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Conceptualizing Inclusive Education for Students with Hearing Impairment: A Delphi-Based Structural Model

بناء نموذج مفاهيمي للتعليم الدامج لذوي الإعاقة السمعية قائم على تقنية دلفاي

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Abstract:

This study aimed to develop an operational conceptual framework identifying the variables that characterize the reality of integrating students with hearing impairment in mainstream schools within the Algerian.

The Delphi technique was adopted, and fifteen experts participated in three consecutive rounds. The first was dedicated to generating variables, the second to quantifying them, and the third to verifying the stability of the conceptual construct.

The findings revealed stable consensus around three dimensions: teachers' readiness, inclusive pedagogical practices, and structural and psycho-social barriers to inclusion.

Keywords: Inclusive education, Hearing impairment, Delphi technique, Teacher readiness, Pedagogical practices.

الملخص:

هدفت الدراسة إلى بناء إطار مفاهيمي إجرائي يحدد متغيرات واقع دمج التلاميذ ذوي الإعاقة السمعية في المدارس العادية في السياق الجزائري.

تم اعتماد تقنية دلفاي، وشارك خمسة عشر خبيرًا في ثلاث جولات متتالية. خُصصت الأولى لتوليد المتغيرات، والثانية لتقويمها كميًا والثالثة للتحقق من استقرار البناء المفاهيمي.

أسفرت النتائج عن توافق مستقر حول ثلاثة أبعاد: جاهزية المعلم، والممارسات البيداغوجية الدامجة، ومعوقات الدمج البنيوية والنفس-اجتماعية.

الكلمات المفتاحية: الدمج التربوي، الإعاقة السمعية، تقنية دلفاي، الجاهزية المعلم، الممارسات البيداغوجية.

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1- Introduction

Inclusive education has become a central orientation in contemporary special education policy and practice, reflecting a shift from segregated models of schooling toward educational systems that recognize learner diversity, equity, participation, and the right of all learners to meaningful educational opportunities within mainstream schools. Within this perspective, inclusion is not limited to the physical placement of learners with disabilities in regular classrooms; rather, it requires the restructuring of school culture, curriculum, teaching practices, assessment procedures, communication systems, and support services in ways that enable all learners to participate and learn effectively (UNESCO, 1994) (Ainscow, 2005). This understanding is particularly relevant to students with (Silvestri & Hartman, 2022)hearing impairment, whose access to learning depends not only on school enrollment, but also on the availability of communicative, pedagogical, technological, and psychosocial conditions that support effective participation.

For students with hearing impairment, inclusive education presents specific challenges because classroom learning is strongly mediated by language, communication access, visual information, classroom acoustics, peer interaction, and the availability of assistive technologies. In this regard, (Silvestri & Hartman, 2022) argue that the inclusion of deaf and hard-of-hearing students may become restrictive rather than inclusive when mainstream settings fail to provide adequate accessibility, linguistic support, and social integration. Similarly (Alanazi, 2021) emphasizes that communication style is a central condition for the participation of deaf students, as it affects their access to instruction, interaction with peers, and sense of belonging. Accordingly, the inclusion of students with hearing impairment should be examined through the quality of access, participation, interaction, and support, rather than through physical placement alone.

Recent studies indicate that the effectiveness of inclusive education for students with hearing impairment depends on multiple interrelated factors. Teachers' readiness, attitudes, professional competence, and ability to adapt instruction are repeatedly identified as key determinants of successful inclusion (Akshatha, Bhat, & Ravi, 2024). In addition, inclusive pedagogical practices—such as differentiated instruction, curriculum adaptation, visual representation of content, adapted assessment, classroom interaction management, and the use of assistive technologies—constitute

essential classroom-level conditions for enabling learning and participation (Taylor, 2020) (Odhiambo, Ouko, & Onchari, 2024); At the same time, structural, organizational, and psychosocial barriers, including classroom density, limited specialized support, insufficient resources, weak coordination, and social isolation, may restrict the effectiveness of inclusion even when formal integration policies are in place (Dewi, Sudadio, & Fadlullah., 2024).

