Chapter 1
Examining the Validity and Reliability of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) Among Greek Preschool Teachers: A Comparative Study with Turkey

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Introduction

The COVID-19 pandemic has brought unprecedented educational challenges, including preschool education (Daniel, 2020). As a result, many preschools have had to shift from traditional face-to-face instruction to distance learning approaches in order to ensure the continuity of educational provision (Gözüm et al., 2022a; Yıldırım, 2021). In this context, information and communication technology (ICT) has emerged as a critical factor in enabling preschool teachers to engage with their students remotely effectively.

Self-efficacy, predicated upon a firm conviction in one's abilities, is pivotal for achieving professional success and societal recognition, specifically within teaching and education-related fields. Teachers, as principal agents of societal policy

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execution, are uniquely positioned to directly influence student outcomes, with their competence being a key determinant. Such competence is fundamentally underpinned by self-efficacy, a construct delineated by Bandura (1997) as the belief in one's cognitive, affective, and behavioural capabilities to execute tasks successfully. In education, self-efficacy translates into a teacher's confidence in their capacity to impact students' academic achievements positively. However, a deficiency in self-efficacy may precipitate emotional and behavioural challenges, consequently impairing professional efficacy.

This conceptual framework of self-efficacy is particularly salient in the context of ICT implementation in distance education, where its effectiveness is heavily contingent on the self-efficacy of teachers (Govender & Govender, 2009; Gözüm et al., 2022a, b; Taş et al., 2021). Specifically, the confidence and competence teachers exhibit in deploying ICT tools and resources dictate the success of such initiatives. Within the sphere of teaching, self-efficacy pertains to an educator's belief in their capacity to successfully undertake specific tasks (Erdem & Demirel, 2007; Pavithra & Kumar, 2012). A substantial body of research underscores the profound influence of teacher self-efficacy on instructional practices, student learning outcomes, and overall educational quality (Burić & Kim, 2020; Künsting et al., 2016; Schwab, 2019).

The Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE), developed by Gözüm et al. (2022a), was initially intended to gauge the self-efficacy of Turkish preschool teachers in integrating ICT into remote instruction. It is, however, essential to examine the scale's validity and reliability in distinct contexts, such as among Greek preschool teachers, for several reasons. Firstly, cultural and contextual variables can shape how individuals perceive and respond to specific measures. Confirming that the scale accurately represents and measures the intended constructs within the specificities of the Greek cultural and educational milieu is vital. Secondly, this exploration in Greece allows researchers to contribute to a broader understanding of the scale's generalizability and applicability across diverse contexts. This knowledge is invaluable to Greek researchers and international readership, broadening the scale's relevance and informing its future usage across various cultural and educational landscapes. Therefore, the findings of this study hold potential relevance for researchers, educators, and practitioners globally, extending the utility of the TSES-ICT-PDE beyond its initial development and application and thus making the study compelling to a broader audience.

Furthermore, there is a necessity for more comparative investigations, not just between Greece and Turkey but also across different international contexts, of teacher self-efficacy in using ICT for distance education. Such comparative research can illuminate global commonalities and disparities in preschool teachers' perceptions, attitudes, and practices. Recognizing these potential variations allows for creating tailored strategies to bolster teacher self-efficacy and foster effective ICT integration within preschool distance education. While Greece and Turkey serve as initial comparative examples, the implications of this research extend beyond these specific countries. Indeed, the universality of ICT in education means these findings hold considerable relevance for the broader international audience, providing

globally applicable insights and beneficial to educators, researchers, and policymakers alike.

Hence, the primary objective of this study is twofold. Firstly, it aims to validate and test the reliability of the TSES-ICT-PDE among Greek preschool teachers, ensuring that it is a robust and accurate measure of their self-efficacy in using ICT for distance education. Secondly, it compares teacher self-efficacy in ICT utilization for distance education between Greece and Turkey, shedding light on the similarities and differences in the two countries' educational contexts.

By exploring these research objectives, this study aims to contribute to the existing body of knowledge on the use of ICT in early childhood education, particularly in the context of distance education during the COVID-19 pandemic. By examining the validity and reliability of the TSES-ICT-PDE and conducting a comparative analysis, this research will provide insights that can inform policy and practice, supporting the development of targeted interventions and initiatives to enhance preschool teachers' self-efficacy in using ICT effectively for distance education. Ultimately, this study seeks to advance the field of preschool distance education and promote the continued provision of quality early childhood education in the face of challenging circumstances.

ICT Integration in Early Childhood Education: Benefits, Challenges, and Considerations

Integrating information and communication technology (ICT) in pedagogy has become essential to educational reform globally. ICT is recognized for its critical role in fostering active participation in the information society and supporting children's development in educational settings (Dong et al., 2020; Gayatri, 2020; Kim, 2020; Nikolopoulou & Gialamas, 2015; Peeraer & Van Petegem, 2011).

At the core of these learning environments are teachers, whose beliefs, attitudes, and self-efficacy significantly influence the successful implementation and use of ICT in schools (Bandura, 1993; Badia et al., 2013; Ertmer, 2005; Erdogan, 2011; Harding, 2012; Oye et al., 2014; Tondeur et al., 2012). They are crucial integrators of educational elements and are instrumental in creating conducive teaching and learning environments.

Building on Becker's (2000) exploration into the challenges teachers face when implementing computers in teaching practices, Ertmer (2005) delineated two distinct categories of impediments that could obstruct teachers' effective incorporation of ICT into classrooms. First-order barriers are external constraints such as insufficient resources, inadequate time, lack of training, and limited support. Conversely, second-order barriers emanate from teachers' knowledge base and pedagogical and epistemological beliefs, including the perceived utility of ICT, self-efficacy in its application in pedagogical contexts, and readiness to modify traditional teaching methods.

Subsequently, Tsai and Chai (2013) introduced a third tier of obstacles related to educators' pedagogical thinking and ability to design learning experiences, which must be surmounted to fluidly and actively incorporate ICTs in their classrooms. This suggests that for teachers to architect meaningful learning scenarios and foster efficient learning experiences, they must perceive ICT as an integral component of the educational milieu in their classrooms and a valuable tool to enhance students' learning.

Despite the growing incorporation of ICT into early childhood classrooms, there still needs to be a significant challenge in effectively integrating ICT tools and resources (Aubrey & Dahl, 2014; Leung, 2010). One must not merely focus on the idea of promoting computer literacy or technical skills (Wilson-Strydom & Thompson, 2005) but rather on leveraging these technologies to enhance the teaching-learning process (Aldunate & Nussbaum, 2013; Flanagan & Jacobsen, 2003; Nkula & Krauss, 2014). This challenge persists despite the increasing availability of ICT tools (Balanskat et al., 2006).

External factors like the availability and accessibility of technology, instructional planning time, technical and administrative support, school curriculum, school culture, and pressure for exam preparation all influence the integration of ICT (Abu Al-ruz & Khasawneh, 2011; Tezci, 2011). Moreover, the perceptions and visions of school leaders also play a pivotal role in the implementation process (Pelgrum & Law, 2003). The school's cultural context, too, has a significant mediating role that influences teachers' actions, beliefs, and attitudes towards the use of ICT (Albirini, 2006; Chai et al., 2009).

