



DEPARTMENT OF HEALTHCARE AND SPEECH THERAPY

**Investigating Relations of Communication Skills and School
Performance of Children with Hearing Disorders with Teacher
Competencies in Implementing Differentiated Teaching in Inclusive
Learning Environments.**

Doctoral student: Tsimplidou Elisavet

Supervisor: Prof. Katya Dionissieva, PhD

2026, Sofia

Thanks

Upon completion of this study, I feel the need to thank those who supported me and contributed in their own way to its processing.

First of all, I owe thanks to Prof. Katya Dionissieva, for her support and her guidance throughout the research. Furthermore,

I thank my family for their patience, understanding and their support in my endeavour.

Finally, it would be remiss not to thank colleagues teachers, who were the sample of the research, who willingly accepted to complete the study questionnaire, contributing essentially to conducting the results.

TABLE OF CONTENTS

1. Introduction	4
Chapter 1. Hearing Loss from Audiological Diagnosis to Language Accessibility	5
Chapter 2. Differentiated Teaching and Children with Hearing Disorders	8
Chapter 3. Differentiated Teaching for Students with Hearing Loss	11
Chapter 4. Research Methodology and Results	15
Chapter 5. Discussion and Conclusions	21
Conclusion	26
Contributions of the dissertation	27
References	29

1. Introduction

The present thesis, entitled “Investigating Relations of Communication Skills and School Performance of Children with Hearing Disorders with Teacher Competencies in Implementing Differentiated Teaching in Inclusive Learning Environments,” explores the multifaceted and dynamic relationship between students’ communicative competence, academic achievement, and the pedagogical preparedness of teachers operating within inclusive educational contexts. The study is grounded in the interdisciplinary fields of inclusive education, special education, and educational psychology, with a particular emphasis on learners with hearing loss.

In recent decades, there has been a profound transformation in educational paradigms, with systems worldwide increasingly adopting inclusive models that prioritize equity, accessibility, and participation for all learners. These models move beyond mere physical integration and aim to ensure meaningful engagement and equal learning opportunities regardless of students’ individual differences or disabilities. Within this evolving educational landscape, differentiated teaching has emerged as a central pedagogical approach, designed to respond proactively to learner diversity by adapting instructional content, processes, learning environments, and assessment practices. (Tomlinson, 2014; Florian & Black-Hawkins, 2011).

Despite these advancements, the effective inclusion of students with hearing loss remains a complex and demanding challenge. These challenges extend beyond the sensory characteristics of hearing impairment and are deeply connected to the quality of instructional practices, the communicative accessibility of the learning environment, and the extent to which teachers possess the necessary competencies to implement inclusive strategies. In many cases, the limitations observed in students’ academic performance are not solely attributable to hearing loss itself, but rather to insufficient adaptation of teaching methods and limited accessibility to linguistic input.

Within this framework, the present thesis seeks to address a critical gap in the literature by examining how teacher competencies in differentiated instruction influence both the development of communication skills and the academic performance of students with hearing disorders. By integrating perspectives from audiology, linguistics, pedagogy, and cognitive development, the study aims to provide a comprehensive understanding of how

inclusive teaching practices can enhance educational outcomes and support the holistic development of learners with hearing loss.

Chapter 1: Hearing Loss from Audiological Diagnosis to Language Accessibility

Chapter 1 establishes the theoretical and conceptual foundation of the thesis by redefining hearing loss not merely as a biomedical or audiological condition, but as a complex issue of language accessibility, communicative equity, and educational participation. Traditional approaches to hearing loss have largely focused on its classification according to type (conductive, sensorineural, mixed), degree (mild to profound), and laterality (unilateral or bilateral). While these classifications are essential for clinical diagnosis and intervention planning, they offer limited explanatory power when it comes to understanding the wide variability observed in educational and developmental outcomes among students with hearing loss.

A central premise of this chapter is that children with similar audiological profiles may exhibit significantly different trajectories in language development, cognitive functioning, social integration, and academic achievement. These differences are shaped by a range of interacting variables, including the age at which hearing loss is identified, the timing and quality of early intervention, family communication practices, socioeconomic conditions, access to appropriate hearing technology, and, critically, the competencies of teachers in creating accessible and inclusive learning environments. Consequently, the focus of the analysis shifts from the concept of hearing loss as a deficit to the broader issue of access to rich, structured, and meaningful linguistic input.

The chapter advances the argument that hearing loss becomes educationally disabling primarily when it leads to reduced or inconsistent access to language. In this sense, language deprivation, rather than hearing loss per se, is identified as the most significant risk factor for subsequent academic difficulties and social-emotional challenges. This perspective is consistent with ecological and sociocultural models of disability, which emphasize the interaction between the individual and the environment, and highlight the role of contextual factors in either facilitating or hindering development. (Hall, Levin, & Anderson, 2017).

The impact of hearing loss is analysed across three interrelated domains: language development, cognitive development, and social development. In terms of language, limited

auditory access can affect multiple aspects, including vocabulary acquisition, grammatical development, phonological awareness, and literacy skills. Even mild hearing loss may lead to cumulative learning gaps over time, particularly in acoustically challenging environments such as noisy classrooms. In cases of severe or profound hearing loss, the availability of an accessible language system—whether spoken, signed, or bilingual—is crucial for ensuring typical language development.

