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A COMPARATIVE STUDY OF ICT TEACHING IN PERU AND GREECE

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Abstract:
This study examines the factors influencing the teaching of Information and Communication Technologies (ICT) (or Computer Science, or Informatics) in classrooms in Peru and Greece. Its primary objective is to explore how ICT is introduced across different educational stages -namely early childhood, primary, and secondary education- through official state-mandated curricula. The study provides a comparative analysis of ICT teaching approaches at each educational level in the two countries. The main differences concern the use of virtual environments in Informatics instruction, whereas the similarities include programming education, the use of educational software, and the integration of ICT into the curriculum.

Keywords: comparative study, ICT, Greek educational system, Peruvian educational system

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1. Introduction

This study adopts a comparative perspective to examine the Greek and Peruvian educational systems with regard to the teaching of ICT in schools (Argyropoulou, 2015; Van de Werfhorst & Mijs, 2010). The aim is to identify similarities and differences in the way ICT is integrated and taught across these systems. The study is motivated by an academic interest in improving the preparation of future ICT educators and understanding the challenges they face within diverse educational contexts. Teaching Computer Science and ICT at the university, and aiming to identify the most effective ways to communicate with and train future ICT teachers, helped us better understand the complex situations they face within specific educational systems.

A key research question that guided this study concerns whether the Peruvian educational system shares similar guiding principles with the Greek system in relation to ICT teaching. To address this question, a small-scale comparative analysis was conducted between the two countries. Peru was selected due to its geographical distance from Greece and the opportunity it provides for examining different yet potentially comparable educational contexts.

To sum up, this study recognizes the challenges associated with undertaking an exhaustive analysis of the complex domain of Information and Communication Technologies (ICT) and their instructional application. Despite these constraints, it endeavors to investigate a wide spectrum of contributing elements and viewpoints, with the aim of offering a more comprehensive and nuanced understanding of current educational realities (Blackman, Wistow, & Byrne, 2013; Seeber, 2020; Selvaraj, Radhin, Benson, & Mathew, 2021). This study aims to highlight and examine a number of factors that often remain unnoticed, primarily due to their occurrence in geographically distant contexts. As Anderson (1961) has perfectly written, "*What is more natural than to believe that in some other country the shortcomings of our own schools have been avoided*?" (Anderson, 1961, p. 1).

Before proceeding further, it is necessary to clarify that the definition of Computer Science has been the subject of ongoing debate for several decades. This issue remains fundamentally unresolved, particularly concerning its translation into multiple languages and its interpretation within diverse educational systems worldwide (McGuffee, 2000). In our text, for brevity, we will use the abbreviation 'ICT', instead of CS or Informatics.

2. The two educational systems

2.1 Peruvian educational system

The Peruvian educational system operates under the authority of the Ministry of Education, which is responsible for formulating, directing, regulating, and evaluating national educational and pedagogical policies in coordination with regional governments (Ministry of Education of Peru, n.d.). These policies are structured around four key

pillars: curriculum and educational management; infrastructure and technological integration; teacher training and professional development; and the improvement of pupils' living conditions (International Institute for Educational Planning –UNESCO, n.d.).

As established in Article 3 of the General Education Law (Law No. 28044) (Congress of the Republic of Peru, 2003), education is recognized as a fundamental right of both individuals and society. The State is responsible for safeguarding this right by ensuring access to comprehensive, high-quality education for all and by actively promoting the universalization of Basic Education.

The Peruvian educational system is characterized by its integration and flexibility, designed to interconnect its various components while enabling learners to navigate their educational paths according to their individual needs. As outlined in Articles 25, 28 and 29 of Law No. 28044, the system is organized into stages, levels, modalities, cycles and programs. These stages include Basic Education -which comprises early childhood education (ages 0-5), primary education (ages 6-11) and secondary education (ages 12-16) -as well as Higher Education, which encompasses universities and higher education institutes (Directorate of Quality for Higher Education of the Ministry of National Education of Colombia, n.d.).

On the other hand, the Political Constitution of Peru reinforces these foundational principles. Article 13 states that "education has as its purpose the integral development of the human person". Similarly, Article 14 affirms that "*education promotes knowledge, learning and the practice of the humanities, science, technology, arts, physical education and sports. It prepares individuals for life and work and fosters solidarity*" (Constitutional Court of Peru, 2022). These constitutional provisions underscore the fundamental role of education in shaping citizens who are equipped to contribute meaningfully to the country's social and economic development.