Simultaneously, internal factors such as teachers' beliefs, understanding of ICT use, attitudes towards technology integration, self-confidence, knowledge, readiness to use ICT, and self-efficacy also come into play (Abu Al-ruz & Khasawneh, 2011; Sang et al., 2011; Palak & Walls, 2009). There are also inherent challenges, such as student mobility, special needs, and anxiety associated with ICT integration (Frederick et al., 2006).

However, despite these concerns and potential limitations (Cordes & Miller, 2000; Gialamas & Nikolopoulou, 2010; Lindahl & Folkesson, 2012; Palaiologou, 2016), proponents argue that the transformative power of ICT lies in its potential to facilitate student-centred teaching and learning approaches (Scrimshaw, 2004). There is consensus that technology can enhance learning and development when used intentionally (NAEYC, 2012).

Indeed, numerous studies have demonstrated the positive impact of ICT on children's curiosity, language and communication skills, creativity, mathematical thinking, problem-solving abilities, cooperation, literacy, and exploratory approaches to leadership (Clements & Sarama, 2003; Hatzigianni & Margetts, 2012; Jack & Higgins, 2019; NAEYC & Fred Rogers Center, 2012; Nikolopoulou & Gialamas, 2015). Also, ICT provides new opportunities to enhance various aspects of early childhood education practices (Kerckaert et al., 2015).

However, the appropriateness of content delivered through ICT applications in classrooms continues to raise concerns (Gözüm, 2022; Gözüm & Kandır, 2021; Papadakis & Kalogiannakis, 2020), thereby emphasizing the need for careful

consideration and responsible use of ICT in early childhood education. Kundu and Bej (2020) proposed the 3E model (encourage, enforce, enhance) for effective integration, accounting for various stakeholders such as teachers, students, and school management to address these complexities. In summation, understanding the potential benefits of ICT integration and addressing the associated challenges can enable policymakers, educators, and researchers to collaboratively harness the full potential of ICT while ensuring its responsible and appropriate use in enhancing early childhood education.

In conclusion, integrating ICT into education represents a multifaceted undertaking fraught with opportunities and challenges. Navigating this dynamic landscape necessitates a deep understanding of its myriad dimensions – the external and internal factors shaping its deployment, the role of teachers as critical integrators, and the potential impact on student learning outcomes. Acknowledging and addressing the concerns about ICT's practical and responsible use in classrooms remains pivotal, especially in early childhood education. It is evident that a strategic and thoughtful approach to ICT integration, as embodied by the 3E model, could pave the way for more effective, enriching, and learner-centred educational experiences. This endeavour warrants concerted effort and collaboration among stakeholders, including educators, policymakers, and researchers. In doing so, we can ensure that the benefits of ICT are optimal while mitigating potential drawbacks, thereby fulfilling the promise of ICT as a transformative tool for education in the twenty-first century.

Enhancing ICT Self-Efficacy Among Preschool Teachers

Bandura's social cognitive theory provides a valuable framework for understanding self-efficacy, an essential concept when exploring teachers' beliefs and confidence in using ICT in their instructional practices. Self-efficacy, as defined by Bandura (1977, 1991, 1993), refers to an individual's belief in their ability to perform specific tasks and produce desired outcomes successfully. According to Barton and Dexter (2020) and Straub (2009), there is an assertion that individuals with elevated levels of self-efficacy are inclined to establish more ambitious objectives, exert more significant effort, and demonstrate increased resilience in the face of challenges and setbacks. In the context of ICT integration, teacher self-efficacy plays a crucial role in determining the extent to which teachers utilize ICT effectively in their classrooms (Ertmer & Ottenbreit-Leftwich, 2010; Morris et al., 2017).

According to Bandura's theory (1997), self-efficacy is influenced by four critical sources of information: mastery experiences, vicarious experiences, social persuasion, and physiological and emotional states. These sources interact to shape individuals' self-beliefs and impact their willingness to engage in new tasks or persevere through challenges. Applying Bandura's theory to the domain of ICT self-efficacy for preschool teachers, we can examine how these sources of information influence their confidence and competence in using ICT tools and resources in their instructional practices.

- Mastery experiences: Mastery experiences involve previous personal successes and failures in utilizing ICT in teaching. When preschool teachers have positive experiences with ICT, such as successfully incorporating technology into their lessons or witnessing improved student outcomes, it enhances their self-efficacy. These successes contribute to a sense of accomplishment and the belief that they can effectively use ICT to support teaching and learning.
- Vicarious experiences: Vicarious experiences involve observing others, particularly role models, who successfully use ICT in their teaching. When preschool teachers witness their colleagues or other educators effectively integrating ICT into their instructional practices, it can inspire and motivate them to enhance their ICT skills. Observing successful ICT implementation by others gives preschool teachers a sense of possibility and helps them develop confidence in their abilities.
- Social persuasion: Social persuasion refers to the feedback, encouragement, and support received from others. In ICT self-efficacy, preschool teachers may receive positive or negative feedback from colleagues, administrators, or professional development providers regarding their ICT skills. Positive feedback and supportive environments that value and promote ICT integration can boost preschool teachers' self-efficacy. Conversely, negative feedback or lack of support can undermine their confidence in using ICT.
- Physiological and emotional states: Physiological and emotional states encompass preschool teachers' physical and emotional reactions when using ICT. Factors such as anxiety, stress, or lack of comfort with technology can significantly impact teachers' self-efficacy. When preschool teachers experience anxiety or frustration related to ICT use, it can lower their confidence and hinder their willingness to explore and incorporate technology into their teaching practices. Creating a supportive and empowering environment that addresses these emotional and physiological factors is crucial for enhancing ICT self-efficacy.

By considering these four sources of information within Bandura's social cognitive theory, we can gain insights into the factors that influence preschool teachers' self-efficacy in using ICT. Understanding these factors allows for developing targeted interventions and support systems that foster positive mastery experiences, provide opportunities for vicarious learning, offer constructive social persuasion, and address physiological and emotional states. By promoting self-efficacy in ICT, preschool teachers can become more confident, competent, and motivated in utilizing technology to enhance teaching and learning experiences for young children.

Turkish and Greek Preschool Teachers' Use of ICT

A comparative analysis of teachers' use of information and communication technology (ICT) in education provides valuable insights into the similarities and differences in ICT integration practices across different cultural and educational contexts.

Specifically, examining the use of ICT among Turkish and Greek preschool teachers offers an opportunity to explore the various factors that shape the adoption and implementation of ICT in early childhood education. Turkey and Greece have experienced significant technological advancements and recognized the potential of ICT in supporting teaching and learning processes. However, the extent and nature of ICT integration in preschool settings may vary due to unique cultural, economic, and educational factors influencing teachers' attitudes, beliefs, and access to ICT resources.

While the comparative exploration of Turkish and Greek preschool teachers' use of ICT offers a nuanced understanding of ICT integration in early childhood education within these countries, it also serves as a model for applying the scale in diverse cultural and educational landscapes. This study illuminates localized practices, challenges, and opportunities for incorporating ICT tools in preschool classrooms. It provides invaluable insights into the cross-cultural applicability and broader generalizability of the TSES-ICT-PDE.

Such insights are significant to researchers and practitioners in various countries and cultural contexts interested in employing this scale or similar measures, extending the study's reach beyond the specific Greek and Turkish contexts. Furthermore, understanding the scale's psychometric properties in different contexts aids in advancing measurement science and methodology, yielding benefits for researchers across various disciplines. Thus, while rooted in a specific geographical context, the implications of this study are fundamentally universal, thereby maintaining its relevance to an international readership.