From a cognitive perspective, the chapter draws on sociocultural theory to emphasize the central role of language as a mediating tool for higher-order thinking. Restricted access to language can influence key cognitive processes such as working memory, executive functioning, problem-solving, and metacognitive regulation. Additionally, the concept of listening effort is introduced as a significant factor affecting learning: when students with hearing loss must allocate substantial cognitive resources to decoding auditory input, fewer resources remain available for comprehension and knowledge construction. (Pichora-Fuller et al., 2016).

Social development is also closely linked to communication access. Students with hearing loss may encounter barriers in peer interaction, group discussions, and spontaneous communication within the classroom. These barriers can lead to reduced participation, social isolation, and decreased self-confidence. However, the chapter emphasizes that such outcomes are not inevitable. With appropriate pedagogical interventions—such as structured interaction, visual supports, multimodal communication, and increased peer awareness—students with hearing loss can actively participate and develop meaningful social relationships.

The chapter also reviews the etiological factors associated with hearing loss, including congenital, genetic, acquired, progressive, noise-induced, and medically related causes. While these factors are important for understanding the origin and progression of hearing loss, their educational significance lies primarily in how they influence access to communication, stability of auditory input, and intervention strategies. Regardless of etiologic, the central educational concern remains consistent: ensuring that the student has continuous, meaningful access to language.

A substantial portion of the chapter is devoted to educational support systems. Effective education for students with hearing loss requires individualized planning, often implemented through an Individualized Education Program (IEP), and the collaboration of

a multidisciplinary team, including general educators, special educators, speech-language therapists, audiologists, and families. Key components of effective support include communication development, curriculum accessibility, specialized instruction, assistive technology, social-emotional support, and family engagement.

Access to the general curriculum is identified as a fundamental principle of educational equity. Inclusion is not achieved simply through physical placement in mainstream classrooms, but through ensuring that students can actively engage with instructional content. This requires the use of captioned materials, visual supports, written instructions, real-time transcription, adapted teaching strategies, and, where appropriate, sign language interpretation.

The role of assistive technology is also highlighted. Devices such as hearing aids, cochlear implants, FM systems, and captioning tools can significantly enhance access to auditory information. However, their effectiveness depends on proper use, consistent maintenance, and integration within pedagogical practices. Technology alone cannot compensate for inaccessible instruction; it must be complemented by appropriate teaching strategies.

Finally, the chapter underscores the importance of family involvement. Families play a critical role in supporting language development, communication choices, emotional well-being, and the consistent use of hearing technology. Strong collaboration between families and schools contributes to more effective interventions and improved educational outcomes.

In conclusion, Chapter 1 reframes hearing loss as an issue of accessibility rather than limitation. The primary determinant of educational success is not the degree of hearing loss, but the extent to which the educational environment provides accessible communication, responsive teaching, and opportunities for meaningful participation. This perspective lays the foundation for the subsequent analysis of differentiated teaching as a key strategy for addressing learner diversity in inclusive classrooms.

Chapter 2: Differentiated Teaching and Children with Hearing Disorders

Chapter 2 examines differentiated teaching as the primary pedagogical framework for supporting students with hearing loss within inclusive educational environments. The chapter develops the argument that differentiated instruction should not be understood as a collection of isolated teaching techniques, but rather as a coherent and comprehensive educational philosophy that responds systematically to learner diversity through intentional planning, flexible instructional design, and continuous assessment practices.

At its core, differentiated teaching is grounded in the recognition that students differ in readiness levels, learning profiles, interests, and, in the case of students with hearing loss, communication modalities and access to linguistic input. These differences are not peripheral but central to the learning process. Therefore, instruction must be designed in such a way that it anticipates variability rather than reacts to failure. In this sense, differentiation is proactive rather than remedial, aiming to prevent barriers to learning before they emerge.

The theoretical framework of the chapter is primarily based on the model proposed by Tomlinson, which conceptualizes differentiation across four key dimensions: content, process, product, and learning environment. According to this model, effective teaching requires systematic adaptation of these dimensions in response to student characteristics. In the context of hearing loss, these adaptations become particularly critical, as access to learning is directly influenced by factors such as auditory perception, language development, communication preferences, listening effort, and the ability to engage with spoken classroom discourse. (Pichora-Fuller et al., 2016).

The chapter further situates differentiated teaching within broader theoretical perspectives, including constructivist learning theory, Vygotsky's sociocultural theory, and the framework of Universal Design for Learning (UDL). Constructivism emphasizes that learners actively construct knowledge through interaction with their environment, suggesting that meaningful learning occurs when students are engaged in tasks that connect with their prior knowledge and experiences. This perspective highlights the importance of providing diverse entry points to learning, especially for students who may not access information through traditional auditory channels. (CAST, 2018).

Vygotsky's sociocultural theory adds another dimension by emphasizing the role of social interaction and language in cognitive development. The concept of the Zone of Proximal Development (ZPD) suggests that learning occurs most effectively when instruction is aligned with what a learner can achieve with appropriate support. For students with hearing disorders, this implies that teaching must be carefully scaffolded, with explicit attention to communication accessibility, visual support, and guided interaction. The teacher's role becomes one of facilitating mediated learning experiences that bridge the gap between current and potential performance.

Universal Design for Learning extends these ideas by proposing that educational environments should be designed from the outset to accommodate variability among learners. Rather than adapting instruction retrospectively, UDL advocates for flexible design that incorporates multiple means of representation, engagement, and expression. For students with hearing loss, this includes providing visual and written representations of content, offering varied ways to engage with learning materials, and allowing multiple formats for demonstrating understanding. (CAST, 2018).

