the US and in Scotland, teachers have identified the implementation of different strategies when attending to individuals within math classes. These include the use of manipulatives, pictorials, authentic applications, cooperative learning structures, and scaffolding. From the comparative analysis, it was evident that there existed some differences in:

- United States: There was emphasis on lesson planning with specific goals such as incorporating UDL. Technology integration in the form of whiteboard technology, accommodation software, and manipulatives is already common in American classrooms in efforts geared at providing differentiation. Teachers in America were faced with opportunities to differentiate their presentation of content, particularly when goals in response to intervention were attained.
- Spanish Classes were more focused on more traditional methods. This included peer tutoring and more flexible grouping. There were fewer indications for curriculum flexibility for Spanish teachers. This was mostly related to reducing homework assignments or extending the time for its completion. There were fewer teachers who possessed

knowledge about systemically differentiated math instruction. This was only related to the task difficulty differentiated by concurrent worksheets.

Initial teacher training and professional development

Notably, the teaching faculty in these environments emphasized the concept of visualization of ideas through the use of number lines, graphics, and procedure graphs to develop mathematical ideas. Furthermore, solving problems within the context also forms part of encouraging students.

Competency Profiles and Teacher Professional Development

- United States: Teachers prior to entering a teaching career would traditionally learn about course content teaching methodologies and special education techniques. Yet, perhaps the correlation between these two topics might be considered somewhat inconsequential. Thus, teaching both special and general education might be considered two separate pathways. Staff development would likely be considerably different from school district to school district.
- Spain: The modules on educational diversity were part of the training of initial teachers, although there are questions which can be raised regarding whether these covered the specially residential approach of inclusive practice when teaching mathematical subjects. Their experience of learning was highly theoretical and did not involve practical approaches for working with disabled pupils. Teacher training was inadequate and did not involve the demands for teaching math.

The teaching professionals from both countries wanted more class-focused training, which would involve action-oriented approaches. There were demands for learn communities, tutoring, and resource banks containing models of exemplary inclusive math activity samples. The Spanish teaching professionals, in particular, wanted better collaboration from special and general educational professionals from the special education sector to enhance their know-how.

Experience of Stakeholders

Results from focus groups among students varied greatly and dwelled mainly on control and attitude. Students with special needs in the US felt that support was more adequate, especially when under co-teaching, when receiving directions in smaller chunks, taking longer, or judging progress differently. Students in Spanish-speaking schools were quite varied and either highly satisfied or felt stigmatized or left out if pulled from their classroom for supportive help or working on other assignments.

The parents from both sides believed there had to be open communication and group decisions made. The American parents felt there was a better understanding of the IEP process and how it aided with accommodations management and how it benefited them. Conversely, the Spanish-speaking parents were not included in the decisions for the education of their children and were dissatisfied with the pace of the response to meet any needs they may have had.

Although the relevance of providing inclusive mathematics education had long been recognized, budget, teacher turnover, and a lack of clarity with regard to policies had served as obstacles hindering such a career in the schools. In both settings, committed principals at schools had become recognized as elements which could enhance inclusive outcomes.

Contextual Facilitators and Barriers

These data have revealed several contextual conditions:

1. Resources and Class Size: The very large class sizes and absence of teaching assistants in Spain meant that it was difficult to facilitate the delivery of differentiated teaching. Again, within the United States, the

issue of inequality meant that schools were not ready or were unable to provide even elementary levels of inclusion.
2. Cultural Paradigms: U.S. culture espoused a philosophy of inclusion based on rights and the concept of equity, while Spanish inclusion paradigms have been primarily conceptualized in terms of accommodation and/or remediation; there were Spanish-speaking educators who were concerned this approach would dilute academic standards.
3. Standardized Testing: The testing procedures were one of the biggest issues in both contexts. American teachers brought up the issue "teaching to the test" as something that limited their ability to be flexible in teaching. Spanish educators mentioned similar limitations, particularly in terms of high school, as they talked about students' progress being supervised through end-of-course tests. This is evident in terms of students' lowered self-esteem and feelings of alienation.

The problems faced by the teachers in both countries included a lack of preparation time for differentiated instruction, staff development, uneven cooperation from special education personnel, and support materials for inclusive learning. The emphasis here was the necessity of structural changes over teacher choice if the concept of inclusive learning in mathematics education was to be achieved.

DISCUSSION

This study on inclusive mathematics education in the United States and Spain has discovered that the topic of inclusive mathematics education is relevant within the context of its significance to the ongoing debate of inclusive pedagogies (Velencia & Monteiro, 2025). By situating the topic of inclusive mathematics education in the present body of knowledge, this study can add to the body of knowledge of inclusive pedagogies. Secondly, this topic also provides relevant information for the development of inclusive education in the fields of science and technology (Vaillant, 2024).

