T I E Journal
Volume 4 Issue 2, 2026
http://ijtie.com/v402/n40242
ISSN: 2820-7521

The International Journal of Technology, Innovation, & Education

Designing a Digital ADHD Screening Tool for Moroccan Kindergartens: Inclusive Early Education and Social Change

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Received: March 07, 2026; **Accepted**: April 28, 2026; **Published**: June 07, 2026

Abstract

Inclusive early childhood education in Morocco has emerged as a national policy priority; however, practical mechanisms for identifying neurodevelopmental conditions such as Attention Deficit Hyperactivity Disorder (ADHD) remain largely absent from kindergarten settings. This study reports on the design and initial feasibility testing of a digital ADHD screening tool co-developed with Moroccan preschool teachers, grounded in the principles of Universal Design for Learning (UDL), inclusive pedagogy, and Design-Based Research (DBR). An online survey was distributed to hundreds of teachers across multiple Moroccan regions over several months, yielding 15 responses. The low response rate is itself a finding, reflecting systemic challenges of teacher engagement with ADHD-related discourse. Among respondents, ADHD-like behaviors were observed regularly: difficulty following instructions (M = 2.67), inattention (M = 2.53), and hyperactivity (M = 2.33) on a 0–4 scale. Only five teachers (33%) had ever used structured observation tools, and more than half reported no institutional referral or support mechanisms. Nevertheless, 14 of 15 teachers expressed willingness or potential willingness to adopt a digital tool, prioritizing multilingual accessibility (Arabic, French, and Darija), printable reports, and actionable pedagogical guidance. The findings demonstrate an urgent need for culturally adapted, teacher-centered digital resources capable of bridging the persistent gap between inclusive education policy and classroom practice in Morocco.

Keywords: ADHD, inclusive education, digital tools, early childhood, Morocco

Hamzaoui, O., & Mrah, I. (2026). Designing a digital ADHD screening tool for Moroccan kindergartens: Inclusive early education and social change. *The International Journal of Technology, Innovation, and Education, 4*(2), 314–337. https://ijtie.com/v402/n40242

1. Introduction

The landscape of early childhood education is undergoing significant transformation worldwide as schools, policymakers, and communities increasingly embrace the imperative of inclusive education. Inclusion is not merely a pedagogical aspiration; it is now positioned as a cornerstone of educational justice and social equity. Within this framework, the early identification of neurodevelopmental conditions, particularly Attention Deficit Hyperactivity Disorder (ADHD), is of central importance. ADHD, characterized by persistent patterns of inattention, hyperactivity, and impulsivity, is one of the most prevalent childhood conditions that can hinder learning and social adjustment if left unaddressed. Globally, research emphasizes that early detection and intervention can mitigate negative outcomes, support positive developmental trajectories, and foster classroom environments where diverse learners thrive (Ward et al., 2020).

In Morocco, inclusive education has become a prominent policy goal, driven by international commitments such as the Sustainable Development Goals (SDGs) and national reforms aimed at expanding access and equity. The Ministry of National Education launched a National Program for Inclusive Education in 2019, emphasizing the integration of learners with disabilities into mainstream schools. However, while policy discourse promotes integration, practical mechanisms for early screening and teacher support remain limited. Children exhibiting ADHD-like behaviors are frequently misunderstood, misclassified, or left without adequate support, perpetuating cycles of underachievement and stigma (Kadiri, 2022; Achamrah, 2022).

This article addresses these systemic gaps by presenting the design and initial testing of a digital ADHD screening tool tailored for Moroccan kindergarten classrooms. Grounded in UDL and inclusive pedagogy, the tool was co-developed using a DBR methodology. Unlike conventional diagnostic approaches, it emphasizes teacher empowerment through practical checklists, observation prompts, and immediate pedagogical suggestions. Survey data from 15 Moroccan preschool teachers, collected despite wide dissemination to hundreds of educators across multiple platforms, reveal consistent patterns of observed ADHD-like behavior alongside critical gaps in training, tools, and institutional support.

The remainder of this article is structured as follows. The literature review outlines the theoretical foundations of the project, focusing on ADHD in early education, teacher knowledge, inclusive education in Morocco, UDL, inclusive pedagogy, DBR, and sociocultural perspectives. The method section explains the research design and survey procedures. The

results section presents teacher responses organized by survey domain. The discussion interprets findings in light of existing scholarship and systemic challenges. A concluding section proposes implications, recommendations, and a standalone conclusion.