A central argument of the chapter is that differentiated teaching reframes diversity as a natural and valuable characteristic of the classroom rather than as a problem to be managed. In inclusive settings, diversity includes not only differences in ability but also differences in communication, language access, and sensory experience. For students with hearing disorders, this means that teachers must anticipate potential communication barriers and design instruction that ensures equitable access to information. This involves the systematic use of visual supports, written materials, multimodal presentations, and interactive learning structures that do not rely solely on auditory input.

The chapter also explores lipreading as an important, though limited, communication strategy for deaf and hard-of-hearing students. Lipreading allows learners to access aspects of spoken language through visual observation of lip movements, facial expressions, and contextual cues. However, the chapter emphasizes that lipreading alone cannot provide complete access to speech, as many phonemes are visually indistinguishable or entirely invisible. Consequently, lipreading must be integrated within a broader system of communication support that includes captioning, written reinforcement, sign language where appropriate, visual aids, and optimal classroom conditions such as good lighting, clear teacher positioning, and reduced background noise.

Following this, the chapter presents the fundamental principles of differentiated teaching. These include recognition of learner variability, the use of ongoing formative assessment, flexible grouping practices, the design of respectful and meaningful tasks, the promotion of student autonomy, and the creation of a supportive and inclusive classroom climate. These principles reflect a shift from uniform instruction to responsive teaching, where the goal is not to treat all students identically, but to provide each learner with the specific support required for success.

The chapter then provides a detailed analysis of the main categories of differentiation. Content differentiation refers to what students learn and how information is presented. For students with hearing loss, this may involve the use of visual materials such as diagrams and infographics, captioned videos, simplified and scaffolded texts, pre-teaching of key vocabulary, and the provision of written keywords or summaries. Multimodal presentation is essential, as it allows students to access content through multiple sensory channels.

Process differentiation focuses on how students engage with learning activities. In practice, this may include the use of small-group instruction, flexible pacing, repetition of key concepts, structured turn-taking, additional clarification, and activities that align with students' communication preferences and cognitive readiness. Process differentiation is particularly important for managing listening fatigue and ensuring that students have sufficient time and support to process information.

Product differentiation concerns the ways in which students demonstrate their learning. Rather than relying solely on oral responses or traditional written assessments, students may be given the opportunity to express understanding through visual projects, written work, presentations with visual support, or multimodal outputs. This flexibility ensures that assessment reflects actual understanding rather than limitations in communication access.

Learning environment differentiation addresses the physical and social conditions of the classroom. This includes seating arrangements that support visual access, control of background noise, clear visibility of the teacher, consistent routines, and the creation of an emotionally supportive environment. For students with hearing loss, these factors are not secondary but fundamental to participation and engagement.

Assessment is presented as a critical component of differentiated instruction. In contrast to traditional models that emphasize summative evaluation, differentiated teaching integrates

assessment throughout the learning process. Formative assessment allows teachers to identify student needs, monitor progress, and adjust instruction accordingly. For students with hearing disorders, assessment practices must be adapted to ensure accessibility, including the use of extended time, visual supports, written instructions, alternative response formats, and reduced reliance on auditory-only information.

The role of the teacher is redefined within this framework. Rather than acting solely as a transmitter of knowledge, the teacher becomes a facilitator of learning, a designer of instructional experiences, and a reflective practitioner. This requires a deep understanding of student characteristics and the ability to adapt teaching strategies dynamically. Teachers must also engage in continuous reflection and professional development to improve their practice.

Despite its benefits, the chapter acknowledges that implementing differentiated teaching presents significant challenges. These include time constraints, large class sizes, limited resources, insufficient training, and resistance to change from traditional teaching methods. These barriers highlight the importance of systematic professional development and institutional support. Without adequate training, teachers may struggle to move beyond superficial applications of differentiation.

In conclusion, Chapter 2 argues that differentiated teaching is not merely beneficial but essential for inclusive education, particularly for students whose access to learning depends heavily on communication accessibility. For children with hearing disorders, differentiation is a structural necessity that ensures equitable participation, supports language development, enables fair assessment, and promotes academic success. This conclusion reinforces the central premise of the thesis that effective inclusion depends not only on the presence of students in mainstream classrooms but on the quality of teaching practices that make learning accessible to all.

Chapter 3: Differentiated Teaching for Students with Hearing Loss

Chapter 3 focuses on the practical implementation of differentiated teaching for students with hearing loss, emphasizing that differentiation is not merely a supportive pedagogical strategy but a fundamental prerequisite for ensuring equitable access, meaningful participation, and academic success within inclusive educational settings. Building upon

the theoretical foundations established in the previous chapter, this section translates theory into practice by demonstrating how instructional adaptations directly respond to the communicative, linguistic, cognitive, and socio-emotional characteristics of deaf and hard-of-hearing (DHH) learners.

A central premise of this chapter is that hearing loss extends beyond a sensory condition and has multidimensional implications that affect not only academic achievement but also communication, social interaction, identity development, and emotional well-being. Students with hearing loss often encounter barriers in accessing spoken language, following classroom discourse, engaging in spontaneous interaction, and participating fully in collaborative learning environments. Without appropriate instructional support, these challenges may lead to reduced engagement, lower academic performance, increased cognitive load, and potential social exclusion. Therefore, effective teaching in inclusive classrooms requires not only awareness of hearing loss but also the ability to operationalize this understanding through differentiated instructional practices.