Within the Algerian educational context, the issue becomes particularly significant because inclusive education for students with hearing impairment still requires locally grounded conceptual and diagnostic tools. Although existing research has addressed aspects of integration and inclusive practices, many studies continue to rely on ready-made or externally adapted measurement instruments that may not fully reflect the professional, organizational, pedagogical, communicative, and psychosocial realities of Algerian mainstream schools. This creates a methodological gap related to the validity of the variables used to assess inclusion, especially when such variables are not generated from the local educational context or from the expertise of professionals directly engaged with the phenomenon. The current manuscript itself identifies this concern by emphasizing the need for a framework capable of capturing the specific variables that characterize the inclusion of students with hearing impairment in Algerian mainstream schools.

Therefore, the research problem of the present study lies in the absence of an operational conceptual framework, grounded in expert consensus, that identifies and organizes the key variables and dimensions representing the reality of integrating students with hearing impairment into mainstream schools in the Algerian context. This problem leads to the following central research question: What are the key conceptual variables and dimensions that constitute the reality of integrating students with hearing impairment into mainstream schools in the Algerian educational context, as determined through expert consensus using the Delphi technique?.

To address this problem, the present study employs the Delphi technique to develop an expert-consensus-based conceptual framework for inclusive education of students with hearing impairment. The Delphi method is appropriate for this purpose because it allows the systematic collection, refinement, and stabilization of expert judgments in areas where

the phenomenon is complex, multidimensional, and insufficiently structured in the existing literature (Jorm, 2015). In the present study, the Delphi process is used to generate relevant variables, evaluate the degree of expert consensus around them, and consolidate them into higher-order constructs that can guide future measurement and educational planning.

2-Key Concepts of the Study

The present study is grounded in a set of core concepts that define its theoretical orientation and analytical boundaries. These concepts are clarified below to ensure terminological precision and internal coherence, particularly in relation to the operationalization of the study variables within the Delphi-based conceptual framework.

-Inclusion (Integration) of Students with Hearing Impairment:

Conceptual Definition: In the field of education, inclusion refers to the systematic integration of learners with disabilities into mainstream schools in ways that ensure equitable access, active participation, and meaningful learning opportunities. The Salamanca Statement (UNESCO, 1994), conceptualizes inclusive education as a process requiring the restructuring of school culture, policies, and practices to accommodate learner diversity.

Operational Definition (as used in this study):
In this study, inclusion denotes the integration of students with hearing impairment into mainstream schools through adaptive pedagogical practices, individualized instructional adjustments, and supportive communicative and social environments that promote equity, belonging, and comprehensive development within regular classrooms.

-Students with Hearing Impairment:

Conceptual Definition: Students with hearing impairment are learners who experience partial or total loss of hearing that significantly affects language acquisition, communication, and access to auditory information in educational settings. Within inclusive education frameworks, this group requires specialized instructional accommodations, visual and multimodal communication strategies, and appropriate assistive technologies to ensure equitable participation in mainstream classrooms(Afrini, 2025).

Operational Definition (as used in this study): In the context of this research, students with hearing impairment refer specifically to learners enrolled in mainstream Algerian schools whose auditory limitations

necessitate adapted pedagogical approaches, communicative adjustments, and institutional support measures to facilitate their academic achievement and social integration.

-Teachers' Readiness:

Conceptual Definition: Teachers' readiness refers to the degree to which educators possess the knowledge base, pedagogical competencies, and professional dispositions necessary to implement inclusive education effectively(Afrini, 2025). It encompasses theoretical understanding of disability and inclusion, instructional adaptability, and a positive orientation toward accommodating diverse learners within mainstream classrooms.

Operational Definition (as used in this study): In this research, teachers' readiness denotes the extent to which mainstream teachers are professionally, pedagogically, and attitudinally prepared to integrate students with hearing impairment. This includes their ability to adapt lesson plans, employ differentiated instructional strategies, utilize assistive technologies, and create communicative environments responsive to learners' specific needs.

-Pedagogical Practices:

Conceptual Definition: Pedagogical practices refer to the instructional strategies, classroom management approaches, and communicative methods employed by teachers to achieve learning objectives while responding to learners' individual characteristics. In inclusive settings, these practices include differentiated instruction, multimodal communication, environmental adaptations, and the use of technological tools to enhance accessibility and engagement(Dewi, Sudadio, & Fadlullah., 2024).

Operational Definition (as used in this study): Within the present study, pedagogical practices denote the inclusive teaching strategies adopted by mainstream teachers to support students with hearing impairment. These practices encompass the use of visual aids, assistive technologies, flexible instructional techniques, adapted assessment procedures, and structured communicative supports designed to facilitate active participation and equitable learning outcomes.