1.1. Background of the Study

ADHD is among the most commonly diagnosed neurodevelopmental disorders in school-aged populations worldwide, with prevalence estimates ranging from 5% to 7% (Ward et al., 2020). Symptoms typically manifest before formal schooling begins, making early childhood settings critical for detection and support. In Morocco, inclusive education reforms have expanded teacher awareness in principle, yet the practical implementation gap remains wide (Kadiri, 2022). Preschool settings lack standardized mechanisms for detecting or supporting ADHD, and children showing signs of inattention or hyperactivity are frequently labeled as difficult rather than recognized as requiring differentiated support. This study's finding that only 15 teachers responded to a widely disseminated survey underscores this systemic challenge, pointing to the need for tools that are culturally sensitive, contextually adapted, and directly relevant to teachers' daily realities.

1.2. Research Questions

This study is guided by the following central question: How can a digital ADHD screening tool support Moroccan preschool teachers in the early identification of attentional and behavioral difficulties, and how might such a tool contribute to inclusive education practices and systemic reform? This overarching question is addressed through four sub-questions: (a) What levels of ADHD knowledge and training do Moroccan preschool teachers currently report, and how do gaps manifest in classroom practice? (b) How frequently do teachers observe ADHD-like behaviors, and how do they respond in the absence of formal tools? (c) What institutional support mechanisms exist, and how do their absence or presence affect teacher action? (d) To what extent are teachers willing to adopt a digital ADHD screening tool, and what features do they regard as essential for usability and cultural relevance?

2. Literature Review

2.1. ADHD in Early Childhood Education

ADHD is a neurodevelopmental condition characterized by persistent patterns of inattention, hyperactivity, and impulsivity that interfere with functioning or development (American

Psychiatric Association [APA], 2013). Its global prevalence is estimated between 5% and 7% among school-aged children, though rates vary by diagnostic criteria and context (Ward et al., 2020). Symptoms typically appear before age 12 and can be visible in preschool years, making early childhood settings critical for detection. Research consistently shows that children with ADHD face heightened risks of academic underachievement, peer rejection, and behavioral difficulties if their needs go unrecognized (Frolli et al., 2023). Early intervention improves outcomes by providing timely support; however, this depends on teacher awareness, institutional mechanisms, and access to screening tools (DuPaul et al., 2011; Polanczyk et al., 2015). Globally, studies reveal that teachers often feel underprepared to identify ADHD, particularly in preschool settings where behaviors may be attributed to developmental immaturity rather than neurodevelopmental differences (Ward et al., 2020; Sciutto et al., 2000).

2.2. Teacher Knowledge, Training, and the Knowledge–Practice Gap

Teacher training is a crucial determinant of how effectively educators recognize and support children with ADHD. Studies across multiple countries show that structured training programs increase teachers' theoretical knowledge, but these gains often fail to translate into classroom practice without applied tools and institutional backing (Ward et al., 2020; Kos et al., 2004). Teachers report higher confidence immediately following training, but in the absence of ongoing support, their ability to identify and intervene declines over time. In low- and middle-income countries, this gap is compounded by limited resources, large class sizes, and minimal specialist support (Charach et al., 2011).

In Morocco, research highlights similar patterns. While national reforms emphasize inclusive education, implementation remains inconsistent. Teachers may receive some professional development on special educational needs, but this is often theoretical rather than applied (Achamrah, 2022). Institutional mechanisms such as referral systems or school-based specialists are limited, leaving teachers to rely on personal judgment. This situation increases the risk of misinterpretation, stigmatization, and missed opportunities for early support, reinforcing the case for practical, teacher-ready digital resources (Kadiri, 2022).

2.3. Inclusive Education and Neurodiversity in Morocco

Morocco’s educational system has undergone significant reform in recent decades, with increasing emphasis on inclusion. The 2019 National Program for Inclusive Education seeks to integrate children with disabilities into mainstream schools. While this marks an important step

toward equity, studies show that inclusion remains more aspirational than operational in classroom practice (Kadiri, 2022). Teachers often express willingness to support diverse learners but face challenges including overcrowded classrooms, limited resources, and inadequate training (Achamrah, 2022). Cultural factors also shape the experience of ADHD in Morocco: awareness of neurodevelopmental conditions is limited, stigma surrounding mental health remains strong, and parents may resist labeling their child with ADHD for fear of social consequences (Belhadj et al., 2006). These dynamics create a context in which teachers are aware of behavioral difficulties but lack systemic pathways to act, underscoring the need for culturally responsive tools that normalize ADHD screening as a professional practice rather than a deficit-labeling exercise.