2.2 Greek educational system

The Greek educational system is highly centralized and exhibits a markedly stratified structure, with most official decisions concerning educational and teaching matters issued directly by the State (Anastasiou & Papagianni, 2020). The Ministry of Education is responsible for initiating and implementing reforms, introducing improvements, designing curricula for each subject, addressing key policy and operational issues, managing funding, and shaping the daily educational experience of both educators and pupils (Chandolia & Anastasiou, 2020). It also integrates scientific and pedagogical reforms in alignment with each government's intentions to adopt global educational developments (Foundation, 2024).

Two key scientific bodies under the Ministry's jurisdiction are the Institute of Educational Policy (IEP) and the Youth and Lifelong Learning Foundation (INEDIVIM) (Eurydice, 2024a). According to Article 16 of the Greek Constitution, "*Education constitutes a basic mission for the State and shall aim at the moral, intellectual, professional and physical training of Greeks, the development of national and religious consciousness, and at their*

formation as free and responsible citizens". The article further stipulates that art, science, teaching and research must develop freely and that the State is obligated to safeguard them (Eurydice, 2024b).

In line with contemporary imperatives, educational systems today must become inclusive of diversity. They are expected to meet both the academic and socio-emotional needs of all pupils, while simultaneously promoting intra-generational and inter-generational sustainability through the values of inclusion, equality, and social justice (Sorkos & Hajisoteriou, 2021).

3. ICT teachers

Educators, and particularly those specializing in Information and Communication Technologies (ICT) (or Computer Science or Informatics), are expected to possess a set of essential qualifications deemed indispensable for effective teaching. While educational systems may differ, the qualifications required of teachers remain legally mandated. Educators must possess specialized technological knowledge, the ability to evaluate appropriate teaching materials, and specific technology-support skills to operate effectively within the classroom environment. Additionally, they are responsible for fostering the development of digital competencies among their pupils (Claro et al., 2018; Cornu, 2013; Loewenberg Ball, Thames, & Phelps, 2008; Sailer et al., 2021); "[…] *the integration of ICT into the classrooms is a dynamic process connecting various factors such as teachers' skills, experience with ICT, gender, age of teacher, level of qualification, type of training, computer and peripheral available at schools, and administration support*" (Alazam, Bakar, Hamzah, & Asmiran, 2013, p. 70). In brief, teachers play a crucial role in the integration of ICT in the classroom (Comi, Argentin, Gui, Origo, & Pagani, 2017).

4. STEM and STEAM

Dr. Judith Ramaley, *"assistant director of the Education and Human Resources Directorate, at NSF in 2001 (Chute, 2009)"* (in Daugherty, 2013, p. 10), introduced the acronym STEM (Science, Technology, Engineering, and Mathematics) as an educational framework within which pupils are encouraged to engage in problem-solving and the exploration of real-world challenges (Daugherty, 2013; Psycharis, 2018). Since its inception, STEM education has attracted global attention, with educators and researchers across the world deeply involved in its implementation and development. The addition of the 'A' in STEAM represents the integration of the Arts, aiming to bridge the gap in creativity often overlooked in traditional STEM learning processes.

5. TPACK

"*In an attempt to better understand teachers' technology integration into their classroom practices, Mishra and Koehler (2006) developed a conceptual framework called technological*

pedagogical content knowledge (TPACK). The TPACK framework builds on Shulman's (1986) delineation of teachers' professional knowledge as pedagogical content knowledge (PCK)." (Phillips, Koehler, Rosenberg, & Zunica, 2017, p. 2422). This model encapsulates the knowledge teachers have to possess in order to effectively combine technology, pedagogy and content (Durdu & Dag, 2017; Phillips et al., 2017).

6. How ICT is taught nowadays

6.1 Peru

The implementation of Information and Communication Technologies (ICTs) in Basic Regular Education (EBR) in Peru has been a progressive process led by the Ministry of Education (Congress of the Republic of Peru, 2003). The first programs, such as Edured and Infoescuela, emerged in the 1990s. From 2001 to 2015, the period was marked by equipment provision projects such as the "Huascarán Project" and the "One Laptop per Child" (OLPC) strategy (Pacsi Chávez & Torres Reyes, 2022). While these efforts reduced the access gap (Bustamante, 2020), they failed to generate curricular impact due to an instrumental view of technology and a lack of continuous pedagogical support for teachers (Comunicambioperú, 2013).