-Barriers to Inclusion:

Conceptual Definition: Barriers to inclusion are defined as the structural, organizational, pedagogical, material, and social factors that constrain the

effective implementation of inclusive education. These barriers may operate at the classroom, school, or systemic level and collectively impede equal participation and access to learning opportunities for students with disabilities.(Dewi, Sudadio, & Fadlullah., 2024)

Operational Definition (as used in this study): In this research, barriers to inclusion refer to the constellation of pedagogical, institutional, material, and socio-cultural challenges that hinder the effective integration of students with hearing impairment in Algerian mainstream schools. These include insufficient teacher training, limited availability of specialized resources and assistive technologies, inadequately adapted infrastructure, and persistent attitudinal constraints that restrict the full realization of inclusive education policies and practices.

3- Methods:

3-1- Research Design:

This study employed a Delphi-based exploratory design to develop an operational conceptual framework for understanding the inclusion of students with hearing impairment in mainstream schools. The Delphi method was selected because the phenomenon under investigation is complex, multidimensional, and insufficiently structured in the Algerian educational context. Rather than imposing predefined variables derived from external measurement tools, the study sought to generate, refine, and stabilize the relevant dimensions through expert consensus.

The Delphi method is particularly appropriate when research aims to establish informed agreement among experts regarding concepts, priorities, practices, or standards in areas where empirical evidence remains incomplete or fragmented(Jorm, 2025). explains that a typical Delphi study involves recruiting experts, asking them to respond independently to structured questionnaires, providing anonymous feedback on group responses, and allowing experts to revise their judgments across successive rounds until a defined level of consensus is reached. This procedural logic supported the present study’s aim of constructing a context-sensitive conceptual model for inclusive education of students with hearing impairment.

3-2- Expert Panel:

The expert panel was constructed through a criterion-based purposive sampling strategy grounded in epistemic adequacy rather than statistical representativeness. In Delphi-based conceptual investigations, the validity of outcomes depends fundamentally on the cognitive authority, field engagement, and theoretical proximity of participants to the phenomenon under examination. Accordingly, panel selection was guided by predefined eligibility standards ensuring disciplinary relevance, sustained professional engagement, and demonstrable contribution to scholarship or practice in hearing impairment and inclusive education.

Beyond formal qualification thresholds, particular emphasis was placed on assembling a panel characterized by cognitive diversity and experiential complementarity. The composition intentionally integrated academic researchers, field practitioners, and hybrid profiles combining both scholarly and applied expertise. This heterogeneity was methodologically deliberate, as it enhances dialectical rigor within iterative consensus processes and mitigates mono-perspectival bias during conceptual generation.

The final panel size (N = 15) aligns with methodological recommendations for homogeneous expert domains in exploratory Delphi research, where emphasis is placed on saturation of informed judgment rather than numerical expansion. Given the focused scope of the inquiry and the specialized nature of the topic, the panel was deemed sufficient to achieve stability of central tendency and convergence of informed opinion across successive rounds.

Anonymity among panel members was strictly preserved throughout all Delphi iterations to minimize authority effects, reduce conformity pressures, and protect the independence of evaluative reasoning. This procedural safeguard reinforced the methodological integrity of the consensus-building process.

3-3- Delphi Procedure

The Delphi process was implemented across three successive rounds. The use of three rounds was determined by the progressive stabilization of expert responses rather than by an arbitrary procedural convention. Each round served a distinct methodological function.

In the first round, experts responded to an open-ended question asking them to identify the main variables that, in their professional judgment,

characterize the reality of integrating students with hearing impairment into mainstream schools. This round aimed to generate variables inductively from expert experience rather than from pre-existing instruments.

In the second round, the variables generated from the first round were transformed into structured statements and presented to the same experts for quantitative evaluation. Experts rated the importance of each statement using a five-point Likert-type scale. This round aimed to determine the degree of agreement around each variable and to identify the most stable and relevant dimensions.

In the third round, the consolidated conceptual structure was returned to the expert panel for confirmation. Experts were asked to re-evaluate the higher-order constructs that emerged from the second round and to indicate whether the proposed framework required further refinement. This round served to verify the stability and acceptability of the final model.