Within this framework, differentiated teaching is conceptualized as a proactive, student-centered approach that aligns instructional methods, materials, and assessment strategies with learners' readiness levels, communication preferences, and individual learning profiles. Rather than adapting instruction after difficulties arise, differentiation anticipates variability and designs flexible pathways to learning from the outset. This approach is particularly important for students with hearing loss, as it allows them to participate in mainstream classrooms without stigmatization or segregation, given that all students engage with diverse materials, varied tasks, and flexible grouping structures. (Tomlinson & Imbeau, 2010).

The chapter highlights three fundamental principles derived from Universal Design for Learning (UDL), which serve as a guiding framework for inclusive instruction. The first principle, multiple means of representation, ensures that information is presented through a variety of modalities, including visual, written, signed, and auditory formats. This reduces dependence on auditory input and enhances accessibility for students with hearing loss. The second principle, multiple means of expression, allows students to demonstrate their understanding through diverse formats, such as written responses, visual projects, presentations, or signed communication. This flexibility ensures that assessment reflects actual learning rather than limitations in communication access. The third principle, multiple means of engagement, focuses on sustaining motivation and active participation

through collaborative learning, meaningful tasks, and an inclusive classroom climate that values diversity. (CAST, 2018).

A substantial portion of the chapter is dedicated to the use of instructional resources that support accessibility. Visual supports are identified as central tools in differentiated instruction for students with hearing loss. These include diagrams, infographics, charts, captioned videos, interactive whiteboards, and visual organizers, all of which facilitate comprehension by providing concrete representations of abstract concepts. Visual scaffolding reduces cognitive load and supports information processing, particularly when auditory input is limited or inconsistent.

Pre-teaching vocabulary is also emphasized as a critical instructional strategy. Due to reduced incidental exposure to spoken language, students with hearing loss may have gaps in vocabulary knowledge, particularly in academic language. Structured vocabulary instruction prior to lesson delivery enables students to engage more effectively with new content, enhances comprehension, and supports literacy development. This strategy also contributes to increased confidence and participation during classroom activities.

The chapter further explores various communication approaches, including sign language, cued speech, oral communication, and multimodal systems that combine multiple forms of communication. It is emphasized that no single approach is universally appropriate; rather, communication strategies must be individualized based on student needs, family preferences, and educational context. Written instructions are highlighted as an essential complement to oral communication, providing students with the opportunity to access, review, and clarify information independently. This redundancy in communication channels is a key principle of differentiated instruction.

Collaboration among professionals emerges as a crucial component of effective inclusive practice. Teachers, special educators, speech-language therapists, audiologists, and families must work together to ensure consistency in communication strategies and educational support across different contexts. Interdisciplinary collaboration enhances both academic and communicative outcomes, as it integrates expertise from multiple domains. Family involvement is particularly important, as it supports language development, reinforces communication strategies, and contributes to the student's overall well-being.

Classroom adaptations are presented as essential conditions for accessibility rather than optional enhancements. These adaptations include preferential seating arrangements that allow clear visibility of the teacher and peers, reduction of background noise to improve auditory conditions, adequate lighting to support visual communication, and the use of captioned materials and assistive listening devices. Lipreading is also discussed as a supportive strategy; however, its limitations are emphasized, as it cannot provide complete access to spoken language. Therefore, it must be integrated within a broader system of visual and contextual support.

The chapter also examines the role of hearing technologies, such as hearing aids, cochlear implants, and FM systems. While these technologies enhance auditory access, they do not guarantee comprehension or full participation in learning. Their effectiveness depends on proper fitting, consistent use, regular maintenance, and integration into a supportive educational environment. The chapter underscores that technology alone cannot compensate for inadequate instructional practices; instead, successful outcomes result from the interaction between technological support, pedagogical adaptation, and environmental accessibility.

Differentiated teaching is then analysed across its four core dimensions. In terms of content, instruction must incorporate visual materials, simplified language, and scaffolded explanations to ensure accessibility. In the process dimension, teaching should include structured interaction, flexible grouping, repetition, guided practice, and opportunities for clarification. Product differentiation allows students to demonstrate learning through multiple formats, thereby ensuring fair and inclusive assessment practices. The learning environment must be acoustically optimized, visually accessible, and emotionally supportive, fostering both engagement and a sense of belonging.

Beyond instructional considerations, the chapter explores the psychological and social dimensions of hearing loss. Communication barriers may lead to social isolation, reduced self-esteem, anxiety, and decreased participation in classroom activities. These challenges highlight the importance of differentiated teaching not only as an instructional framework but also as a means of supporting students' emotional well-being and social integration. Inclusive classroom practices, such as peer collaboration, structured interaction, and positive reinforcement, can significantly mitigate these risks.

Individualized Education Programs (IEPs) are presented as essential tools for planning and monitoring educational interventions. These programs include specific goals related to communication, academic achievement, and social development, and they are continuously adjusted based on student progress. Ongoing assessment, both formal and informal, allows educators to respond dynamically to students' evolving needs and to refine instructional strategies accordingly.

The chapter also addresses the growing role of digital technology and artificial intelligence in supporting students with hearing loss. Tools such as real-time captioning, speech-to-text applications, adaptive learning platforms, and virtual assistants enhance accessibility and enable personalized learning experiences. When integrated within differentiated teaching and UDL frameworks, these technologies contribute to removing barriers and promoting full participation in the learning process.