The operational guidelines and regulations of technology use should be present in Greek infant/child centres. Within kindergarten classrooms, information technology (IT) is designated as one of eight learning domains that warrant consideration during the devising and execution of meaningful, purposeful activities for children. As outlined in the Kindergarten Curriculum (2011), the objectives of IT usage encompass (a) the sourcing, organization, management, and generation of multiform information for idea development, creation, and personal expression; (b) collaboration and fostering communication; (c) promoting exploration, experimentation, problem-solving across subject areas, and invention; and (d) promoting comprehension of how digital technologies are impacting modern society and culture (p. 114). The everyday utilization of information technology encompasses its application in educational contexts as tools for exploration, experimentation, addressing challenges, information management, digital literacy, creative expression across diverse media, and enabling communication and cooperation (Kindergarten Curriculum, 2011, p. 114). IT usage is intertwined with play as the curriculum highlights its role in early childhood education (ECE) for 'strengthening the significance of play as a crucial aspect of their development' (Kindergarten Curriculum, 2011, p. 114). While the curriculum explicitly references incorporating technological tools into play spaces and emphasizes the importance of technology play, a study conducted by Nikolopoulou and Gialamas (2015) in Greece highlighted a requirement for a more comprehensive integration of information technology in early childhood education, despite the curriculum's support for IT utilization.

Additionally, the authors found that early childhood education (ECE) teachers regard technology-based play as a valuable educational approach for young children. They argue that using technology extends beyond casual play and should be integrated into structured learning activities (Nikolopoulou & Gialamas, 2015). Similarly, Manessis (2011) supported this perspective by noting that early childhood educators consider digital games valuable educational resources for infants. Incorporating educational digital games can exemplify effective learning methods, enabling infants to develop practical skills and social behaviours through engaging with these games.

The Early Childhood Education Program formulated in 2013 by the Turkish Ministry of National Education (2013) elucidates the objectives of early childhood education, the consequential developmental outcomes, and the factors influencing these outcomes while providing examples of monthly plans, environmental arrangements, and daily routines. However, upon evaluation of the program, the references to the utilization of IT in early childhood education could be more extensive. The document mentions using computers or technology in early childhood centres in merely three instances. One instance occurs under the segment on developing self-care skills and safeguarding oneself from accidents and harmful situations. In this context, prolonged periods spent watching television or engaging in computer games are portrayed as detrimental. The application of technology in early childhood education continues to be a contentious subject in Turkey. When considering school readiness, academic research primarily focuses on textbooks and review articles, as highlighted by Kartal and Guven (2006). Fewer studies are dedicated to creating surveys to assess teacher perspectives regarding integrating information technology in early childhood centres, as Kol (2012a) demonstrated or delving into their viewpoints (Kol, 2012b). In Kol's research (2012b), among the 33 teachers surveyed, nine reported seldom or no utilization of computer-assisted software (CAS), while the remaining teachers indicated sporadic usage. The obstacles, as perceived by the teachers, were primarily hardware malfunctions, followed by software issues and a lack of technical proficiency among teachers. Early childhood educators opined that CAS is instrumental in developing audiovisual skills and believed that computer usage might engender antisocial behaviours.

As Slutsky et al. (2021) documented, the Kindergarten Curriculum (2011) classifies technology as one of eight pivotal learning spheres in Greece. It underscores its effectiveness in functions, such as gathering and structuring information, promoting communication and cooperation, supporting exploration and issue resolution, and comprehending the role of digital technologies in today's society and culture. However, Nikolopoulou and Gialamas (2015) disclosed an underwhelming technology integration within early childhood education. Their study also endorsed that, according to Greek educators, play is the most potent strategy for young children's learning. In the context of Slutsky et al.'s (2021) research, Greek educators concurred that technology could support children's learning and enhance their preparedness for school. However, a subset of these educators maintained that young children derive more benefits from outdoor play, hence advocating for controlled use of technology.

Research conducted in Greece has examined teachers' perspectives and attitudes towards incorporating ICT in early childhood education. It has been noted that in the field of education, preschool teachers typically hold favourable views regarding the incorporation of computers or information and communication technology (ICT) (Gialamas et al., 2008; Pange, 2008; Tsitouridou & Vryzas, 2003, 2004). However, these favourable sentiments are tempered by concerns regarding the potential adverse effects of ICT on children (Tsitouridou & Vryzas, 2003, 2004).

These attitudes are influenced by many factors, such as tenure, knowledge of and experience with ICT, home computer use, self-confidence in abilities, and in-service training (Tsitouridou & Vryzas, 2003, 2004; Gialamas et al., 2008). Petrogiannis (2010) further identified a significant correlation between teachers' readiness to adopt computer technology and certain psychological factors, including internal control, perceived stress, attitudes towards computers, perceived utility, ease of use, and anxiety.

While there are differences between preservice and in-service teachers (Gialamas & Nikolopoulou, 2010), the former generally display positive attitudes towards ICT use. However, room for improvement remains (Pange, 2008; Toki et al., 2009). These attitudes may be influenced by factors such as years of study, self-efficacy with ICT, and home access to ICT (Nikolopoulou & Gialamas, 2009).

In Greece, early childhood education departments at universities have incorporated ICT modules into the curriculum to enhance preservice teachers' competence in using ICT in education (Nikolopoulou & Gialamas, 2009; Toki & Pange, 2006). For in-service preschool teachers, numerous training programs have been launched at national and European levels (Nikolopoulou & Gialamas, 2009; Tsitouridou & Vryzas, 2004). However, as Gialamas et al. (2008) noted, these efforts need more systematic organization and exhibit a techno-centred orientation. The primary focus, therefore, should be on formulating and implementing effective teacher training programs to help educators develop scientifically grounded perspectives and attitudes towards ICT (Gialamas & Nikolopoulou, 2010).

In a study by Lavidas et al. (2021), the technological pedagogical content knowledge (TPACK) model is identified as a robust theoretical framework for understanding the requisite knowledge for educators to incorporate ICT in teaching effectively. This study evaluated the perceptions of 147 Greek in-service preschool teachers concerning their proficiency and knowledge of integrating ICT into their teaching practices. A scale of 28 items, aligning with the seven domains of the TPACK model, was utilized to assess teachers' perspectives. The validation and reliability of the scale were confirmed. The findings demonstrated that preschool teachers had adequate perceived self-efficacy in integrating ICT across all seven TPACK domains. Factors such as teachers' age, years of teaching experience, and level of education appeared to influence their perceived self-efficacy for integrating ICT.

Historically, TPACK was built on Shulman's (1986) pedagogical content knowledge, encapsulating general pedagogical skills and subject-specific knowledge. Shulman underscored that having content knowledge and basic pedagogical strategies needed to be improved for efficient teaching. TPACK, paralleling PCK, integrates knowledge of technology, subject matter, learner profiles, pedagogical

strategies, and practices essential for competent ICT integration in classrooms (Koehler et al., 2014). Therefore, effective ICT integration in teaching hinges on a profound understanding of the interplay between content, pedagogy, and technology.