3-4- Data Analysis

Data analysis combined qualitative and quantitative procedures. Responses from the first Delphi round were analyzed using inductive thematic analysis. Expert responses were segmented into meaning units, coded, and grouped into preliminary categories based on semantic similarity and conceptual relevance. The aim of this stage was to preserve the richness of expert input while preparing the material for structured evaluation in the following round.

For the second and third rounds, non-parametric descriptive and inferential statistics were used because Delphi ratings are ordinal in nature. The median was used as an indicator of central tendency, while the interquartile range was used to assess dispersion and stability of responses. Agreement percentage was calculated by combining responses rated as “important” and “very important.”

Consensus was considered high when the agreement percentage reached 80% or higher and the interquartile range was equal to or less than1. Items with lower agreement but stable dispersion were not excluded automatically; rather, they were interpreted in light of their conceptual relevance to inclusive education. This decision was consistent with the study’s conceptual purpose, which aimed to build a coherent framework rather than merely eliminate items statistically.

To examine whether expert ratings reflected meaningful prioritization, the Friedman test was used to identify statistically significant differences among ranked variables, and Kendall's coefficient of concordance was calculated to assess the overall degree of agreement among experts. These procedures strengthened the methodological rigor of the consensus process and supported the transition from individual variables to higher-order constructs.

3-5- Consensus and Model Construction

The final conceptual model was constructed through the integration of statistical indicators and conceptual interpretation. The consolidation of variables was guided by three criteria: semantic proximity, functional interdependence, and theoretical relevance to inclusive education and hearing impairment. Based on this process, the variables were organized into three higher-order constructs: teachers' readiness for inclusion, inclusive pedagogical practices, and barriers to inclusion.

This model reflects the multidimensional nature of inclusive education. Teachers' readiness represents the professional and attitudinal capacity required to implement inclusion. Inclusive pedagogical practices represent the classroom-level translation of readiness into accessible teaching, communication, assessment, and interaction. Barriers to inclusion represent the structural, organizational, material, and psychosocial constraints that may limit the effectiveness of inclusion.

3-6- Ethical Considerations

Participation in the study was voluntary. Experts were informed about the purpose of the study, the nature of their participation, and the confidentiality of their responses. Anonymity was preserved throughout the Delphi rounds to reduce dominance effects, conformity pressure, and authority bias. This procedure is consistent with the basic principles of the Delphi method, which relies on independent expert judgment and controlled feedback rather than direct face-to-face debate.

4- Results

The results are presented according to the three Delphi rounds. The first round generated the initial conceptual domains, the second round assessed the degree of expert consensus on the generated variables, and the third round examined the stability of the consolidated framework.

4-1- Round One: Generation of Initial Conceptual Domains

All 15 experts participated in the first Delphi round. The inductive thematic analysis of their responses produced five preliminary conceptual domains: teachers' readiness, inclusive pedagogical practices, supportive resources and assistive tools, institutional organization and support structures, and the psycho-social dimension of integration.

Teachers' readiness included variables related to specialized pre-service and in-service training, professional experience, attitudes toward inclusion, and awareness of the characteristics of hearing impairment. Inclusive pedagogical practices included instructional differentiation, curriculum and activity adaptation, classroom environment structuring, visual communication, classroom interaction management, and adapted assessment practices. Supportive resources and assistive tools included visual aids, assistive technologies, and teachers' competence in using these tools. Institutional organization and support structures included classroom density, specialized support services, pedagogical supervision, administrative support, and intra-school coordination. The psycho-social dimension included students' sense of support and classroom belonging.

The first round resulted in an initial pool of 22 measurable statements, which were refined and converted into structured evaluative items for the second round.

4-2- Round Two: Quantitative Consensus on Sub-Variables

In the second round, the structured questionnaire was administered to the same panel of 15 experts, with a response rate of 100%. The median, interquartile range, and percentage of agreement were calculated for each item. Agreement was defined as the proportion of experts rating an item as "important" or "very important." High consensus was defined as agreement of 80% or higher combined with an interquartile range equal to or below 1.