In 2016, policy was reoriented towards the National Digital Technologies Strategy (Ministry of Education of Peru, 2016a), shifting from the conception of ICTs as tools to a systemic approach to Digital Intelligence (Ministry of Education of Peru, 2016b). This strategy formalized digital competence as a cross-cutting area in the National Curriculum for Basic Education (CNEB) (Ministry of Education of Peru, 2016c).

The COVID-19 pandemic acted as an unintended catalyst, forcing the implementation of distance learning through "Aprendo en Casa" (I Learn at Home), which allowed for educational continuity via digital platforms, radio, and television. However, this crisis exposed deep structural inequalities, the persistent rural connectivity gap, and the critical need for teacher support and training (Flores Suarez, Pacsi Chavez, & Torres Reyes, 2022; Salirrosas Navarro, Tuesta Panduro, & Guerra Chacon, 2021).

The post-crisis vision, based on the General Education Law (Congress of the Republic of Peru, 2003), focuses on sustainability and strengthening the digital competence of teachers.

Despite progress, authors such as Pacsi and Torres, Aguilar, Corcino, Buendía, Agurto, Vivanco, and Silva agree that significant obstacles remain in the integration of ICTs into the Peruvian education system. These include teacher training in the pedagogical use of ICTs and in planning innovative teaching strategies, lack of connectivity in rural areas, unequal access to technological resources, insufficient investment in infrastructure, and resistance to change from some educational stakeholders (Pacsi Chávez & Torres Reyes, 2022; Aguilar Sotelo, 2018; Corcino, 2020; Buendía, 2017; Agurto Oliva, 2021; Vivanco Enríquez, 2025; Silva Pérez, 2018). We can conclude that successful integration requires a systemic design and a continuous process supported by clear policies and investment in infrastructure.

6.2 Greece

ICT (or Computer Science or Computing or Informatics, depending on the translation each country uses (Passey, 2017)) was introduced in the mid-1980s to the Greek educational system in Technical-Vocational High Schools (Charpantidou & Trachanopoulou, 2012; Mpratitsis, 2013; Mpratitsis, Chasanisis, & Chatzopoulos, 2012). In 1992, the subject was introduced as a separate one-hour course in Junior High Schools/Gymnasiums (Mpratitsis, Savvoglou, & Meresti, 2014; Papadopoulos, 1998) and finally in all High Schools in the 1997-1998 Curriculum for Computer Science (Mpratitsis, 2013; Mpratitsis, Chasanisis, & Chatzopoulos, 2012). As regards primary education, the ICT course was officially inaugurated in the 2003 curriculum (Ministry of Education of Greece, 2003; Plati, Mpellou, & Mikropoulos, 2012).

In summary, the introduction of this course at the Primary School level aims to stimulate pupils' interest in computers, foster a comprehensive understanding of their functions, and cultivate both evaluative thinking and socially responsible behaviour (Ministry of Education of Greece, 2003, 2016). At the Junior High School (Gymnasium) level, the course is intended to provide pupils with exposure to ICT, enable effective use of personal computers, and support the development of problem-solving skills (Ministry of Education of Greece, 2003, 2017). Finally, at the High School (Lyceum) level, the course seeks to familiarize pupils with programming languages and to enhance their analytical and synthetic thinking abilities, alongside a solid foundation in computer science (Ministry of Education of Greece, 1997, 2014a, 2014b).

In Primary Schools, ICT is currently taught for one hour per week in each class. In Junior High Schools, Computer Science is taught two (2) hours per week in the first grade and one (1) hour per week in the other two grades. In Upper High School, Computer Science is a compulsory/common subject in the first and second grades and is taught two (2) hours per week; in the third year of Lyceum, the course is designated as a 'directed course' typically offered prior to the Panhellenic examinations held in June for university admission and is taught for six (6) hours per week (Ministry of Education of Greece, 2020, 2021, 2023).

It should be noted that starting from the 2026–2027 academic year, ICT textbooks are expected to be introduced in primary education. At the time of writing, however, no official textbook was available for ICT at the primary school level.