Conversely, Turkish educators exhibited apparent hesitance towards the routine incorporation of technology. The Turkish Preschool Education Program (Turkish Ministry of National Education, 2013) delineates the national objectives for early childhood education and mentions technology only in the context of potential harm due to excessive television viewing or computer gaming. This apprehension about technology was mirrored in the responses of Turkish educators participating in Slutsky et al.'s (2021) study. Except for a few, they emphasized that play is a superior methodology for young children's learning and development compared to extensive technology use, expressing fears about its potential to affect children's development detrimentally. They further warned that an overreliance on technology could precipitate attention deficits and antisocial behaviour in children.

As Konca and Tantekin Erden (2021) documented, a cross-sectional survey explored preschool teachers' digital technologies (DT) utilization in early childhood education settings. The study, which involved 167 teachers across 52 different preschools, included questionnaires and the completion of the Attitude Scale for Technological Tools and Materials Use in Preschool Education. It was observed that classrooms were well-equipped with a range of DTs, including television, DVD, computers, and smartphones, with television and computers being the preferred devices for instructional purposes. Despite teachers displaying positive attitudes towards DT application, their usage was notably restrained, primarily encompassing activities such as watching cartoons and listening to music. The research found that the teachers' gender, teaching experience, and attitudes towards ICT did not significantly impact their utilization of DT in the classroom. Their study suggests that despite access to DT and positive attitudes towards its use, teachers' implementation of these tools was limited to certain activities. Thus, to enhance the effectiveness of DT use, it is necessary to identify and address the potential barriers inhibiting successful technology integration in the classroom (Konca & Tantekin Erden, 2021).

An exploration of research in Turkey reveals a generally cheerful disposition from preschool teachers towards technology integration in their classrooms (Konca et al., 2016). Additionally, these educators perceive digital technology (DT) as essential and underscore its beneficial influence (Korkmaz & Ünsal, 2016). Simsar and Kadim (2017) investigated the influence of DT use on teaching approaches among preschool educators, unearthing a pattern of DT application primarily in music and play-oriented activities. Nonetheless, certain impediments were highlighted by some educators, such as hardware-related difficulties with DT and insufficient institutional and technical assistance (Kabadayı, 2006; Simsar & Kadim, 2017). This perspective aligns with the contention that while technology facilitates child learning, its application can be challenging (Lindahl & Folkesson, 2012). Consequently, educators tend to favour the employment of DT primarily in creating educational plans and musical activities in the classroom (Yurt & Cevher-Kalburan, 2011).

In conclusion, the comparative analysis of Turkish and Greek preschool teachers' use of ICT in education reveals an intricate interplay of cultural, technological, and pedagogical dimensions that influence the adoption and integration of ICT. While both countries display significant strides in ICT adoption and acknowledge its potential in early education, they also show a degree of hesitation and measured approach attributed to concerns about potential adverse effects on children. These viewpoints are shaped by numerous factors, including educators' tenure, knowledge and experience with ICT, self-confidence, and training. Addressing these concerns through comprehensive teacher training programs focusing on the technological aspect and pedagogical and content knowledge is imperative. Additionally, strategies to bridge the gap between positive attitudes towards ICT and its actual use in classrooms should be explored. This could be achieved by identifying and mitigating potential barriers to successful technology integration.

The Present Study

This study aims to address two primary research questions that focus on the validity and reliability of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) among Greek preschool teachers, as well as a comparative analysis of teacher self-efficacy in using ICT for preschool distance education between Greece and Turkey. Therefore, the research questions of this study are as follows:

1. What is the validity and reliability of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) among Greek preschool teachers?

   This research question focuses on investigating the psychometric properties of the TSES-ICT-PDE scale when applied to Greek preschool teachers. It aims to determine the extent to which the scale accurately measures preschool teachers' self-efficacy in using ICT for distance education. Examining validity and reliability will involve analysing the scale's internal consistency, construct validity, and test-retest reliability among Greek preschool teachers.
2. How does teacher self-efficacy in using ICT for preschool distance education compare between Greece and Turkey?

   This research question aims to compare the levels of teacher self-efficacy in using ICT for preschool distance education between Greece and Turkey. By conducting a comparative analysis, this study will explore the similarities and differences in the beliefs, attitudes, and confidence of preschool teachers from the two countries regarding the use of ICT in distance education. The investigation will shed light on potential contextual factors influencing teacher self-efficacy in each country and contribute to a broader understanding of ICT integration in preschool education within these cultural and educational contexts.

By addressing these research questions, this study aims to provide valuable insights into the validity and reliability of the TSES-ICT-PDE scale among Greek preschool teachers and to offer a comparative analysis of teacher self-efficacy in using ICT for preschool distance education between Greece and Turkey. The findings will contribute to the field of early childhood education by informing policymakers, educators, and researchers about the effectiveness of the scale and the similarities and differences in teacher self-efficacy in the two countries. Ultimately, this research aims to support evidence-based decision-making and the development of targeted interventions to enhance ICT integration in preschool distance education.

Methodology

The principal aim of this study is to conduct a validity and reliability analysis for the scale adaptation of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) in Greece. The study was designed according to the descriptive research method, a quantitative research design. The research primarily focuses on the validity and reliability study of the TSES-ICT-PDE among Greek preschool teachers. At the same time, it also aims to draw an international comparison by contrasting the results with Turkish preschool teachers, among whom the scale was initially developed.

In this context, a descriptive survey method was utilized to ascertain preschool teachers' ICT self-efficacy in Greece and Turkey. Descriptive survey methods are commonly used in educational research as they provide a detailed view of the participants' beliefs, views, and attitudes (Johnson & Christensen, 2004). Thus, this study utilized the descriptive survey method to provide a comprehensive picture of Greek and Turkish preschool teachers' self-efficacy in using ICT for distance education. The cross-cultural comparison aims to shed light on potential differences and similarities and test the scale's robustness and versatility in different cultural and educational contexts.

Participants

The participants of this study consist of 192 Greek and 213 Turkish preschool teachers, selected using the convenient sampling method appropriate to the quantitative research approach. Simple random sampling assures equal probability for each participant to partake in the study. Given that the participants independently joined the study, their prospects of representing the population are high (Büyüköztürk et al., 2011). A total of 405 teachers participated in the research. The gender distribution among the participating teachers is 285 males and 120 females.

Concerning the educational qualifications of the teachers, the distribution is as follows: 220 hold a bachelor's degree, 118 hold a master's degree, and 242 have

Table 1.1 Demographic findings regarding the participants

Country		Teachers' gender		Teachers' educational level			Teaching experience					
		Male	Female	Bachelor's	Master's	PhD	0–5	6–10	11–15	16–20	20±	Total
Greece	n	131	61	101	56	35	58	12	2	3	3	192
	%	68.2	31.8	52.6	29.2	18.2	30.2	6.3	1.0	1.6	1.6%	100
Turkey	n	154	59	119	62	32	66	19	2	1	1	213
	%	72.3	27.7	55.9	29.1	15.0	31.0	8.9	0.9	0.5	0.5%	100
Total	n	285	120	220	118	67	124	31	4	4	4	405
	%	70.4	29.6	54.3	29.1	16.5	30.6	7.7	1.0	1.0	1.0%	100

doctoral degrees. The teaching experience of the teachers is distributed across various ranges: 124 teachers have 0–5 years of experience, 31 teachers have 6–10 years, four teachers have 11–15 years, four teachers have 16–20 years, and four teachers have more than 20 years of teaching experience.