2.4. Universal Design for Learning (UDL)

The Universal Design for Learning (UDL) framework provides a powerful lens for rethinking early childhood education in inclusive terms. Developed from research in cognitive neuroscience and instructional design, UDL holds that variability is the norm in learning, not the exception. Its three core principles — multiple means of engagement, representation, and action and expression — provide actionable guidance for responding to learner variability (CAST, 2018). For children with ADHD, UDL offers practical strategies: breaking tasks into smaller steps, incorporating movement into learning, using visual schedules, and offering alternative modes of participation. Studies confirm that UDL-based practices enhance both academic and behavioral outcomes for learners with ADHD (Frolli et al., 2023). Importantly, UDL reframes ADHD not as a deficit but as one form of learner variability, thereby reducing stigma and promoting systemic inclusion.

2.5. Inclusive Pedagogy

Inclusive pedagogy complements UDL by emphasizing the ethical and relational dimensions of teaching. It holds that inclusion is not simply about adding accommodations for specific learners but about designing environments where all learners feel valued (Florian, 2014). Inclusive pedagogy challenges teachers to move beyond a medicalized view of ADHD and instead adopt a strengths-based perspective that recognizes children's capacities alongside their challenges. In Moroccan preschools, adopting inclusive pedagogy would require a shift from deficit-based narratives, labeling children as difficult, to approaches that view attentional and behavioral differences as opportunities for pedagogical innovation. Research consistently

shows that inclusive practices are more successful when teachers view diversity as a resource rather than a burden (Achamrah, 2022; Sharma et al., 2012).

2.6. Design-Based Research (DBR)

This study is framed within Design-Based Research (DBR), a methodological approach that emphasizes iterative, collaborative, and contextually grounded innovation. DBR integrates theory and practice by involving stakeholders — in this case, teachers — in the co-creation of tools and interventions (Anderson & Shattuck, 2012). It is particularly suited to complex educational challenges where solutions must be adaptable to local contexts. In ADHD-related research, DBR has been used to develop participatory interventions that empower teachers to adapt strategies based on real classroom needs (Carr-Fanning et al., 2025). For Morocco, where systemic support is limited and teacher engagement is uneven, DBR offers a framework for building locally relevant, teacher-owned solutions rather than importing models from other contexts.

2.7. Sociocultural Perspectives on ADHD and Inclusion

A sociocultural perspective highlights how ADHD is understood not only as a clinical category but also as a socially constructed phenomenon influenced by cultural norms, educational expectations, and societal attitudes (Timimi & Taylor, 2004). In Morocco, where concepts of childhood, discipline, and academic achievement are deeply shaped by cultural values, ADHD may be interpreted differently than in Western contexts. Behaviors such as restlessness or inattentiveness may be attributed to parenting or discipline issues rather than recognized as neurodevelopmental traits. This perspective underscores the importance of designing tools that are culturally sensitive and linguistically accessible. Teachers in this study emphasized the need for Arabic, French, and Darija interfaces — an indication that inclusivity in Morocco must account for linguistic diversity as well as pedagogical adaptation. Comparative evidence from similar low- and middle-income country contexts, including studies from Egypt and the broader MENA region, suggests that culturally adapted screener tools significantly improve teacher uptake and reduce stigma-related barriers (Faraone et al., 2021; Charach et al., 2011).

2.8. Theoretical Integration

Taken together, these frameworks, UDL, inclusive pedagogy, DBR, and sociocultural perspectives, provide a comprehensive foundation for the present study. They establish that early ADHD screening in Moroccan kindergartens is not a purely technical task but one that requires: recognition of learner variability (UDL); commitment to valuing all learners (inclusive

pedagogy); development of practical, co-created solutions (DBR); and sensitivity to cultural and social contexts (sociocultural perspectives). By integrating these perspectives, this study situates the proposed digital tool not as a diagnostic device alone, but as a catalyst for systemic change — intended to empower teachers, reduce stigma, and bridge the gap between inclusive education policy and practice in Morocco.

3. Methodology

3.1. Research Design

This study adopted a mixed descriptive and exploratory design within the broader framework of Design-Based Research (DBR). The purpose was to document teacher perceptions and classroom realities regarding ADHD and to generate preliminary empirical insights to inform the design of a digital screening tool. DBR was selected as the guiding framework because it emphasizes iterative, participatory, and contextually grounded innovation (Carr-Fanning et al., 2025; Anderson & Shattuck, 2012). This represents an initial, exploratory stage; subsequent DBR iterations will involve prototype development, classroom piloting, and refinement based on participant feedback.