In conclusion, Chapter 3 demonstrates that differentiated teaching functions as a comprehensive and integrative framework that connects instructional design, communication accessibility, technological support, and social inclusion. For students with hearing loss, differentiation is not simply an optional pedagogical approach but a necessary condition for ensuring meaningful participation, academic achievement, and overall well-being in inclusive educational environments. The chapter reinforces the broader argument of the thesis that effective inclusion depends on the quality of teaching practices and the extent to which they are responsive to the diverse needs of all learners.

Chapter 4: Research Methodology and Results

Purpose and Importance of the Research

The education of students with hearing loss is intrinsically linked to the development of their communication skills, which function as a foundational mechanism for both academic achievement and social participation within the school environment. Communication accessibility is not a fixed condition but rather a dynamic outcome shaped by multiple interacting factors, including the type and degree of hearing loss, the age at which it is identified, the timing and quality of early intervention, the consistent use of hearing technologies, and the level of support provided by both family and educational professionals. In addition, the communicative modalities available to each student—such

as spoken language, sign language, written language, and visual communication strategies like lip-reading—play a decisive role in shaping educational trajectories and influencing placement within inclusive or specialized educational settings.

In contemporary educational systems, inclusive education has become a central policy and pedagogical priority. This shift reflects a broader commitment to equity, access, and social justice, requiring mainstream classrooms to accommodate increasingly diverse student populations. Within this context, students with hearing loss represent a group whose educational participation depends heavily on the accessibility of communication within the classroom. Despite significant technological advancements, such as cochlear implants and digital hearing aids, many students continue to experience barriers in accessing instructional content, participating in classroom discourse, and maintaining sustained engagement with learning tasks.

These challenges highlight the importance of differentiated teaching (DT) as a pedagogical framework capable of addressing learner variability in a systematic and proactive manner. Differentiated teaching allows educators to adapt instructional content, processes, assessment methods, and classroom environments in ways that respond to individual student needs. For students with hearing loss, such adaptations are not supplementary but essential, as they directly influence access to language, comprehension of content, and participation in social learning processes.

The primary aim of the present study is to examine the implementation of differentiated teaching practices for students with hearing loss, with particular emphasis on changes that occur before and after teacher participation in structured training programs. Specifically, the study evaluates the effectiveness of training provided by the Institute of Educational Policy (IEP) under the Greek Ministry of Education, exploring whether such training enhances teachers' knowledge, skills, confidence, and practical ability to apply differentiated instructional strategies within inclusive classrooms.

In addition to teacher-focused outcomes, the study investigates student performance and levels of educational risk through the use of the S.I.F.T.E.R. instrument. By combining teacher data and student performance indicators, the research adopts a comprehensive approach that examines both instructional practice and its impact on learning outcomes.

To achieve these aims, the study is guided by several specific objectives. These include examining the extent to which differentiated teaching is implemented in everyday classroom practice, exploring the influence of teachers' demographic and professional characteristics on their instructional approaches, and evaluating differences in teaching practices before and after participation in IEP training. Furthermore, the study investigates the extent to which assistive technologies are integrated into teaching and assesses student performance using SIFTER both prior to and following teacher training.

A central component of the research is the large-scale teacher training program implemented in Greece by the Institute of Educational Policy under project MIS 5032906 (ESPA 2014–2020). The program, titled “Training in Practices for Supporting Students within the Framework of Differentiated Teaching,” represents one of the most significant national initiatives aimed at strengthening inclusive education practices.

The training program was designed to enhance teachers' competencies in differentiated instruction and inclusive pedagogy through a structured and comprehensive approach. It was delivered through 14 hours of synchronous online learning and involved approximately 25,000 teachers across various educational levels. The program employed innovative methodologies, including flipped classroom approaches and collaborative learning communities, facilitated through digital platforms such as Microsoft Teams and Moodle.

The training content was organized into five thematic units, covering key aspects of inclusive education. These included the theoretical foundations of differentiated teaching, strategies for adapting the social learning environment, approaches for including students with disabilities, and targeted support for specific student populations such as Roma students and students with migrant or refugee backgrounds. The program emphasized core principles such as the differentiation of content, process, and product, flexible grouping strategies, inclusive assessment methods, the use of assistive technologies, and alignment with Universal Design for Learning (UDL). (CAST, 2018).

This structured training environment provided teachers with both theoretical knowledge and practical tools, enabling them to design more inclusive and responsive instructional practices.

Research Hypotheses

The study is guided by seven research hypotheses that reflect the theoretical framework and research objectives.

It is hypothesized that teachers who receive training in differentiated teaching demonstrate higher levels of implementation in classroom practice (H1), and that there is a positive correlation between teacher training and the level of differentiation across instructional domains (H2). Furthermore, the study assumes that differentiated teaching practices improve significantly following training (H3), and that these practices vary depending on contextual factors such as school type and teaching experience (H4).

In relation to student outcomes, the study hypothesizes that the systematic use of the SIFTER instrument contributes to earlier identification of educational risk (H5), that SIFTER scores are positively correlated with academic performance and social participation (H6), and that teachers trained in SIFTER use demonstrate greater diagnostic accuracy compared to those relying on informal observation (H7).

Sample

The study sample includes both teachers and students, allowing for a multi-level analysis of educational practices and outcomes. A total of 14 teachers participated in the study, of whom 10 had received training in differentiated teaching, while 4 had not and formed a control group. All participants were drawn from schools in the region of Thessaly, Greece.