The demographic information on the distribution of participants across countries is provided in Table 1.1.

Data Collection Instruments

This research employed two data collection instruments: a personal information form and the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE).

Personal information form: This form was prepared by the researchers to gather demographic data from the teachers, including gender, educational level, and teaching experience. A consent section was included at the top of the form, explicitly explaining that the data would only be collected from teachers who volunteered to participate in the study.

Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE): The TSES-ICT-PDE was developed by Gözüm et al. (2022a) with the participation of 555 preschool teachers in Turkey. The scale underwent an exploratory factor analysis, followed by a confirmatory factor analysis. The exploratory factor analysis identified three factors: information, communication, and technology. The 'information' factor comprises six items, 'communication' consists of 6 items, and 'technology' includes five items. The scale's Cronbach alpha (α) values were above the acceptable threshold of 0.70: for the overall scale (α = 0.904), for the information factor (α = 0.928), for the communication factor (α = 0.884), and for the technology factor (α = 0.845). The confirmatory factor analysis (CFA) of the three-factor structure demonstrated excellent model fit indices: chi-square ($\chi 2 = 249.527$; df = 116; $p < 0.001$), and the chi-square/degrees of freedom ratio ($\chi 2/df = 2.15$), which is below 3 indicat-

ing a good fit, adjusted goodness of fit index (AGFI = 0.92), comparative fit index (CFI = 0.94), goodness of fit index (GFI = 0.95), incremental fit index (IFI = 0.95), normed fit index (NFI = 0.90), and root mean square error of approximation (RMSEA = 0.04).

Data Collection Process

The researchers utilized Google Forms to prepare the data collection instruments in Greek and Turkish. These electronic forms were then disseminated to potential participants through social media applications like Facebook and WhatsApp. It is important to note that the institutions where participants were employed did not assume any responsibility for distributing these electronic forms.

The forms included a consent section where participants affirmed their voluntary participation in the study. Additionally, an ethical statement ensured that participants' data would not be shared with third parties. The researchers provided their email addresses and contact information within the digital forms, allowing participants to acquire further information about the research and ask any questions.

After consenting to participate in the study, participants shared their personal information and completed the items of the data collection tool. An open-ended question was included in the digital form, providing an opportunity for those teachers who wanted to avoid completing the scale items or to express their opinions on the comprehensibility of the scale items. Notably, no participants expressed any negative views on mandatory items or concerns regarding their comprehensibility.

Data Analysis

The data analysis in this research was carried out in two stages. The first stage comprised validity and reliability analyses directed towards the data collected from Greek participants. The second stage involved analyses to compare data collected from Greek and Turkish participants.

In the first stage, confirmatory factor analysis and item-total correlation, item discrimination, and internal consistency analyses on item statistics were performed. The second stage involved the implementation of an independent t-test for comparing Greek and Turkish teachers.

Descriptive statistics, such as mean, standard deviation, frequency, and percentage, were utilized to describe the participants' demographic data and provide a descriptive account of the data gathered through the measurement tool.

Assumptions

When the data was analysed, the assumptions of confirmatory factor analysis (CFA) and independent t-tests were examined. The dataset from Greek participants was solely used to investigate the assumptions of CFA, whereas the dataset from Greek and Turkish participants was amalgamated for the independent t-test.

Before conducting the CFA, multivariate normality values in the Greek participants' dataset were scrutinized. The CR values in the dataset from Greek participants were under 10, and both kurtosis (0.618) and skewness (0.745) values in the datasets ranged between −3 and + 3. Therefore, the Greek participants' dataset was determined to exhibit a normal distribution.

After examining the multivariate normality values, model fit values were reviewed before the CFA analysis, and levels of fit were determined according to the literature (see Table 1.2) (Gürbüz & Şahin, 2018).

When comparing the data of Greek and Turkish teachers, the assumptions of the independent t-test were examined. The Kolmogorov-Smirnov test was performed on the data for Greek (n = 192) and Turkish (n = 213) teachers. As there was no significant difference ($p > 0.05$), it was assumed that both groups showed a normal distribution.

Procedure

The adaptation process of the TSES-ICT-PDE scale for Greek teachers was carried out by the researchers in the following stages:

- Determining the psychometric property to be researched and scale selection: In line with the aim of this study, it was decided that the TSES-ICT-PDE scale could be adapted for Greek teachers as it is suitable and current in terms of its psychometric properties (Seçer, 2015, p. 68).

Table 1.2 Model fit indices for the validation of the TSES-ICT-PDE scale

Measure	Acceptable fit[a]	Good fit[a]	Model fit values
(χ2/sd)	$3<\chi 2/sd. \leq 5$	$\chi 2/sd. \leq 3$	1.448
RMSEA	$0.05<RMSEA \leq 0.06$	$RMSEA \leq 0.05$	0.048
NFI	$0.90\leq NFI <0.95$	$0.95\leq NFI <1$	0.924
CFI	$0.90\leq CFI<0.95$	$0.95\leq CFI<1$	0.975
GFI	$0.90\leq GFI<0.95$	$0.95\leq GFI<1$	0.914
AGFI	$0.90\leq AGFI <0.95$	$0.95\leq AGFI <1$	0.904
IFI	$0.90 \leq IFI<0.95$	$0.95 \leq IFI<1$	0.975

[a]Anderson and Gerbing (1984), Hooper et al. (2008), Hu and Bentler (1999), Marsh and Hau (1996), Schermelleh-Engel et al. (2003), Tabachnick and Fidell (2013)

- Translation into Greek: The translation was performed by experts proficient in the language the scale was written in Turkish and the adapted language was Greek. Seçer (2015, pp. 68–69) recommends that the translations be done by at least two Greek and six foreign language experts. The researchers from both countries ensured the proper translation of each item by discussing each one. After the translations were done, they were reviewed by six language experts from Greece. The translators chosen for this phase were experts in the literature and specialized in the translated language (Çapık et al., 2018, p. 203). The Greek translators' language levels and linguistic knowledge are native-level proficiency (Hambleton & Patsula, 1999, p. 5).
- Comparison of Greek and Turkish measurement tools in a common language: After the TSES-ICT-PDE scale was translated into Greek, an English version was prepared by experts who speak Greek and English. The Turkish version was prepared by experts who speak both Turkish and English. The translations made by different experts were compared in terms of language and meaning. The translation's semantic relation was checked through English, a common language (Hambleton & Patsula, 1999, p. 6). All 17 items were found to retain their original meaning.
- Back translation method from common language: The scale items translated into English were sent back to experts proficient in both languages for translation back into their original languages. After completing the back translation process with the help of two Greek and Turkish language experts, the original and final Turkish texts were compared. It was observed that the Greek and Turkish versions of the items were consistent with the initial translation (Seçer, 2015, p. 71).
- Preparation of Greek scale form and pilot application: The Greek version of the scale was designed similarly to the original one. Greek researchers conducted face-to-face interviews with six teachers, applying the scale one-to-one to examine the comprehensibility of the Greek scale form. Open-ended questions were used to examine language comprehensibility. The 17-item scale form contained the meaning derived from Turkish researchers (Hambleton & Patsula, 1999, p. 6).
- Main application of the Greek scale form: The Greek version of the measuring instrument was applied to 193 teachers. Since the number of items in the measuring tool is 17, the main application was made with more than 170 teachers, which is ten times the number of items.
- Validity and reliability processes to be applied to the scale: Descriptive factor analysis was not conducted on the data collected with the Greek scale form. The structure of the scale was theoretically identified in the Turkish version. Therefore, a confirmatory factor analysis was conducted on the data of Greek participants to determine the validity of the three-factor theoretical structure (Şeker & Gençdoğan, 2014, p. 35).