The Policy-Practice Disconnect

The findings from the data above confirm and verify the existence of a gap between the policies and practices of inclusive education mentioned in previous studies. In the USA, there are legal standards such as IDEA and ADA, and Spain also has a framework of standards such as LOMLOE and other directives from the EU. However, from the findings of this study, there are gaps in the way these standards are interpreted and applied. Bridging this gap has been discussed previously by López & Sischik (2023) in previous studies about the implementation of policies.

Learning Strategies and Differentiation

Our study supports the approach that the practices of differentiating and UDL have been effective in ensuring positive outcomes for math for ALL learners. There is an adaptation in the methodologies for the U.S. culture with the influence of more adaptive and technology-infused strategies being encouraged in UDL. Concerning the U.S. culture, where there is an increased adaptation in the application of UDL methodologies particularly in design and training specifically for the culture, more ways of teaching and learning are being incorporated using multiple modalities such as technology-infused materials. Concerning the U.S. culture specifically, where the application for the use of UDL methodologies is particularly encouraged in design and training for the culture, more ways of utilizing teaching and learning are incorporated for the use of multiple modalities like technology-infused materials. Moreover, according to the study conducted by Cortez (2024), the conceptual evidential aspect indicates the undeniable positive contribution made possible by the practices of differentiated instruction and effective tech utilization for the current success observed for the

disabled population. Concerning the Spanish culture particularly, where the age-old conventional approach in methodological application is still being followed regardless of the modern advancements in education particularly for the culture, according to the results gathered from our study, the approach is indeed more traditionally taught with fewer differences being made for those studying the culture. Moreover, according to the García & Romero's (2018) study, the approach in methodologies is indeed very challenging for incorporation within the Spanish culture.

Teacher Preparation and Professional Development

Both teacher preparedness programs within these two different educational institutions do not suitably address pedagogies and inclusiveness within the subject matter of Mathematics (Rojas *et al*., 2023). Both American teacher preparedness programs require classes in pedagogies related to the subject content and special education. Yet, the integration point within these courses is extremely minimal; therefore, pedagogies and teaching approaches are divided or separate. Spanish pedagogies relate to teaching concepts within an abstract framework. They are also very theoretical. In past studies, an analysis done by Silva-Hormazábal *et al*. in 2022 referred to a missing concept of inclusiveness within Spanish teacher preparedness programs.

Experience of Stakeholders, Relations, and Aspects

These findings regarding the experiences of students and parents enable us to interpret perhaps better the experience and reception of inclusive education. The contradictory parental and student responses are reflective of the previously studied literature regarding its importance in terms of its role in relationships and teacher characteristics. In order to enable learning in the domain of mathematics, the students in both countries felt that when their teachers were able to be patient, utilize visual aids appropriately, and demonstrate flexibility in terms of assessment, it enabled the students to learn and comprehend the concept in a better manner in the domain of mathematics. This is more or less in line with the findings of Motta & Rivera (2021), as it was an essential part to include growth mindset in the domain of mathematics learning and help students gain entry points.

The inclusiveness and active collaboration of parents were understood to play an important role in the success of inclusive education, and this was an active role for parents in the American context as parents were already familiar with procedural commitments to IEPs for example. The engagement of parents was not as active in the Spanish context as parents were not actively involved in planning and decision-making activities. There have been similar observations by Valero & Plaja (2019), and culture-sensitive strategies have been highlighted as important in engaging parents meaningfully and appropriately as indicated by parents and students themselves.

Structural Barriers and Systemic Limitations

Among the key contributions brought by the above-discussed study is the comparison of systemic constraints cross-nationally. These are points of concern that ignore national boundaries. Issues such as class sizes, the utilization of teaching aids, as well as teachers' transfer are some of these concerns that do not limit within borders. These are some of the structural points brought out as known barriers in the world against effective inclusion (OECD, 2021; Unesco, 2020).

Moreover, standardized forms of assessment are also highlighted. Teachers asserted that such methods are counterproductive towards inclusive pedagogy. "In high-stakes testing environments, students with learning differences are harmed, and teachers are less likely to take risks for their students", indicated Valbuena & García (2021).

Cultural Paradigms of Inclusion

Cultural paradigms regarding disability also need more examination. In America, equity and rights-based approaches to inclusivity align with what would be viewed as a socio-political perspective of disability, viewing difficulties in education as inherent and therefore non-individualized challenges, as viewed by Giménez *et al*. (2007). Conversely, it appears that Spain maintains elements of the medical understanding of disability, viewing inclusivity as something which aims to help students "catch up" to their able-bodied counterparts. These philosophical bases also play an important role in shaping programmatic elements and what is considered program success. Evidence supports that indeed, views on disability held by cultures do carry ramifications in the realm of education, as seen by Cortés & Puentes (2017).

CONCLUSIONS

Within the context of the comparative analysis of inclusive mathematics education in both Spain and the USA, the complex dynamics that occur in the policy, practice, and pedagogy of mathematics education within two different educational settings have been highlighted. Issues such as policy and practice alignment, teacher learning, flexibility of pedagogy, boundaries of culture, and sustainability of the system are some of the key themes of this study.