Data were collected on a range of teacher characteristics, including demographic variables (age, gender), professional experience, training background, employment status, and school type. This diversity enabled the exploration of factors that may influence the implementation of differentiated teaching.

The student sample consisted of 27 students with hearing loss, aged between 6 and 12 years. Of these, 10 were taught by trained teachers, while 17 were taught by untrained teachers. This structure facilitated direct comparison between the two groups and allowed the study to examine the relationship between teacher training and student outcomes.

Research Tools

The study employed two primary research tools: a teacher questionnaire and the S.I.F.T.E.R. instrument.

The questionnaire was adapted from the instrument developed by Karam Siam and Al-Natour (2016) and included Likert-scale items designed to measure teachers' attitudes, instructional practices, and use of inclusive strategies. It also included demographic questions to provide contextual data. The questionnaire was administered electronically via Google Forms, allowing efficient data collection and organization.

The S.I.F.T.E.R. instrument was used to assess educational risk in students with hearing loss across five domains: academic performance, attention, communication, class participation, and school behavior. The instrument consists of 15 items rated on a five-point scale, providing a comprehensive overview of student functioning within the classroom. While SIFTER is practical and effective for early identification, its reliance on teacher judgment introduces potential subjectivity.

Data Analysis

Data analysis was conducted using IBM SPSS Statistics and Microsoft Excel. The analysis included both descriptive and inferential statistical techniques. Descriptive statistics provided an overview of teacher characteristics and overall trends, while inferential analyses (including Wilcoxon tests, t-tests, and correlations) were used to examine differences between groups and changes over time.

These methods enabled the researcher to evaluate the impact of training on teaching practices and to explore the relationship between instructional strategies and student outcomes.

Results and Interpretation

The results indicate that teacher training in differentiated teaching had a measurable and positive impact on instructional practices. Teachers demonstrated improved ability to adapt content, organize learning processes, and use inclusive assessment methods following training.

Significant improvements were observed particularly in content differentiation and assessment practices, where teachers showed increased use of varied instructional strategies and more accessible evaluation methods. Process differentiation also improved, with greater use of group work, individualized support, and technology-enhanced learning.

Although improvements in product differentiation were less pronounced, overall trends suggest a gradual shift toward more flexible and inclusive teaching approaches. Classroom management practices showed moderate changes, particularly in the organization of learning activities and student grouping.

The comparison with untrained teachers revealed substantial differences across all domains. Untrained teachers consistently demonstrated lower levels of differentiation, indicating that professional development plays a crucial role in enabling inclusive teaching.

Student performance data further support these findings. Students taught by trained teachers achieved significantly higher SIFTER scores, particularly in communication, participation, and attention. These results highlight the strong relationship between instructional practices and student outcomes.

Qualitative data from teacher interviews reinforced these findings, revealing increased use of multimodal communication strategies, visual supports, and inclusive classroom practices. However, the results also indicated variability in ongoing professional development, suggesting the need for continuous training and support.

Limitations

Despite its strengths, the study has several limitations. The relatively small sample size limits the generalizability of the findings, while the focus on a specific geographical region restricts broader applicability. Additionally, reliance on self-reported data introduces potential bias, and variations in training quality may influence results.

Nevertheless, the study provides valuable insights into the role of differentiated teaching in inclusive education and highlights the importance of systematic teacher

Chapter 5: Discussion and Conclusions

The findings of the present study provide strong empirical support for the critical role of teacher training in differentiated teaching as a determinant of both instructional quality and student outcomes in inclusive educational settings involving children with hearing loss. The results demonstrate that differentiated teaching is not merely a theoretical construct or a set of isolated techniques, but rather a comprehensive pedagogical framework capable of transforming classroom practices when applied systematically and with pedagogical awareness.

More specifically, the study reveals that teachers who received structured training in differentiated teaching were significantly more capable of adapting their instructional practices across multiple domains, including content delivery, instructional processes, use of resources, assessment strategies, and classroom management. This multidimensional improvement suggests that training contributes not only to knowledge acquisition but also to the practical operationalization of inclusive pedagogy within real classroom contexts.

The confirmation of the majority of the study's hypotheses reinforces the theoretical assumption that differentiated teaching functions as an effective response to learner variability. In particular, the observed improvements in teaching practices after training indicate that differentiation requires deliberate planning and cannot emerge spontaneously or intuitively without structured professional development.

An important aspect of the findings is that differentiation was most evident in areas that directly influence access to communication, such as content presentation and assessment. This is particularly relevant for students with hearing loss, whose educational experience depends heavily on how information is delivered and evaluated. The increased use of visual supports, written instructions, multimodal resources, and flexible assessment methods suggests that trained teachers were better equipped to reduce communication barriers and enhance comprehension.

At the same time, the findings reveal that differentiation is not uniformly implemented across all instructional domains. Areas such as product differentiation and certain aspects of classroom management showed more limited change, indicating that these dimensions may require longer-term professional development and deeper pedagogical transformation.

This highlights the complexity of differentiated teaching as a holistic approach rather than a collection of independent practices.

Teacher Training as a Key Factor in Inclusive Education

One of the most significant conclusions of the study is that teacher training constitutes a decisive factor in the successful implementation of inclusive education. The results clearly indicate that teachers who participated in differentiated teaching training demonstrated higher levels of instructional adaptability, greater awareness of student needs, and more effective use of inclusive strategies.