Findings

The findings of the research questions are sequentially presented. Specifically, the question, 'What is the validity and reliability of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) among Greek preschool teachers?' is the focal point of our initial discussion. In order to comprehensively address this query, the findings related to the first research question have been organized into two subsections: First, we explore the results derived from the confirmatory factor analysis, which assesses the construct validity of the TSES-ICT-PDE among Greek preschool teachers. Subsequently, we delve into the reliability analysis findings, examining the consistency and stability of the TSES-ICT-PDE scores. Each section provides critical insights into the utility and reliability of the TSES-ICT-PDE as a measure of Greek preschool teachers' self-efficacy in using ICT for distance education.

Confirmatory Factor Analysis (CFA) Findings

Several fit indices were considered and assessed as acceptance criteria in the existing literature to evaluate the appropriateness of the factor structure for the CFA study group. These indices include the chi-square to a degree of freedom ratio ($\chi 2$/df), root mean square error of approximation (RMSEA), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), comparative fit index (CFI), and incremental fit index (IFI). The fit index values are presented in Table 1.2.

Based on the findings presented in Table 1.2, the CFA fit index values for the three-factor structure of the scale are as follows: $\chi 2 = 163.441$, sd = 113, $p = 0.000$, $\chi 2/sd = 1.448$ (below 3 indicating a good fit according to Jöreskog & Sörbom, 1993). The RMSEA value is 0.048, indicating a good fit based on Hu and Bentler (1999). The NFI value is 0.924, indicating an acceptable fit, and the CFI value is 0.975, indicating a good fit, according to Tabachnick and Fidell (2001). The GFI value is 0.914, suggesting an acceptable fit, while the AGFI value is 0.904, indicating an acceptable fit based on Hooper et al. (2008). Furthermore, the IFI value is 0.975, suggesting a good fit based on Marsh and Hau (1996). Overall, the scale demonstrates good fit values when examined. Figure 1.1 provides standardized estimates resulting from the CFA analysis.

Upon examining the findings from the first-level factor analysis, as illustrated in Fig. 1.1, a positive correlation was identified between the measurement tool's information factor and communication at 0.58, technology and communication at 0.51, and information and technology at 0.43. This implies a significant interplay among the factors – information, communication, and technology – signifying their integral roles in shaping the teacher self-efficacy in the use of ICT at home for preschool distance education.

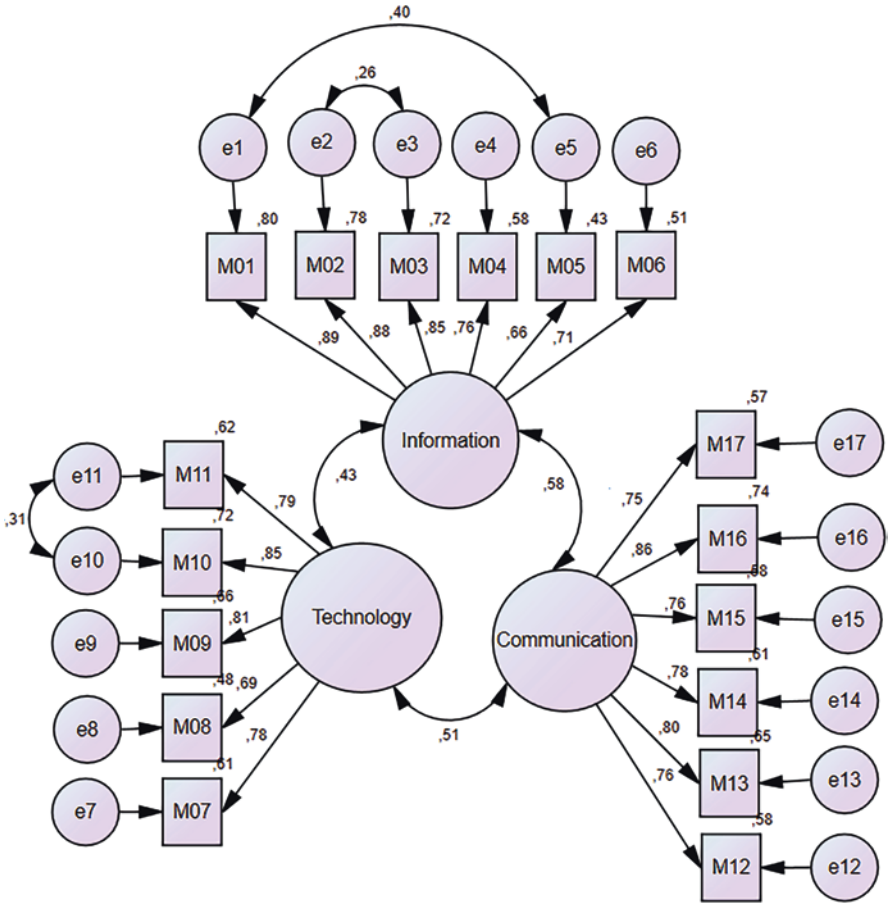

Fig. 1.1 First-level DFA model

Table 1.3 shows the first- and second-level confirmatory factor analysis (CFA) results. The items were found to be meaningfully placed under their respective factors and the factors under the TSES-ICT-PDE, as significant at a ($p < 0.001$) level. Adjustments, or modifications, were made between M1 and M5 and M2 and M3 under the information factor. In contrast, under the technology factor, modifications were made between M10 and M11. The most strongly related item within the information factor was M1, while M10 had the highest estimated value among the items under the technology factor.

Furthermore, the highest estimate value under the communication factor was taken by M16. All the items within the measurement tool were significantly ($p < 0.001$) placed under the scale factors. Therefore, the structural validity of the measurement tool has been verified within the Greek participants' dataset according to the CFA. This demonstrates the robustness of the Teacher Self-Efficacy Scale in

Table 1.3 Standard error and CR values of standardized and unstandardized factor loadings for TSES-ICT-PDE scale from CFA

CFA				Stnd estimate	Unstnd estimate	SE.	CR.
Second level	ICT	->	Technology	0.564	1.000		
	ICT	->	Communications	0.761	1.405	0.237	6.358***
	ICT	->	Information	0.615	2.125	0.358	6.246***
First level	Information	->	M001	0.894	1.000		
	Information	->	M002	0.883	0.983	0.061	16.121***
	Information	->	M003	0.848	0.928	0.062	14.907***
	Information	->	M004	0.759	0.846	0.066	12.919***
	Information	->	M005	0.656	0.742	0.060	12.269***
	Information	->	M006	0.713	0.774	0.066	11.706***
	Technology	->	M007	0.782	1.000		
	Technology	->	M008	0.693	0.856	0.086	9.959***
	Technology	->	M009	0.814	0.994	0.082	12.084***
	Technology	->	M010	0.850	1.087	0.090	12.102***
	Technology	->	M011	0.785	0.952	0.087	10.948***
	Communication	->	M012	0.761	0.995	0.093	10.664***
	Communication	->	M013	0.803	1.066	0.094	11.321***
	Communication	->	M014	0.783	1.017	0.092	11.005***
	Communication	->	M015	0.762	0.972	0.091	10.674***
	Communication	->	M016	0.858	1.147	0.094	12.176***
	Communication	->	M017	0.754	1.000		

*** $p < 0.001$

the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) in assessing the relevant constructs within the Greek context.