The Imperative for Policy-Practice Alignment

One of the significant findings obtained is that despite the strength of Spanish legislation and US legislation on inclusive education, a significant gap exists between the legislation and its application at the level of the educational system. This is evident through the inequality shown in the provision of support services, the teaching methods, as well as the difficulty caused to the content-based pedagogies, specifically math, to integrate with the concept of inclusive education. It has also been confirmed that legislation is not the prescribed route to achieve equity in education. Achievement in inclusive education solely depends on the flexibility of interpretation in the context of the educational institution.

Comparative Pedagogical Flexibility

Interestingly, it appears that the United States is relatively more developed in regard to the integration of the principles of differentiated learning and Universal Design for learning in mathematics education. The factors which aid this are the facilities which provide whole-school support in the school, such as the provision of learning coaches and technology support staff and other specialists. In the meantime, it seems that the focus of Spain lies in more traditional forms of learning and less assistive use of technological aids for the aforementioned purpose. The other factors which affect them are the asynchronous collaborations of the general education and special education personnel.

The second major finding has to do with issues in initial and continuous teacher education concerning inclusivity. In both issues, teachers displayed their commitment to an inclusive classroom but lacked preparation in an inclusive classroom in mathematics. In one crucial point in this argument, it has been noted that there are discrepancies between training in both inclusivity and content knowledge concerning teachers. Inclusivity training is better accomplished by pre-service teachers in the United States compared to their training in content knowledge in mathematics education, while, on the other hand, Spanish pre-service teachers are adequately prepared in content knowledge but receive none of their ideas from special education.

Our interpretation of the views of the parents and students draws attention to and supports the significance of the relational and environmental precursors of inclusive effectiveness. Students with disabilities in each context were more positive in their experiences when they

felt understood and appreciated through the use of empathetic communication and support networks. US parents reported a greater sense of inclusion during the planning process due to the presence of legal processes and procedures such as the Individualized Education Program (IEP). Within each context, Spanish parents reported feeling left out of the process regarding participation. These latter findings necessitate the same element of trust and responsiveness—namely, the infrastructure of inclusion for Spain.

Structural reformation & cultural bound

Inclusion and mathematics learning is a theme that is closely connected with and represented through the need for structural transformation and change that can make maths learning more inclusive. Resource inequities, starting from technology, staff, and group planning time, are established as the pivotal inhibitors of and suppressors of inclusive learning environments. In effective schools, there is a distinction in distributed school leadership and, ultimately, school culture that values diversity, equity, and innovation, and, therefore, inclusion is not a preference or choice of the educators.

Future Projections

Standardized high stake test administration in both countries was found to be incompatible with the ideology of inclusive education with respect to providing rigid curriculum content and hindrances in innovative pedagogies in education. To address this mismatch, it has to incorporate some principles of universal design and real assessment strategies like projects, along with involving a wider range of children in the activity. The fact that such a study has global implications is one thing that ensures it proves itself applicable in the sense that although similarities or differences in things like structure and culture are likely, it seems evident that certain fundamental issues are common across both nations in a manner concerning “difference” in society, so it seems evident that it is important for such a piece to argue that it would be important to work towards a philosophy of compliance within a need for a more inclusive and flexible teaching system related to mathematics in their approach towards such a teaching philosophy. A comparison of such a model from two nations is one such item from where global innovation can be developed concerning an inclusive teaching process of mathematics as an accepted, and not exceptional, practice.

The findings of the research conducted determine the list of strategic components needed to enhance inclusive mathematics education in different educational settings. Using the comparative analysis approach, a framework for action is proposed through the following four components: 1) strengthening coordination between policy making and implementation in educational institutions; 2) designing initial and in-service training programs for teachers, which include the methodology of mathematics teaching along with the principles of inclusive education; 3) implementing flexible approaches to teaching, which involve the use of Universal Design for Learning, differentiation, and technology; and 4) strengthening collaboration among teachers, parents, specialists, and educational administration.

The findings of the research may be presented as an academic contribution of the research, as the recommendation made is empirical and might serve as the basis for further research.

The results of the current research define the set of strategic elements in order to improve inclusive mathematics education in various contexts of education. On the basis of comparative analysis, a framework for action is suggested with the help of four supporting pillars: 1) reinforcing the coordination between the policy and its actualization in educational institutions; 2) developing initial and continuous training programs of teachers combining mathematics methodology with the principles of inclusive education; 3) applying flexible approaches in teaching based on Universal Design for Learning, differentiation, and technology resources; and 4) reinforcing collaboration between teachers, parents,

specialists, and school management teams in order to improve educational process.

The recommendations may be defined as an academic contribution of the research being an empirically-based suggestion which may become the basis for future studies, teacher training, and development of policies.

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