The study combined quantitative survey items, frequency-of-observed-behaviors scales, binary training and support variables, with open-ended qualitative prompts allowing teachers to elaborate on training experiences, challenges, and concerns. This dual strategy provided both numerical indicators of teacher experience and descriptive data to contextualize these patterns.

3.2. Participants

Table 1 presents the demographic profile of the 15 Moroccan kindergarten teachers who participated in this study. Participants were drawn from urban (n = 9), rural (n = 4), and semi-urban (n = 2) locations, and worked predominantly in public schools (n = 13), with two in private institutions. The sample was overwhelmingly female (n = 14), reflecting the gender distribution typical of Moroccan early childhood education. The largest age group was 30–39 years (n = 9), followed by 18–29 years (n = 4). Educational attainment varied from Baccalauréat (n = 5) to Licence/Bachelor's degree (n = 8), with one respondent each holding a Master's degree and a teaching certificate. Teaching experience ranged from 0–2 years (n = 2) to more than 10 years (n = 2), with the modal group at 3–5 years (n = 8).

The sample size of 15 teachers, though small, reflects a significant constraint: the survey was disseminated to several hundred teachers across multiple regions and time periods, yet yielded

a very low response rate. Given these constraints, the study makes no claim to statistical representativeness. Rather, it presents descriptive patterns and exploratory insights appropriate to the DBR stage of inquiry. Findings should be interpreted as indicative, offering a foundation for larger-scale validation studies.

Table 1. *Demographic Profile of Participants (n = 15)*

Variable	Category	Frequency	Percentage
Gender	Female	14	93%
	Male	1	7%
Age	18–29 years	4	27%
	30–39 years	9	60%
	40–49 years	1	7%
	50+ years	1	7%
Education	Baccalauréat	5	33%
	Licence (Bachelor's)	8	53%
	Master’s degree	1	7%
	Teaching certificate	1	7%
Teaching experience	0–2 years	2	13%
	3–5 years	8	53%
	6–10 years	3	20%
	10+ years	2	13%
School type	Public	13	87%
	Private	2	13%
School location	Urban	9	60%
	Rural	4	27%
	Semi-urban	2	13%

3.3. Instruments

The primary research instrument was a Google Forms survey developed by the first researcher. The survey instrument was reviewed by the supervising co-author and by two colleagues with experience in inclusive education research prior to distribution, serving as a

form of expert validation. Minor item wording adjustments were made following this review. The instrument comprised seven sections: (1) demographic variables (gender, age, educational level, years of experience, school type, location); (2) professional context (class size, ADHD or special educational needs [SEN] training exposure); (3) knowledge and confidence (self-evaluations of ADHD knowledge and symptom familiarity); (4) observed behaviors (frequency scales, 0 = never to 4 = always, for inattentiveness, hyperactivity, and difficulty following instructions); (5) institutional support (availability of referral services or support for suspected ADHD cases); (6) digital tool openness (willingness to adopt a digital ADHD screening tool, preferred features, and concerns); and (7) open-ended prompts for teachers to elaborate on their training, challenges, and reservations. The full survey instrument is included in the Appendix.

3.4. Data Collection Procedure

The survey was disseminated electronically through teacher networks, social media groups, and professional education forums across multiple Moroccan regions. Despite repeated sharing over several months to reach hundreds of teachers, only 15 responses were obtained. This low response rate was interpreted as data in itself, potentially reflecting teacher workloads, limited awareness of ADHD, stigma surrounding neurodevelopmental conditions, or reluctance to engage in research perceived as time-consuming. In DBR terms, this disengagement highlights the necessity of designing tools that are not only pedagogically useful but also accessible, non-burdensome, and clearly relevant to teachers' professional realities.

3.5. Data Analysis

Quantitative data were analyzed using descriptive statistics (frequency counts, means, and percentages) for categorical and Likert-type responses. Key variables included frequency of ADHD-like behaviors, prevalence of training, levels of confidence, and openness to digital tools. Qualitative data from open-ended responses were coded thematically by the first researcher using an inductive approach, identifying patterns in training experiences, challenges, motivations for tool adoption, and concerns about implementation. A second coding pass was conducted by the co-author to verify thematic consistency. Given the small sample, no formal inter-rater reliability coefficient was calculated; rather, discrepancies were resolved through discussion until consensus was reached. Qualitative themes were then integrated with quantitative results to provide a richer, contextualised interpretation of the findings.