Findings of Reliability

Delving into the reliability findings in Table 1.4, the Cronbach's alpha (α) values for the measurement tool and its respective factors provide compelling evidence of commendable internal consistency. With an alpha value of 0.837 for the measurement tool overall and the information factor, communication factor, and technology factor recording alpha values of 0.914, 0.907, and 0.885, respectively, these figures substantially exceed the generally accepted threshold of 0.70. This leads to the inference that the measurement tool and its factors uphold reliability in the context of internal consistency (Murphy & Davidshofer, 1994).

An examination of the item-total correlation (r) between the items in the scale and their respective factors was also undertaken. These correlation coefficients range from 0.30 to 0.70, indicative of moderate to strong correlations (Büyüköztürk, 2011). Specifically, the information factor presented a correlation range of 0.663 to

Table 1.4 Item-wise analysis and Cronbach's alpha values for the TSES-ICT-PDE scale

Factor	No	Item statistics						Cronbach's alpha
		r	$\bar{x}$	sd	Lower 27% group ($\bar{x}1$)	Upper 27% group ($\bar{x}2$)	t	(α)
Information	M1	0.845	3.15	0.799	2.65	3.65	7.173***	0.914
	M2	0.828	3.20	0.794	2.77	3.65	6.143***	
	M3	0.800	3.26	0.781	2.85	3.58	5.053***	
	M4	0.829	3.20	0.796	2.92	3.63	4.822***	
	M5	0.785	3.26	0.807	2.88	3.67	5.297***	
	M6	0.663	3.22	0.775	2.88	3.62	5.140***	
Technology	M7	0.745	3.27	0.975	2.54	4.08	11.136***	0.885
	M8	0.661	3.24	0.941	2.63	3.98	8.873***	
	M9	0.762	3.21	0.931	2.63	3.96	8.974***	
	M10	0.755	3.14	0.974	2.42	4.08	12.505***	
	M11	0.692	3.20	0.924	2.50	3.88	9.676***	
Communication	M12	0.711	3.54	0.861	2.81	4.02	9.095***	0.907
	M13	0.760	3.52	0.874	2.85	4.06	9.449***	
	M14	0.740	3.52	0.856	2.96	4.06	7.924***	
	M15	0.715	3.58	0.840	2.88	4.04	8.646***	
	M16	0.811	3.52	0.880	2.81	3.98	8.625***	
	M17	0.715	3.49	0.874	2.87	3.92	7.168***	
Total								0.837

*** $p < 0.001$

0.845, the technology factor ranged from 0.661 to 0.755, and the communication factor showcased a range from 0.711 to 0.811. It is important to note that an r value below 0.30 ($r < 0.30$) signals a low correlation between the item and the factor, typically prompting the recommendation to eliminate the item from the scale. However, all items within our measurement tool exceeded this threshold. Items M6, M8, and M11 displayed moderate correlation, while all other items manifested strong correlations. This reinforces the reliability and robustness of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) as an instrument for gauging pertinent constructs in the context of Greek preschool teachers.

As illustrated in Table 1.4, the distinguishing capability of the test items within the scale stems from their psychometric properties. Specifically, they can differentiate between teachers with high and low ICT self-efficacy beliefs (Kalaycı, 2008). To examine this further, teachers' ICT self-efficacy scores were stratified into two groups: a lower group comprising 27% of the sample and an upper group comprising 27%. After applying an independent t-test to these groups, it was discerned that all items on the scale manifest a significant difference at the $p < 0.001$ level. Consequently, the inference can be drawn that the items in the measurement tool are aptly designed to distinguish between teachers with high ICT self-efficacy and

Table 1.5 Comparison of the findings regarding TSES-ICT-PDE and its sub-factors between Greece and Turkey

Variable	Country	N	Mean	SD	df	t	*p*
Information	Greece	192	19.27	3.97	403	0.355	0.723
	Turkey	213	19.40	3.53			
Technology	Greece	192	16.05	3.92	403	1.381	0.168
	Turkey	213	16.63	4.42			
Communication	Greece	192	21.15	4.28	403	1.348	0.179
	Turkey	213	20.68	2.71			
TSES-ICT-PDE	Greece	192	56.48	7.74	403	0.597	0.551
	Turkey	213	56.92	6.75			

those with low ICT self-efficacy. This finding substantiates the discriminant validity of the scale, asserting its suitability as a tool for evaluating variations in ICT self-efficacy among teachers.

Transitioning from examining the scale's psychometric properties, we now address our central research question: 'How does teacher self-efficacy in using ICT for preschool distance education compare between Greece and Turkey?' Findings pertinent to this inquiry are encapsulated in Table 1.5, which presents an intriguing comparative perspective on the self-efficacy of preschool teachers in Greece and Turkey in using ICT for distance education. This cross-national comparison sheds light on the potential differences and similarities in teachers' self-efficacy across the two countries, providing valuable insights for policy implications and future research directions.

According to Table 1.5, upon a comparison of the scores on the TSES-ICT-PDE and its sub-factors between Greece and Turkey, it was observed that there was no significant difference in the information factor scores between preschool teachers in Greece and Turkey ($t(403) = 0.355$; $p = 0.723$; $p > 0.05$). When looking at the technology factor, there was also no significant difference discerned between Greek and Turkish preschool teachers ($t(403) = 1.381$; $p = 0.168$; $p > 0.05$). Moreover, the analysis of the communication scores revealed no significant discrepancy between Greek and Turkish preschool teachers ($t(403) = 1.348$; $p = 0.179$; $p > 0.05$). Lastly, there was no significant variance found between Greek and Turkish preschool teachers' ICT self-efficacy scores ($t(403) = 0.597$; $p = 0.551$; $p > 0.05$).

Conclusions and Discussion

The primary aim of this study, which was the adaptation of the Teacher Self-Efficacy Scale in the Use of ICT at Home for Preschool Distance Education (TSES-ICT-PDE) for preschool teachers in Greece, has resulted in a reliable and valid form of the scale. In this context, the findings obtained from the validity and reliability analyses performed in this study are intended to be discussed in comparison to the

results of the research conducted by Gözüm et al. (2022a), not only regarding the structural validity of the scale but also the ICT self-efficacy of Greek and Turkish preschool teachers.

In the first-level confirmatory factor analysis conducted on the ICT scale of the Greek participants, relationships of 0.43 between knowledge and technology, 0.51 between technology and communication, and 0.58 between knowledge and communication were identified. In the validity and reliability study conducted in Turkey, where the original measurement tool was developed, there were 0.49 between knowledge and technology, 0.59 between technology and communication, and 0.63 between knowledge and communication (Gözüm et al., 2022a). An interesting result in this context is that when the magnitudes of the relationships between the ICT self-efficacy of Greek and Turkish preschool teachers are arranged from large to small, the relationship between knowledge and communication is the largest, and the relationship between knowledge and technology is the smallest. This result, in light of the similarity of relationships among ICT self-efficacy sub-factors for Greek and Turkish preschool teachers, suggests that in-service training applied to teachers in both countries originates from everyday needs.