7. Material and Methods

This study adopts a comparative methodology to analyze ICT curricula in Peru and Greece. The comparative analysis centers on the formally defined curricular objectives and content, as documented in public sources, in conjunction with the ways in which these curricula are enacted in classroom practice. Notwithstanding their geographical disparity, the selection of these two countries aims to facilitate the identification of convergences and divergences in educational practices.

The methodological approach consisted of a systematic examination of the representation of ICT in official curricular documents across various educational levels. These stages were categorized as follows: early childhood education (ages 3-5), lower primary (1st-2nd grade), middle primary (3rd-4th grade), upper primary (5th-6th grade), lower secondary, and upper secondary education.

Creese, Gonzalez, & Isaacs (2016) propose nine key aspects to consider when comparing national curricula and educational systems. These include, among others, "*the goals of the educational system and how these are embodied in the curriculum," "principles and methods of accountability and their link to the instructional system"*, and *"how twenty-first-century skills are embedded in the curriculum*" (Dudok, 2019, p. 53).

This research focuses exclusively on the stated objectives and content of the curricula, without assessing their actual implementation or examining the degree of centralization or school autonomy within each educational system.

8. Results / Findings

Before proceeding with the analysis, it is important to clarify the rationale behind the categorization of data. The classification framework employed in this study draws primarily from the official national curricula and policy documents related to Computer Science (CS) -or Informatics or Information and Communication Technologies (ICT)- in Greece and Peru. In addition to these official sources, the categorization also reflects our professional judgement, perspectives and critical involvement with educational and curricular matters, informed by professional experience.

Inevitably, certain approximations were made during the analytical process to ensure a coherent and meaningful classification. The findings are presented under six sections, each corresponding to a specific educational level:

1) Early childhood education (ages 3-5),
2) 1st -2nd grade Primary/Elementary school,
3) 3rd -4th grade Primary/Elementary school,
4) 5th -6th grade Primary/Elementary school,
5) Lower secondary school/Gymnasium,
6) Upper secondary school/Lykeio.

The findings reveal both similarities and differences in the teaching of ICT across the two countries. In both systems, early education focuses on basic digital literacy. At the primary level, both countries promote the use of digital tools and content creation; however, Peru places greater emphasis on virtual environments, while Greece introduces conceptual and technical skills earlier.

At secondary level, both systems include programming and digital literacy skills. The Greek system emphasizes theoretical understanding and structured curricula, whereas the Peruvian system prioritizes applied digital skills, collaboration, and virtual learning environments.

8.1 Comparing the Peruvian and Greek ICT/CS/Informatics lesson

Table 1: Age 3-5

Similarities
• In both educational systems, pupils receive foundational instruction in the operation and practical use of personal computers and various electronic devices, reflecting a shared emphasis on basic digital literacy.
Differences
• The Peruvian educational system emphasizes the use of computers and other electronic devices, whereas the Greek system not only incorporates this focus but also introduces pupils to the fundamentals of computer programming.

Table 2: 1st -2nd grade Primary/Elementary school

* In Greek Primary/Elementary school, there does not exist a specific Curriculum for ICT/CS/Informatics.
Similarities
• The exploration and practical use of technological tools, such as personal computers, tablets and related devices.
• The creation of digital content, including text, images, and drawings.
• The use of interactive games and educational software to support a variety of learning activities.
Differences
• In the Peruvian educational system, there is a notable emphasis on the extensive use of virtual environments tailored to the developmental stage of the learners. Additionally, pupils engage in activities related to the organization, retrieval, and evaluation of digital information.
• Conversely, the Greek curriculum introduces pupils to basic modeling techniques through the construction of conceptual maps and offers an initial orientation to fundamental principles of the Internet. In terms of information management, pupils undertake essential operations such as saving and printing digital texts and images.

Table 3: 3rd -4th grade Primary/Elementary school

Similarities
• More advanced use of a PC for information management, compared to previous classes.
• More extensive creation of digital material (e.g. text files), compared to previous classes.
• Use of various software and applications to support learning in specific subject areas.
• More extensive use of the Internet (navigation, communication, etc.), compared to previous classes.
Differences
• In the Peruvian educational system, there is an introduction to computer programming, virtual environments are used in almost every activity (e.g. in learning to communicate via the Internet), and pupils also create digital material such as images, videos, etc.
• In the Greek educational system, pupils make more extensive use of concept maps and also learn more about computer hardware.