3.6. Ethical Considerations

Participation was voluntary. Informed consent was obtained via the Google Form prior to recording responses. The survey was anonymous, collecting no identifying information beyond general demographic categories. Respondents were informed that data would be used solely for research purposes and would contribute to the development of inclusive educational resources.

4. Results

This section presents the findings of the survey organized into five domains: demographics and professional background, training and knowledge of ADHD, classroom experiences and observed behaviors, confidence and institutional support, and openness to digital screening tools.

4.1. Demographics and Professional Background

Table 1, presented in the Method section, shows the demographic profile of the 15 participants. The sample was overwhelmingly female (n = 14, 93%), predominantly aged 30–39 years (n = 9, 60%), and employed mainly in public schools (n = 13, 87%). The majority held a ‘Licence’ degree (n = 8, 53%), and the modal teaching experience band was 3–5 years (n = 8, 53%). Urban settings were most represented (n = 9, 60%). Class sizes varied: seven teachers had classes of 15–25 students, four reported more than 25, and four had fewer than 15 students.

4.2. Training and Knowledge of ADHD

Table 2 summarizes teacher training and ADHD knowledge. Nine teachers (60%) reported having received training related to ADHD or SEN, while six (40%) had not. Self-evaluations of ADHD knowledge were relatively positive: nine teachers (60%) reported good knowledge, five (33%) moderate knowledge, and one (7%) none. Familiarity with ADHD symptoms showed similar patterns, with most respondents (n = 10, 67%) indicating moderate familiarity, four (27%) strong familiarity, and one (7%) none.

Despite these levels of reported theoretical knowledge, only five teachers (33%) had ever used structured observation tools or behavioral checklists in practice. As shown in Table 2, this confirms the knowledge–practice gap identified in the literature (Ward et al., 2020; Kos et al., 2004).

Table 2. *Teacher Training and Knowledge of ADHD (n = 15)*

Variable	Category	Frequency	Percentage
Received ADHD/SEN training	Yes	9	60%
	No	6	40%
Self-rated ADHD knowledge	Good	9	60%
	Moderate	5	33%
	None	1	7%
Familiarity with symptoms	Strong	4	27%
	Moderate	10	67%
	None	1	7%
Use of structured observation tools	Yes	5	33%
	No	10	67%

4.3. Classroom Experiences and Observed Behaviors

Table 3 presents the frequency of observed ADHD-like behaviors. Eleven teachers (73%) reported having suspected ADHD in a child in their classroom, while four (27%) had not. Using a scale of 0 (never) to 4 (always), teachers rated how often they observed three core behavioral indicators. Difficulty following instructions yielded the highest mean score (M = 2.67, approaching often), followed by inattention (M = 2.53, between sometimes and often), and hyperactivity (M = 2.33, slightly above sometimes).

Table 3. *Frequency of Observed ADHD-like Behaviors (n = 15)*

Behavior	Mean (0–4)	Never	Sometimes	Often	Always
Inattention	2.53	0	8	6	1
Hyperactivity	2.33	1	7	7	0
Difficulty following instructions	2.67	0	8	4	3

The distribution of responses further illustrates consistency: difficulty following instructions was rated always by three teachers, suggesting it is a pervasive, daily challenge in some classrooms. Inattention was rated sometimes by eight teachers and often by six. Hyperactivity showed a bimodal pattern, rated sometimes and often by seven teachers each. These data

suggest that ADHD-related behaviors are not isolated events but regularly encountered realities in Moroccan preschool classrooms.

4.4. Confidence and Institutional Support

Table 4 presents teacher confidence and institutional support data. Results showed that 11 teachers (73%) reported feeling somewhat capable of responding to suspected ADHD cases, while 4 teachers (27%) reported feeling very capable. No teacher reported feeling entirely incapable. When asked about institutional support, 8 teachers (53%) reported no school-level referral or support system, 4 teachers (27%) reported that such mechanisms existed, and 3 teachers (20%) were unsure. This demonstrates that while teacher confidence was moderate, systemic support structures were weak or absent, leaving teachers without reliable pathways to act on their observations.