This finding is particularly important in the context of hearing loss, where educational barriers are often invisible and may be misinterpreted as lack of ability or motivation. Students with hearing loss frequently experience difficulties in accessing spoken language, following classroom discourse, and participating in spontaneous interaction. Without appropriate instructional adjustments, these challenges may remain unrecognized, leading to underachievement and reduced engagement.

Training appears to play a crucial role in helping teachers identify these hidden barriers and respond to them through targeted instructional strategies. These strategies include the use of visual supports, structured communication, written reinforcement of oral information, extended processing time, and alternative forms of assessment. Such practices align with the principles of inclusive pedagogy, which emphasize the need to design learning environments that are accessible to all students from the outset.

Furthermore, the study highlights that teaching experience alone does not guarantee effective differentiation. Although many participants had extensive professional experience, those without specific training demonstrated significantly lower levels of differentiated practice. This suggests that inclusive competence is not automatically developed through years of teaching but requires systematic and continuous professional development.

Therefore, the findings support the view that teacher education systems must move beyond traditional models of training and incorporate differentiated teaching as a core component of professional preparation. Without such training, inclusive education risks remaining a theoretical ideal rather than a practical reality.

The Role of SIFTER in Identifying Educational Risk

Another important contribution of the study lies in its examination of the SIFTER instrument as a tool for identifying educational risk among students with hearing loss. The results indicate that SIFTER is not only effective as a screening instrument but also serves as a valuable tool for informing instructional planning.

Students who were assessed using SIFTER and taught by trained teachers achieved higher overall scores, suggesting that systematic assessment contributes to improved educational outcomes. This finding supports the hypothesis that structured evaluation methods enhance teachers' ability to identify areas of difficulty and implement appropriate interventions.

The importance of SIFTER is particularly evident in the identification of subtle communication-related difficulties that may not be immediately observable. For example, a student may appear attentive but fail to fully comprehend oral instructions, or may avoid participation in discussions due to communication barriers. SIFTER allows these issues to be documented and quantified, providing a more accurate picture of student functioning.

By shifting the focus from informal observation to structured assessment, SIFTER enables teachers to adopt a more systematic approach to intervention planning. This contributes to more targeted support strategies and reduces the likelihood of misinterpretation or underestimation of student needs.

However, it is also important to acknowledge the limitations of the instrument. As a teacher-reported tool, SIFTER is subject to potential bias and depends on the teacher's level of awareness and training. Therefore, its effectiveness is closely linked to the competence of the teacher using it. This further reinforces the importance of training, not only in differentiated teaching but also in the use of assessment tools.

Communication Skills and Academic Achievement

A central finding of the study is the strong relationship between communication skills and academic performance. Students who demonstrated higher levels of communication competence also showed better academic outcomes, increased participation, and more active engagement in classroom activities.

This finding highlights the fundamental role of communication as the primary medium through which learning occurs. For students with hearing loss, communication is not a

supplementary skill but the foundation of academic development. Access to communication affects comprehension, memory, problem-solving, and the ability to interact with both teachers and peers.

The results suggest that improving communication should be a central goal of inclusive education. Teachers must ensure that students can understand instructions, ask questions, participate in discussions, and express their knowledge through accessible modes of communication. Differentiated teaching supports this goal by providing multiple pathways for communication and learning, thereby reducing barriers and promoting participation.

Comparative Interpretation: Trained vs Untrained Teachers

The comparison between trained and untrained teachers represents one of the most compelling aspects of the study. The results consistently show that trained teachers demonstrated higher levels of differentiated practice across all instructional domains, while untrained teachers relied more heavily on traditional, uniform teaching approaches.

The most significant differences were observed in content differentiation, assessment practices, and the use of teaching resources. These findings suggest that these areas are particularly dependent on professional training and may not develop naturally without structured support.

Untrained teachers also demonstrated limited use of technology and visual resources, which are essential for students with hearing loss. This limitation reduces accessibility and may contribute to lower levels of student engagement and participation.

These findings indicate that inclusive education cannot rely solely on teacher goodwill or general teaching experience. Instead, it requires a combination of knowledge, skills, resources, and institutional support. Professional development programs play a crucial role in equipping teachers with the necessary tools to implement inclusive practices effectively.

Discussion of the Seven Hypotheses

The study's hypotheses were largely supported by the findings. The first hypothesis was confirmed, as trained teachers demonstrated higher levels of differentiation in classroom practice. The second hypothesis was also supported, indicating a positive correlation between training and differentiation across instructional domains.

The third hypothesis was validated through the observed improvements in teaching practices after training, particularly in content, process, and assessment differentiation. The fourth hypothesis received partial support, as differences were observed between school types, although the small sample size limited stronger conclusions.

The fifth and sixth hypotheses were supported by the SIFTER results, which demonstrated both improved identification of educational risk and a positive relationship between SIFTER scores and student performance. Finally, the seventh hypothesis was confirmed, as trained teachers showed greater accuracy in identifying student needs compared to those relying on informal observation.

Together, these findings reinforce the importance of structured training and systematic assessment as key components of effective inclusive education.

Ideas for the future

Based on the findings of the study, several suggestions maybe derived for educational policy and practice.

First, differentiated teaching should be integrated into initial teacher education programs, ensuring that future teachers are prepared to implement inclusive practices from the beginning of their careers. This includes training in communication strategies, assessment adaptation, and the use of assistive technologies.

Second, ongoing professional development should be provided for in-service teachers, focusing on differentiated teaching, hearing loss, and inclusive pedagogy. Continuous training is essential for maintaining and improving teaching quality.