Table 4: 5th-6th grade Primary/Elementary school

Similarities
• A shared emphasis on computer programming, introduced at various stages of the curriculum.
• The extensive use of office productivity applications, such as presentation software, spreadsheets, and word processing tools.
• The organization and management of information from multiple sources.
• The effective and responsible use of Web 2.0 tools for communication and collaboration
• The appropriate use of a variety of software programs and digital applications
• The creation and maintenance of a digital portfolio as a means of documenting learning progress and achievements.
Differences
• The Peruvian educational system emphasizes the use (for various purposes) of virtual objects and virtual environments.
• The Greek educational system focuses on the use of spreadsheets, on image, video, audio processing and on creating animations. It also focuses on the Internet and networks.

Table 5: Gymnasium/Lower Secondary school

Similarities
• Management of information and data; emphasis on copyright.
• Computer Programming.
• The development of a broad range of abilities and skills, both technological and cross-disciplinary in nature.
• Create, use and modify media.
Differences
• Peruvian Lower Secondary school consists of two classes. The Greek system consists of three.
• In the Peruvian educational system, there is an emphasis on the use of virtual environments, collaborative activities and the use of spreadsheets and multimedia.
• In the Greek educational system, concepts of ICT/CS/Informatics and computer hardware, special topics of the Internet and Internet security, creation of text files, presentations and spreadsheets, are thoroughly examined.

Table 6: Upper Secondary school/Lykeio

Similarities
• Proper use of software and applications.
• Management and sharing of data and information.
• Both educational systems include computer programming within their curricula; however, the type and depth of programming instruction differ. Each country adopts distinct approaches aligned with its educational goals and pedagogical frameworks.
Differences
• In the Greek educational system, pupils receive instruction in a broad range of theoretical and practical areas within Computer Science and Information and Communication Technologies. The curriculum includes foundational concepts in computer science, computer programming, object-oriented programming, markup languages such as HTML, HTML5, and CSS, as well as topics related to the Internet, Web 2.0 applications and cloud-based services. At the level of the third grade of Upper Secondary School (Lykeio), the Informatics course is offered exclusively to pupils who have selected the 'Economics and Computer Science/Informatics Studies' orientation group. At this stage, the course focuses on theoretical aspects of computer science alongside practical instruction in computer programming.

- In the Peruvian educational system, the teaching of ICT emphasizes a range of digital competencies, including the creation of virtual objects through 3D modeling applications, the use of video and animation tools, the application of calculation functions within spreadsheets and databases, and engagement with virtual environments and collaborative online communities for diverse educational purposes. With regard to computer programming, pupils are introduced to the development of logical sequences, the design of digital games, and the construction of basic robotic prototypes.

As Aristotle[ii] (1939) notes maturity, derived from education, lies at the threshold between development and decline and is expressed only in and for the community. Fostering the development of mature individuals capable of critical thinking and autonomous decision-making is a formidable challenge in the rapidly evolving world we inhabit. Teachers of Computer Science and Information and Communication Technologies (ICT) are acutely aware of this reality. Navigating a teaching landscape shaped by dynamic visuals, immersive sounds, and the integration of robotics presents both a powerful opportunity and a significant pedagogical risk.

6. Conclusion

This study aimed to explore the teaching of ICT in schools in Greece and Peru by identifying key similarities and differences. To conduct a detailed analysis of the curricula, the educational stages were divided as follows: early childhood (ages 3-5), lower primary (1st -2nd grade), middle primary (3rd -4th grade), upper primary (5th -6th grade), lower secondary, and upper secondary education.

Although the present research is confined to a specific subject area and selected educational levels, future studies extending to other academic disciplines and higher educational stages may contribute to a more comprehensive understanding of the issue under examination. However, due to time constraints, such an expansion was beyond the scope of this study. At this point, we briefly summarize the most significant differences and similarities that emerged from the comparative analysis of the official curricula in both countries.

In the early childhood stage (ages 3-5), both curricula place emphasis on basic interaction with computers and digital devices. However, in the Greek curriculum, children are introduced to programming only to a limited extent, primarily through the use of simple and developmentally appropriate educational software.