Table N°01 : Consensus Indicators for Sub-Variables in Round Two

Sub-Variable	Agreement (%)	Median	IQR	Consensus Level*	Higher-Order Construct (for consolidation)
Specialized / Pre-service / In-service Training	86.7	5	1	High	Teachers' Readiness
Professional Experience	86.7	5	1	High	Teachers' Readiness
Attitudes Toward Inclusion	86.7	5	1	High	Teachers' Readiness
Awareness of Hearing Impairment Characteristics	66.7	5	1	Moderate	Teachers' Readiness
Competence in Using Assistive Tools	66.7	4	1	Moderate	Teachers' Readiness
Adaptation and Differentiation of Teaching Methods	80.0	4	1	High	Inclusive Pedagogical Practices
Curriculum and Activity Adaptation	66.7	4	1	Moderate	Inclusive Pedagogical Practices
Classroom Environment Structuring	60.0	4	1	Moderate	Inclusive Pedagogical Practices
Classroom Interaction Management	66.7	4	1	Moderate	Inclusive Pedagogical Practices
Adapted Assessment Practices	60.0	4	1	Moderate	Inclusive Pedagogical Practices
Availability of Visual Aids	80.0	5	1	High	Inclusive Pedagogical Practices
Availability of Assistive Technology	53.3	4	1	Limited	Barriers to Inclusion
Classroom Density as Structural Constraint	93.3	5	1	Very High	Barriers to Inclusion
Availability of Specialized Support	86.7	5	1	High	Barriers to Inclusion
Pedagogical	80.0	4	1	High	Barriers to

Monitoring / Supervision					**Inclusion**
Clarity of Organizational Procedures	**46.7**	**4**	**1**	**Limited**	**Barriers to Inclusion**
Coordination and Teamwork Within the School	**66.7**	**4**	**1**	**Moderate**	**Barriers to Inclusion**
Organizational Constraints	**80.0**	**5**	**1**	**High**	**Barriers to Inclusion**
Psycho-Social Barriers	**73.3**	**4**	**1**	**Moderate**	**Barriers to Inclusion**
Student's Sense of Support	**93.3**	**5**	**0**	**Very High**	**Barriers to Inclusion**
Student's Level of Classroom Integration	**86.7**	**5**	**1**	**High**	**Barriers to Inclusion**

Source: Authors' own elaboration based on study data.

The results in Table 1 show that all items had stable dispersion values, with IQR values ranging from 0 to 1. Several variables reached high or very high consensus, particularly classroom density as a structural constraint, students' sense of support, specialized training, professional experience, attitudes toward inclusion, availability of specialized support, and students' level of classroom integration. Other variables showed moderate or limited agreement but retained stable dispersion, indicating that experts differed in prioritization rather than in the basic relevance of these variables.

Based on the quantitative indicators and conceptual proximity among items, the sub-variables were consolidated into three higher-order constructs: teachers' readiness for inclusion, inclusive pedagogical practices, and barriers to inclusion.

4-3- Overall Agreement and Ranking Analysis

To examine whether experts significantly differentiated among the evaluated variables, the Friedman test was conducted. Kendall's coefficient of concordance was also calculated to estimate the overall level of agreement among panel members.

Table N°02 : Friedman Test and Kendall's W for Expert Agreement in Round Two

Statistical Indicator	Value
Number of Experts (N)	15
Number of Variables (k)	21
χ^2	155.638
df	20
p-value	p < .001
Kendall's W	0.519

Source: Authors' own elaboration based on study data.

The Friedman test showed significant differences in the ranking of the variables, $\chi^2(20) = 155.638$, $p < .001$. This indicates that experts did not rate all variables uniformly, but rather distinguished among them in a systematic manner. Kendall's coefficient of concordance indicated a moderate level of expert agreement, $W = .519$. These findings provided empirical support for the consolidation of the variables into higher-order constructs.

4-4- Round Three: Stability of the Consolidated Framework

In the third Delphi round, the three higher-order constructs were presented to the expert panel to assess the stability and acceptability of the consolidated conceptual framework. The constructs were: teachers' readiness for inclusion, inclusive pedagogical practices, and barriers to inclusion.

Table N°03 : Stability of Higher-Order Constructs Across Rounds Two and Three

Higher-Order Construct	Round Two Median	Round Two IQR	Round Three Median	Round Three IQR	Stability Interpretation
Teachers' Readiness for Inclusion	5	1	5	1	Stable
Inclusive Pedagogical Practices	4	1	4	1	Stable
Barriers to Inclusion	5	1	5	1	Stable

Source: Authors' own elaboration based on study data.