Third, schools should promote interdisciplinary collaboration among teachers, special educators, speech therapists, psychologists, and families. Such collaboration enhances the effectiveness of support strategies and ensures consistency across different environments.

Fourth, assessment tools such as SIFTER should be used more widely to support early identification of educational risk and guide intervention planning. Teachers should also receive training in the use of such tools.

Fifth, classroom environments should be designed to support accessibility, including the use of visual materials, captioned content, appropriate seating arrangements, and acoustic modifications.

Finally, educational authorities should consider developing a national framework for differentiated teaching, supported by monitoring systems, mentoring programs, and professional learning communities.

Final Conclusion

In conclusion, the present study demonstrates that teacher competencies play a decisive role in the education of students with hearing loss. Communication skills and academic performance are closely interconnected, and both are significantly influenced by the extent to which teachers are able to implement differentiated teaching practices within inclusive classrooms.

The findings provide clear evidence that teacher training improves instructional practices and contributes to better student outcomes. The use of structured assessment tools such as SIFTER further enhances the ability to identify educational risk and plan effective interventions.

Overall, the study supports the need for a comprehensive approach to inclusive education that combines teacher training, differentiated instruction, communication accessibility, and systematic assessment. When these elements are effectively integrated, they can significantly improve the educational experience and life opportunities of students with hearing disorders.

Contributions

Scientific contributions

1. The present doctoral research makes significant contributions to both the theory understanding and the practical implementation of inclusive education for students with hearing loss. By examining the relationship between communication skills, school performance, and teacher competencies in differentiated teaching, the study provides important insights into how inclusive educational environments can become more accessible, equitable, and effective for learners with hearing disorders.
2. The study focuses on the reconceptualization of hearing loss not merely as a medical or sensory condition, but as an issue of communication accessibility and educational participation. The research emphasizes that educational difficulties are often caused not directly by hearing loss itself, but by limited access to language and inaccessible teaching practices. This perspective contributes to contemporary inclusive and socio-cultural theories of disability and education.
3. Also, the study contributes theoretically by demonstrating that differentiated teaching is not simply a supportive instructional method, but a central pedagogical framework for inclusive education. Through the integration of Tomlinson's differentiation model, Universal Design for Learning (UDL), and Vygotsky's sociocultural theory, the thesis develops a comprehensive conceptual model explaining how responsive teaching practices improve communication access, participation, and academic achievement for students with hearing loss.
4. Another major theoretical contribution is the study's emphasis on communication competence as a foundational determinant of school performance. The findings support the theoretical assumption that communication is the primary mechanism through which learning, social participation, and cognitive development occur. The study therefore expands existing literature by highlighting the interdependence between communication accessibility, classroom participation, and academic success within inclusive educational environments.

Practical Contributions

1. A major practical contribution of the study is the empirical evidence showing that structured teacher training in differentiated teaching significantly improves instructional practices. Teachers who participated in the training demonstrated greater ability to adapt content, teaching processes, assessment methods, and classroom management strategies to meet the needs of students with hearing loss. These findings provide practical justification for expanding professional development programs in inclusive education.
2. The study also offers a wide range of practical instructional adaptations that can be directly implemented in inclusive classrooms. These include the use of visual supports, captioned materials, multimodal instruction, written reinforcement of oral information, flexible assessment methods, assistive technologies, structured interaction, and classroom acoustic adaptations. Such strategies provide teachers with concrete methods for reducing communication barriers and improving participation for students with hearing disorders.
3. In addition, the practical research demonstrates that the systematic use of SIFTER contributes to earlier identification of educational risk and more targeted intervention planning. Students taught by trained teachers and assessed through structured evaluation methods achieved higher levels of communication, participation, and academic performance. This finding supports the practical integration of SIFTER into inclusive educational practice and school support systems.
4. Finally, the study provides practical recommendations for educational policy by emphasizing the necessity of integrating differentiated teaching into initial teacher education and ongoing professional development. It also highlights the importance of interdisciplinary collaboration, accessible classroom design, and national frameworks for inclusive pedagogy. These recommendations can support ministry of education, teacher training institutions, and schools in improving inclusive educational practices for students with hearing loss.

References

1. CAST. (2018). Universal Design for Learning Guidelines version 2.2.
<http://udlguidelines.cast.org>
2. Florian, L., & Black-Hawkins, K. (2011). Exploring inclusive pedagogy. *British Educational Research Journal*, 37(5), 813–828.
3. Hall, W. C., Levin, L. L., & Anderson, M. L. (2017). Language deprivation syndrome: A possible neurodevelopmental disorder. *Journal of Deaf Studies and Deaf Education*, 22(4), 1–11.
4. Marschark, M., & Hauser, P. C. (2016). *Deaf cognition: Foundations and outcomes*. Oxford University Press.
5. Pichora-Fuller, M. K., et al. (2016). Hearing impairment and cognitive energy. *Ear and Hearing*, 37, 5S–27S.
6. Pozas, M., Letzel, V., & Schwab, S. (2020). Teachers' attitudes towards differentiated instruction in inclusive classrooms. *European Journal of Special Needs Education*, 35(2), 1–15.
7. Smets, W., De Neve, D., & Struyven, K. (2020). Teachers' implementation of differentiated instruction. *Teachers and Teaching*, 26(5), 1–18.
8. Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners* (2nd ed.). ASCD.
9. Tomlinson, C. A., & Imbeau, M. B. (2010). *Leading and managing a differentiated classroom*. ASCD.