Regarding the 1st and 2nd grades of primary education, both curricula incorporate the use of technological devices, digital content creation, and interactive games and applications as means of fostering digital literacy skills. The Peruvian curriculum appears to place greater emphasis on the use of virtual learning environments and on developing

[ii]Aristotle, 1337, a II, 4: "We must not regard a citizen as belonging to the state. Each is a part of the state; and the provision made for each part will naturally be adjusted to the provision made for the whole."/ Αριστοτελης, 1337, α II, 4: "δει δε τῶν κοινῶν κοινην ποιεισθαι και την ασκησιν, αμα δε ου δε χρη νομιζειν αυτον αυτου τινα ειναι τῶν πολιτῶν, αλλα παντας της πολεως, μοριον γαρ εκαστος της πολεως. ηδ' επιμελεια πεφυκεν εκαστου μοριου βλεπειν προς την του ολου επιμελειαν."

pupils' ability to search for, access, and retrieve digital information. In contrast, the Greek curriculum introduces foundational internet-related concepts, while pupils also engage in basic information management processes, including saving and printing digital texts and drawings.

As regards the 3rd and 4th grade, pupils in both countries engage more actively in information management through the use of computers; they produce a wider variety of digital content, employ diverse software applications aligned with specific educational objectives, and demonstrate more extensive use of internet resources. Nevertheless, the Greek curriculum does not *yet* –based on the present state of our research- appear to promote the systematic production of digital material through virtual learning environments, unlike the Peruvian curriculum, which emphasizes on such practices.

At the 5th and 6th grade levels, both educational systems demonstrate a more systematic and advanced engagement with ICT. Pupils begin learning computer programming, utilize office software suites, engage with Web 2.0 tools, and begin constructing digital portfolios. In the Peruvian curriculum, the use of virtual learning environments is both extensive and systematically integrated into the educational process. In contrast, the Greek curriculum places greater emphasis on the use of spreadsheets and on the processing of images, video, and audio, including introductory animation-related activities.

As for Lower Secondary education, both countries focus on issues such as data and information copyright, programming, and digital content creation. The Peruvian system includes two years of Lower Secondary school, while the Greek system spans three years. Despite this structural difference, the Peruvian curriculum emphasizes collaborative activities within virtual environments, alongside spreadsheets and multimedia tools. Conversely, the Greek curriculum places greater focus on ICT-related theoretical concepts, computer hardware, internet safety, as well as the creation of presentations and text-based documents.

At the Upper Secondary level, both systems promote the proper use of software applications and the management of digital information and programming. In Peru, pupils engage with advanced content such as 3D modeling, video production, animation, logical sequence development, digital game design, and robotics -often within virtual environments. In Greece, the curriculum emphasizes programming, markup languages, cloud services, and the use of Web 2.0 applications. In Greece, the ICT course in the third year of Upper Secondary school is offered only to pupils who have selected it as an exam subject.

In conclusion, teaching -especially in the field of ICT- requires continuous professional development and renewal of knowledge and skills (Abakah, Widin, & Ameyaw, 2022; van Weert, 2006), so as to response to the rapid evolution of technology and societal needs (Debesse & Mialaret, 1974; Jannah, 2025). Educators in both countries are increasingly attempting to integrate STEM and STEAM approaches into their teaching. This reflects a growing awareness of the interdisciplinary nature of Science, Technology, Engineering, Arts, and Mathematics, and of how Computer

Science/Informatics is deeply interconnected with everyday life and the broader scientific enterprise (Dabu, 2017; Özdinç, Kaya, Mumcu, & Yıldız, 2022). It is important to acknowledge that curricula are dynamic and subject to ongoing change, while the context in which this research was conducted is inherently time-bound and context-specific. In addition, this study highlights the interconnected nature of contemporary educational systems, demonstrating that geographically distant contexts may share comparable challenges, priorities, and perspectives (Cancarevic, Plichtová, & Tohid, 2021; Thieme, Giménez, & Prior, 2012). The collaboration underlying this research reflects the value of international academic cooperation in fostering mutual understanding and enriching comparative educational inquiry. The authors gratefully acknowledge the harmonious collaboration and the contribution and support of their colleagues from Peru, whose involvement was essential to the completion of this study (sincere gratitude).

Conflict of Interest Statement
The authors declare no conflicts of interest.

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