As shown in Table 3, median values remained unchanged between rounds two and three, and all IQR values remained equal to or below 1. This indicates stability in expert judgments after conceptual consolidation. No substantive restructuring was suggested by the panel in the third round.

Accordingly, the Delphi process was concluded after the third round, as additional rounds were unlikely to produce meaningful changes in the structure of the model.

5- Discussion

The present study aimed to develop an expert-based conceptual framework for understanding the inclusion of students with hearing impairment in mainstream schools. The Delphi process resulted in a stable three-construct model consisting of teachers' readiness for inclusion, inclusive pedagogical practices, and barriers to inclusion. Interpreted through Bronfenbrenner's Ecological Systems Theory, these constructs indicate that inclusion is not determined by a single classroom factor, but by the interaction of multiple ecological layers surrounding the learner. The micro system includes the immediate classroom environment, teacher practices, communication access, peer interaction, and classroom accommodations(Bronfenbrenner, 1979). The mesosystem includes collaboration among teachers, families, support specialists, and school staff. The exosystem includes administrative decisions, availability of support services, supervision, and resource allocation. The macro system includes broader educational policy, cultural assumptions about disability and deafness, and the institutional interpretation of inclusive education. This ecological interpretation is consistent with studies that apply ecological systems theory to inclusive classrooms for learners with hearing impairment, emphasizing the interaction between classroom organization, accommodations, professional collaboration, administrative structures, and cultural beliefs about access and participation.

5-1- Teachers' Readiness for Inclusion:

The first construct, teachers' readiness for inclusion, received strong expert consensus, particularly in relation to specialized training, professional experience, and attitudes toward inclusion. This finding suggests that experts viewed teachers as the immediate agents through whom inclusive policy becomes educational practice. From an ecological perspective, teacher readiness belongs primarily to the learner's microsystem because it directly shapes daily instruction, communication, assessment, and classroom interaction. However, it is also influenced by exosystemic factors such as teacher preparation programs, in-service training, supervision, and institutional support.

This finding is consistent with Akshatha et al. (2024), who reported that teachers' attitudes and perceptions are important indicators of the success of inclusive education for children with hearing impairment. Their study also showed that inclusive education may be difficult to implement when teachers lack academic resources, expertise, and training, and concluded that awareness and training programs are necessary to strengthen inclusive implementation. Similarly, (Akay, 2023)found that teachers' knowledge of hearing loss, assistive devices, physical environment, and language development is strengthened through in-service training, and that such knowledge supports the academic and social development of students with hearing loss in inclusive environments. Therefore, the present study's emphasis on teacher readiness confirms that inclusion cannot be reduced to placement; it depends on the teacher's professional capacity to respond to the communicative, linguistic, academic, and social needs of students with hearing impairment(Açar & Demiralp, 2025).

The result also supports the orientation found in the original manuscript, which identified specialized training, professional experience, attitudes toward inclusion, awareness of hearing impairment, and competence in using assistive tools as core components of teachers' readiness. The moderate agreement observed for awareness of hearing impairment characteristics and competence in using assistive tools does not necessarily weaken their relevance. Rather, it may indicate variation among experts in prioritizing these sub-variables, possibly because they are perceived as dependent on broader training systems and school-level support.

5-2- Inclusive Pedagogical Practices:

The second construct, inclusive pedagogical practices, reflects the instructional translation of teacher readiness into classroom action. This construct included adaptation and differentiation of teaching methods, curriculum and activity adaptation, classroom environment structuring, classroom interaction management, adapted assessment practices, and the availability of visual aids. From the perspective of ecological systems theory, these practices belong to the microsystem because they are embedded in the learner's immediate classroom experience. They determine whether the classroom becomes an accessible learning environment or merely a physical placement setting.

This result is strongly supported by (Silvestri & Hartman, 2022)who argued that the experiences of deaf and hard-of-hearing students in mainstream classrooms may be either inclusive or restrictive depending on the degree of accessibility and social integration. Their review also emphasized communication access, social-emotional considerations, classroom technology, Universal Design for Learning, and culturally responsive education as important pathways toward more effective inclusion. This aligns with the present study's identification of visual aids, classroom interaction management, and adapted practices as essential components of inclusive pedagogy.