Table 4. *Teacher Confidence and Institutional Support (n = 15)*

Variable	Category	Frequency	Percentage
Confidence in responding to ADHD	Somewhat capable	11	73%
	Very capable	4	27%
	Not capable	0	0%
School-level referral/support system	Yes	4	27%
	No	8	53%
	Unsure	3	20%

4.5. Openness to Digital Screening Tools

Table 5 summarizes teacher openness to digital tools. When asked about their willingness to adopt a digital ADHD screening tool, 9 teachers (60%) answered yes, 5 teachers (33%) answered maybe, and 1 teacher (7%) answered no. Together, 14 of 15 respondents thus indicated some degree of openness. Key motivations included ease of use, the ability to generate printable reports for parents and administrators, and guidance on follow-up actions. Language accessibility was prominently mentioned: teachers requested Arabic and French interfaces, with several explicitly citing Darija as essential for communicability with families. Concerns were limited but noteworthy; the most common issue raised was potential parental resistance, reflecting the stigma attached to ADHD in Moroccan society.

Table 5. *Teacher Openness to Digital Screening Tools (n = 15)*

Variable	Category	Frequency	Percentage
Willingness to adopt digital tool	Yes	9	60%
	Maybe	5	33%
	No	1	7%
Preferred languages	Arabic, French, Darija	—	—
Key motivations	Ease of use; printable reports; guidance	—	—
Main concern	Parental resistance / stigma	—	—

5. Discussion

This section interprets the survey findings and situates them within the broader literature on ADHD, inclusive pedagogy, and Moroccan education reform. The discussion is organized around five themes: teacher training and the knowledge–practice gap; the significance of observed behaviors; teacher confidence and systemic support gaps; digital tools as a pathway forward; and broader implications for inclusive pedagogy and systemic reform.

5.1. Teacher Training and the Knowledge–Practice Gap

The finding that most teachers rated their ADHD knowledge as good (60%) or moderate (33%) suggests a relatively high level of awareness among Moroccan preschool educators. Yet the fact that only 5 of 15 teachers (33%) had ever used structured observation tools reveals a persistent knowledge–practice gap. Theoretical awareness of ADHD does not, in itself, translate into systematic classroom identification. This aligns with international evidence demonstrating that training programs increase knowledge but fail to produce sustained classroom change without ongoing institutional support and practical tools (Ward et al., 2020; Kos et al., 2004). In Morocco, where professional development tends to emphasize awareness rather than applied strategies, this gap is particularly pronounced (Achamrah, 2022).

The practical implication is significant: teachers are not uninformed, but they are under-equipped. Knowledge of what ADHD is does not automatically generate confidence about what to do when a child displays persistent attentional or behavioral difficulties. The strong teacher preference for actionable digital tools — with built-in guidance on next steps — directly reflects this reality. Morocco's inclusive education reforms will remain constrained unless teachers are

provided with tools that translate policy aspirations into usable classroom practices (Kadiri, 2022).

5.2. Observed Behaviors and the Importance of Early Identification

Teachers in this study consistently reported observing ADHD-like behaviors. Difficulty following instructions registered the highest mean score (M = 2.67), a finding that warrants particular attention: three teachers rated this behavior as always present, indicating pervasive and potentially disruptive patterns in their classrooms. These data suggest that ADHD-related challenges are not rare outliers but regularly encountered realities in Moroccan preschool settings. This is consistent with global prevalence estimates and with research confirming that ADHD symptoms are observable from the preschool years (DuPaul et al., 2011; Polanczyk et al., 2015).

The absence of structured tools for documenting these behaviors means that teacher observations remain informal, unstandardized, and therefore difficult to communicate to parents or administrators. Without systematic screening, children who consistently display ADHD-like behaviors risk being labeled as problematic rather than recognized as requiring differentiated support. This perpetuates stigma and delays intervention, undermining individual learning trajectories and broader inclusive education goals (Frolli et al., 2023; Charach et al., 2011).

5.3. Teacher Confidence and Systemic Support Gaps

The majority of teachers (73%) described themselves as somewhat capable of responding to children with ADHD-like behaviors, while 27% felt very capable. This moderate confidence is noteworthy in that it suggests a baseline sense of professional agency. However, it must be read alongside the critical structural finding: over half of teachers (53%) reported no school-level mechanisms for referral or support, and a further 20% were uncertain whether any existed. These findings confirm the implementation gap described in Moroccan inclusive education literature (Kadiri, 2022) — policy promotion without practical infrastructure.

The absence of referral pathways places teachers in a difficult position. They observe concerning behaviors but have no institutional channels through which to escalate these concerns, request external assessments, or secure additional support services. This produces frustration, underutilization of teacher capacity, and missed opportunities for children. From a systemic perspective, the lack of formal mechanisms also undermines the long-term credibility

of inclusive reforms: teachers cannot be expected to sustain inclusive practices without institutional backing (Achamrah, 2022; Sharma et al., 2012).