The results of the second-level confirmatory factor analysis conducted on the ICT scale of the Greek participants revealed standardized estimate values of 0.564 for technology, 0.615 for knowledge, and 0.761 for communication among the sub-dimensions of the ICT scale. In Turkey, where the original form of the scale was developed, the standardized estimate values were 0.67 for technology, 0.73 for knowledge, and 0.87 for communication (Gözüm et al., 2022a, b). In this context, the magnitudes of the relationships between the scale and the sub-factors are similar according to the research results conducted in Greece and Turkey. This outcome also indicates that the tendencies of Greek and Turkish preschool teachers towards the measured psychometric property are similar.

Examining the literature and the findings from the comparative analysis of Turkish and Greek preschool teachers' use of ICT in education provides a nuanced understanding of the complexities and challenges underpinning ICT integration in early childhood education.

Bandura's social cognitive theory was employed as a conceptual framework to investigate teachers' beliefs and self-efficacy in using ICT. In Bandura's social cognitive theory, self-efficacy is the belief in one's capability to perform a specific task. For preschool teachers during COVID-19, having high self-efficacy in ICT use at home is more meaningful and challenging than their level of professional development in the classroom. Indeed, the solutions teachers individually devise at home for the challenges they encounter concerning ICT will facilitate proposing solutions when they confront similar problems in the classroom (Gözüm et al., 2022a). Consistent with earlier studies (Moos & Azevedo, 2009; Morris et al., 2017; Weigold & Weigold, 2021), this research confirmed that self-efficacy significantly influences how ICT is employed in classrooms.

Even acknowledging ICT's importance in education, Turkish and Greek teachers have disagreed with extensive technology use. This apprehension seems rooted in concerns about the potential adverse effects of technology on children's

development, attention span, and social behaviour (Slutsky et al., 2021). These concerns align with prior research (Tsitouridou & Vryzas, 2003, 2004) that underscores the delicate balance educators often strive to maintain between leveraging the benefits of ICT and mitigating its potential risks. Therefore, the self-efficacy of preschool teachers in ICT needs to be supported. Nevertheless, a critical aspect of supporting teachers' ICT self-efficacy is determining their levels of self-efficacy. For these reasons, the scale adapted in this research is critically important in determining the ICT self-efficacy of Greek and Turkish teachers.

When comparing the results of the Greek validity and reliability test for the measurement tool (TSES-ICT-PDE) with the Turkish participants' results, no significant difference was found in the TSES-ICT-PDE among the knowledge, communication, and technology factors. A literature review shows that no significant difference was found when comparing the STEM pedagogical content knowledge of Turkish and Greek preschool teachers, as conducted by Gözüm et al. (2022b). It was determined in both countries that in-service training in STEM has a positive contribution to the development of STEM pedagogical content knowledge. In this context, one of the critical results of this research, the lack of significant differences in the TSES-ICT-PDE scores of Greek and Turkish preschool teachers, is similar to the research results of Gözüm et al. (2022b). Moreover, the research by Papadakis et al. (2022) found no significant difference in the strategies towards parental mediation of the digital games their children play.

Because there is consistency in the research results with Greek and Turkish participants, the lack of significant difference between Greek and Turkish teachers' TSES-ICT-PDE scores can be accepted as an indicator that criterion validity has been achieved. However, this result is crucial for scale development study and for the ICT self-efficacy of early childhood educators and, consequently, for classroom technology integration.

Research on classroom technology integration is being conducted in Greece and Turkey. While the self-efficacy of Greek preschool teachers in integrating ICT across all seven domains of the technological pedagogical content knowledge (TPACK) model is being explored (Lavidas et al., 2021), in Turkey, Gözüm and Demir (2021) have examined the TPACK confidence of preschool teacher candidates towards science teaching. The research found that supporting the teacher candidates' technology knowledge resulted in developing both technical content knowledge and technological pedagogical content knowledge. Therefore, the lack of significant differences in the technology dimension of Greek and Turkish preschool teachers should be considered a significant result that needs to be supported in both countries. Researchers are aware of the importance of supporting teachers' ICT self-efficacy in integrating ICT into classrooms but are also aware of the physical factors in classroom technology integration. In this context, a literature review reveals that, interestingly, despite the generally positive attitudes towards incorporating ICT in teaching, its actual use in classrooms appeared limited, particularly in Turkey (Konca & Tantekin Erden, 2021). This divergence may be attributed to various practical barriers such as hardware malfunctions, insufficient institutional and

technical support (Kabadayı, 2006; Simsar & Kadim, 2017), and a lack of systematic organization in teacher training programs (Gialamas et al., 2008).

Such barriers emphasize the crucial role of teacher training programs in fostering ICT integration in early childhood education. While some initiatives have been undertaken in Greece to enhance preservice and in-service teachers' ICT competence (Nikolopoulou & Gialamas, 2009; Tsitouridou & Vryzas, 2004; Toki & Pange, 2006), these programs have often been criticized for their techno-centred orientation, underscoring the need for a more holistic approach. Such an approach should consider the pedagogical implications of ICT and develop teachers' understanding of how to incorporate technology effectively into their instructional practices.

In conclusion, this study's findings highlight the multifaceted dynamics that influence the adoption and integration of ICT in Turkish and Greek preschool education. The key to enhancing ICT use in early childhood education is a comprehensive teacher training approach that prioritizes pedagogical over technological knowledge and strategies to address the practical barriers to technology use in classrooms. Further research could investigate these dimensions in more depth, thereby contributing to developing more effective policies and strategies for ICT integration in early childhood education.

Limitations and Suggestions

While the present study has elucidated noteworthy findings, certain limitations need to be recognized, which, in turn, pave the way for future research endeavours. The absence of statistically significant differences between Greek and Turkish preschool teachers' ICT self-efficacy presents a promising avenue for future research. Though the lack of difference might indicate parity in skills, it does not inherently confirm that the current self-efficacy levels are optimal. As such, future investigations should identify areas where educators in both nations might need more support or feel more confident, shaping these insights into targeted professional development and support initiatives.

The underlying causes of similar self-efficacy levels between Greek and Turkish educators is another aspect that warrants future exploration. The possible role of shared cultural, professional, or pedagogical experiences, or the impact of education policies and strategies, could be investigated to understand these parallels.

On a practical note, the findings of this study suggest the necessity for continuous interventions to foster ICT self-efficacy among preschool teachers. This entails not only infrastructural enhancements but also designing professional development opportunities that cater to preschool educators' specific, nuanced needs in ICT-enabled education.

Moreover, this research could be extended to include other countries or varied educational stages, thereby broadening the validation of TSES-ICT-PDE and facilitating a comprehensive, global comparison. Such endeavours can enhance our

understanding of how different cultural, pedagogical, and systemic factors influence teacher self-efficacy in using ICT for distance education and consequently inform universally appropriate, efficacious strategies and practices. In summary, this study is an essential contribution to the domain of preschool teachers' ICT self-efficacy, particularly in Greece and Turkey, while concurrently inciting an array of future research possibilities in this critical field.

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