The finding also corresponds with (Odhiambo, Ouko, & Onchari, 2024), whose study on learners with hearing impairments(Açar & Demiralp, 2025) in inclusive classrooms found that classroom accommodations such as proper lighting, preferential seating, visual accessibility, noise reduction, and appropriate physical arrangement are key conditions for inclusive learning. The same study emphasized that the classroom is the learner's most immediate ecological environment and that accommodations such as visual aids, captioning, sign language interpretation, amplification devices, and assistive listening systems can remove barriers to participation(Kiiza & Mwesigwa, 2025). This supports the present study's finding that inclusive pedagogical practices should include environmental structuring and visual communication, not only differentiated instruction(Villarente & Donayre, 2025)

However, the moderate levels of agreement on some pedagogical variables, such as curriculum adaptation, classroom environment structuring, interaction management, and adapted assessment, may indicate that these practices are still not consistently conceptualized as central dimensions of inclusion in some educational contexts. This is important methodologically because it shows that the Delphi process did not merely confirm what is already taken for granted; rather, it revealed areas where expert consensus is stable but not equally strong. This finding can be interpreted as evidence of the need for clearer operational definitions of inclusive classroom practices for students with hearing impairment in the Algerian context.

5-3- Barriers to Inclusion

The third construct, barriers to inclusion, included structural, organizational, technological, and psychosocial constraints. Among these,

classroom density, availability of specialized support, organizational constraints, students' sense of support, and students' level of classroom integration received particularly strong agreement. This finding indicates that experts conceptualized inclusion as an ecological process shaped not only by teacher competence and classroom methods, but also by broader institutional conditions.

From an ecological perspective, these barriers operate across several systems. Classroom density and classroom noise affect the microsystem because they directly constrain communication, visual access, teacher attention, and individualized support. Coordination and teamwork represent the mesosystem because they depend on relationships among classroom teachers, specialist teachers, administrators, families, and support personnel. Availability of specialized support, supervision, and organizational procedures belong to the exosystem because they are shaped by school administration and educational authorities. Broader policy assumptions and cultural views of disability form part of the macrosystem.

This ecological reading is supported by (Akay, 2023)who found that teachers reported problems related to crowded classrooms, insufficient course materials, limited cooperation in individualized education processes, and lack of systematic support services. The study also emphasized that reducing classroom size and noise, improving physical conditions, and providing systematic support services are important for students with hearing loss in inclusive settings. These findings are directly consistent with the present study, in which classroom density reached one of the highest levels of agreement as a structural constraint.

The results also align with (Odhiambo, Ouko, & Onchari, 2024), who reported that large class sizes and limited visual aids reduced one-to-one contact time between teachers and learners with hearing impairments, thereby affecting learners who require more time and more accessible input to understand classroom content. In addition, the absence of assistive devices and sign language interpretation was found to contribute to difficulties in understanding lessons and completing assigned tasks. This supports the present study's inclusion of assistive technology, specialized support, and psychosocial barriers within the broader construct of barriers to inclusion.

The relatively lower agreement on some organizational variables, such as clarity of organizational procedures, should not be interpreted as evidence

of irrelevance. Rather, it may reflect differences in experts' experiences across educational settings. Some experts may perceive organizational procedures as central, while others may view them as secondary compared with more visible classroom-level barriers such as density, lack of support, and limited resources. This variation reinforces the value of the Delphi method in distinguishing between highly salient variables and variables that remain conceptually relevant but less strongly prioritized.

5-4- Psycho-Social Inclusion and Belonging

One of the most important findings of this study is the high level of agreement on students' sense of support and students' level of classroom integration. This suggests that experts did not conceptualize inclusion merely as academic access or physical placement. Rather, they viewed inclusion as involving belonging, participation, interaction, and psychosocial security. This is particularly significant for students with hearing impairment because communication barriers may produce social isolation even when students are formally placed in mainstream classrooms.

This interpretation is consistent with (Silvestri & Hartman, 2022)who noted that mainstream placement may produce isolating and inaccessible experiences for deaf and hard-of-hearing students when communication access, peer interaction, and social-emotional needs are not adequately addressed.(Mura, Bullegas, & Scanu, (2025)) It is also consistent with (Alanazi, 2021), who emphasized that communication style plays a central role in enabling deaf students to engage with others, maintain interaction, and build friendships with hearing peers. Within an ecological framework, belonging emerges from the interaction between the learner and the microsystem of classroom communication, peer relations, teacher responsiveness, and accessible participation.