5.4. Openness to Digital Tools and Cultural Considerations

One of the most striking findings of this study is the high level of teacher openness to digital intervention: 14 of 15 respondents expressed willingness or potential willingness to adopt a digital ADHD screening tool. Motivations centered on ease of use, time efficiency, and actionable outputs, particularly the ability to generate reports for parents and administrators. This finding aligns with research demonstrating the potential of technology as a bridge between awareness and practice when tools are co-designed with end users (Carr-Fanning et al., 2025).

The emphasis on multilingual interfaces (Arabic, French, Darija) is particularly meaningful in Morocco's complex linguistic landscape. Darija's inclusion is not merely a convenience feature; it reflects a recognition that genuine accessibility requires meeting educators and families in their everyday communicative reality. Concerns about parental resistance also deserve attention. Some teachers anticipated that parents would reject ADHD-related labeling due to stigma, a pattern documented in comparative studies from other MENA contexts (Belhadj et al., 2006; Faraone et al., 2021). This underscores the importance of designing digital tools with family communication features that frame ADHD in supportive, non-pathologizing terms — emphasizing learner strengths and concrete support strategies rather than diagnostic categories.

5.5. Broader Implications: Inclusive Pedagogy, UDL, and Systemic Reform

The findings collectively reinforce the importance of adopting UDL and inclusive pedagogy in Moroccan preschools. Teachers' reports of frequent ADHD-like behaviors suggest that variability in attention and activity levels is the norm, not the exception, in these classrooms. UDL's emphasis on multiple means of engagement, representation, and expression provides a directly applicable framework — strategies such as flexible seating, visual supports, varied response formats, and movement-integrated activities address precisely the challenges teachers described (CAST, 2018; Frolli et al., 2023).

Inclusive pedagogy adds an ethical dimension: the goal is not merely to accommodate individual learners but to value diversity as a resource constitutive of classroom community. A digital screening tool embedded in this framework can function as both a pedagogical aid and a cultural intervention, normalizing systematic observation and reducing deficit-based teacher responses. The low survey response rate — 15 teachers despite outreach to thousands — must

itself be interpreted as a systemic signal rather than a methodological inconvenience. It reflects patterns of teacher overload, institutional disengagement, and hesitation around sensitive topics, all of which a DBR approach must foreground in subsequent design iterations. By involving teachers directly in prototype development, DBR can ensure that tools respond to lived classroom realities rather than theoretical ideals (Anderson & Shattuck, 2012; Carr-Fanning et al., 2025).

6. Implications and Recommendations

6.1. Pedagogical Implications

Teachers are the first observers of children's behaviors in early education settings. This study demonstrates that Moroccan preschool teachers frequently encounter inattention, hyperactivity, and difficulties following instructions, yet lack structured tools to interpret and act upon these observations. A digital ADHD screening tool, grounded in UDL and inclusive pedagogy, can directly respond to this need by equipping teachers with standardized observation methods and actionable strategies. The tool must prioritize simplicity, enabling completion in under ten minutes within a busy classroom day.

6.2. Institutional Implications

The near-absence of school-level referral mechanisms represents a structural barrier that policy reforms must address. A digital tool could serve as a bridge between teachers and institutions, generating standardized data that supports referrals, informs administrators, and strengthens evidence-based policy implementation. For institutions, adopting such tools could contribute to more consistent application of inclusive education policies and create feedback loops between classroom observation and systemic resource allocation.

6.3. Societal Implications

At a societal level, the persistence of ADHD stigma creates a critical design constraint. Teachers expressed concern about parental resistance, reflecting broader cultural hesitations around acknowledging neurodevelopmental differences. By incorporating culturally sensitive communication features — multilingual reports using supportive, strengths-based language — digital tools can help reshape family and community attitudes toward ADHD, positioning early screening as an act of care rather than labeling.

6.4. Recommendations

6.4.1. *For Teachers*

Below is a list of actionable recommendations designed to support teachers in developing inclusive and tech-informed kindergarten classrooms:

- Engage with digital tools designed for early ADHD screening, using structured observation as a professional practice embedded in routine classroom monitoring.
- Integrate UDL-informed strategies into classroom practice, including flexible seating, multimodal teaching, visual schedules, and varied expression opportunities.
- Participate actively in co-creation processes to ensure that tools and training reflect the practical realities and cultural sensitivities of Moroccan kindergarten classrooms.