The finding therefore adds an important contribution to the field: any diagnostic framework for inclusive education of students with hearing impairment should include psychosocial indicators, not only instructional or organizational indicators. A school may provide formal access to mainstream education while still failing to create a socially inclusive environment. This distinction is especially important in contexts where inclusion is often measured through enrollment or placement rather than through participation, interaction, and belonging.

5-5- Theoretical Contribution

The three-construct model developed in this study contributes to inclusive education research by offering an ecological and operational structure for analyzing the inclusion of students with hearing impairment. Teachers' readiness represents the professional capacity within the learner's immediate educational environment. Inclusive pedagogical practices represent the classroom mechanisms through which accessibility and participation are enacted. Barriers to inclusion represent the institutional, material, organizational, and psychosocial conditions that either support or constrain effective inclusion.

This structure corresponds with ecological systems theory because it shows that inclusion is not located in the child alone, nor in the teacher alone, nor in the school policy alone. Instead, it results from continuous interaction among classroom practices, professional collaboration, institutional resources, and cultural understandings of disability. The model therefore moves beyond deficit-based interpretations of hearing impairment and supports a contextual interpretation of inclusion in which barriers are understood as features of educational environments that can be modified.

5-6- Practical Implications

The findings have several practical implications. First, teacher training programs should include specialized content on hearing impairment, communication access, assistive technologies, visual pedagogy, classroom interaction, and adapted assessment. Second, schools should develop structured support systems involving classroom teachers, special education teachers, school administrators, families, and specialists. Third, classroom environments should be reviewed in terms of lighting, seating, noise reduction, visual access, availability of visual aids, and assistive technologies. Fourth, educational supervisors and policymakers should avoid evaluating inclusion only through enrollment indicators and should instead examine students' participation, sense of support, and classroom belonging.

These implications are supported by (Akay, 2023), who emphasized teamwork involving classroom teachers, teachers of students with hearing impairment, guidance counselors, school administrators, and families as a key condition for successful inclusion

. They are also consistent with (Odhiambo, Ouko, & Onchari, 2024)who recommended improving classroom physical conditions and resources to promote inclusive learning for learners with hearing impairments.

5-7- Limitations and Future Research

This study has several limitations. First, the framework was developed through expert consensus and therefore requires further empirical validation with larger samples of teachers, administrators, students with hearing impairment, and families. Second, the study was situated in the Algerian educational context; therefore, its transferability to other contexts should be examined cautiously. Third, the Delphi technique provides a structured consensus model, but it does not replace direct observation of classroom practices or the lived experiences of students with hearing impairment.

Future research should develop a measurement scale based on the three constructs identified in this study and examine its psychometric properties. Further qualitative studies should explore the lived experiences of students with hearing impairment in Algerian mainstream schools, particularly their perceptions of communication access, peer interaction, teacher support, and belonging. Comparative studies across educational stages, school types, and regions would also help determine whether the proposed framework functions consistently across different ecological contexts.

- Conclusion

This study aimed to construct an operational and analytically grounded framework for examining the reality of integrating students with hearing impairment in mainstream schools. Through a structured three-round Delphi process, expert convergence stabilized around three interdependent higher-order constructs: Teachers' Readiness for Inclusion, Inclusive Pedagogical Practices, and Barriers to Inclusion. The methodological rigor applied—combining qualitative generation, quantitative prioritization, and stability confirmation—ensures that the resulting model is not merely descriptive but structurally validated.

The findings demonstrate that inclusion cannot be adequately conceptualized as a unidimensional reform centered solely on placement or policy compliance. Rather, it emerges from the dynamic interaction between human capacity, pedagogical enactment, and institutional conditions. The

prominence of teacher-related variables underscores the mediating role of professional competence in transforming inclusive intent into effective practice, while the persistence of structural constraints confirms that systemic alignment remains indispensable.

Importantly, the study establishes that investigating the reality of integrating students with hearing impairment requires an integrated analytical lens encompassing these three constructs. Fragmented analytical approaches risk underestimating the complexity of inclusion as a multi-level educational process.

By articulating a context-sensitive yet theoretically coherent framework, this research contributes to the ongoing effort to move beyond declarative inclusion toward operational effectiveness. The model provides a structured foundation for empirical validation, comparative inquiry, and evidence-informed policy development within mainstream educational systems.

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