6.4.2. *For Policymakers and School Leaders*

To ensure sustainable integration and equitable access, policymakers and school leaders are encouraged to implement the following structural and policy recommendations:

- Embed digital ADHD screening tools within the national inclusive education framework, ensuring alignment with policy goals and accessibility across urban, semi-urban, and rural regions.
- Establish structured referral pathways connecting teacher observations to clinical professionals, parents, and support services.
- Expand professional development programs to emphasize applied, classroom-based ADHD strategies rather than theoretical content alone.
- Address the low engagement of teachers with ADHD-related initiatives by designing targeted awareness campaigns and providing institutional incentives for participation.

6.4.3. *For Researchers*

To build a solid evidence base for the Moroccan context, researchers are encouraged to focus on the following priorities regarding tool validation, design-based research, and sociocultural analysis:

- Conduct larger-scale, stratified studies to validate and refine digital screening tools, ensuring reliability across diverse Moroccan school contexts.

- Use DBR to iteratively develop and test prototypes in collaboration with teachers, administrators, and parents, drawing on comparative evidence from other low- and middle-income country contexts.
- Investigate the role of sociocultural factors, stigma, parental attitudes, linguistic diversity, in shaping tool adoption and effectiveness.

7. Conclusion

This study has demonstrated both the urgency and the opportunity of developing digital tools for early ADHD screening in Moroccan kindergartens. Survey findings reveal that teachers frequently observe ADHD-like behaviors but lack structured tools and systemic support to respond effectively; that theoretical knowledge of ADHD is moderate to good, but practical application remains limited; that institutional referral mechanisms are weak or absent in the majority of schools; and that despite these significant gaps, teachers express strong and consistent openness to adopting culturally adapted digital resources.

The central argument advanced in this article is that a digital ADHD screening tool, co-created with teachers and grounded in UDL, inclusive pedagogy, and DBR, has the potential to catalyze systemic change beyond its immediate screening function. Such a tool can empower teachers to act with greater confidence and precision; provide institutions with standardized data to inform referrals and policy implementation; reduce stigma by framing ADHD as learner variability rather than deficit; and advance Morocco's commitments to SDG 4 and the rights of learners with disabilities under the CRPD.

The findings highlight a fundamental paradox: teacher engagement with the survey was low despite broad and sustained outreach, yet the teachers who did respond revealed both urgent needs and genuine willingness to innovate. This suggests that the challenge is not a lack of professional interest in inclusive practices, but rather the absence of tools and systems that make participation feasible and meaningful. Addressing this gap — by designing tools that are simple, multilingual, culturally sensitive, and embedded within institutional referral structures — is the necessary next step toward transforming inclusive education in Morocco from policy aspiration into everyday classroom reality.

7.1. Limitations and Directions for Future Research

7.2. Limitations

This study faces several methodological limitations that must be acknowledged. First, only 15 teachers responded despite wide dissemination, introducing a potential selection bias whereby participants may be more engaged with ADHD-related discourse than the broader population. Second, the study relied exclusively on self-reported data, which is subject to social desirability bias and inaccuracies in self-assessment. Third, a cross-sectional design prevents assessment of change over time. Fourth, the research focused solely on teachers, excluding the voices of children, parents, and administrators. These limitations restrict the generalizability of conclusions, though the descriptive patterns identified remain significant as an exploratory foundation for subsequent DBR iterations.

7.3. Directions for Future Research

Future studies should recruit larger, stratified samples of Moroccan preschool teachers to increase representativeness across regions, school types, and career stages. Longitudinal designs are needed to assess how teacher knowledge, confidence, and practices evolve following professional development or tool exposure. The next DBR phase should involve co-design, piloting, and iterative refinement of a digital screening prototype, incorporating feedback from teachers, administrators, and parents. Comparative research with other low- and middle-income country contexts — particularly within the MENA region — would provide valuable evidence on how cultural, linguistic, and systemic factors shape ADHD identification and tool adoption. Finally, future work should explore how aggregated data from digital screenings can inform policy-level decision-making, resource allocation, and national inclusive education frameworks.

Disclosure Statement

The authors declare that there is no conflict of interest regarding the publication of this article. No financial, personal, or professional relationships have influenced the research, analysis, or conclusions presented in this work.

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Appendix: Survey Instrument

The following survey was distributed electronically to Moroccan kindergarten teachers via Google Forms. Items are presented here as administered, organized by section.

Section 1: Demographic Information

8. Gender: Female / Male / Prefer not to say
9. Age group: 18–29 / 30–39 / 40–49 / 50+
10. Highest educational qualification: Baccalauréat / Licence (Bachelor's) / Master's / Teaching certificate / Other
11. Years of teaching experience: 0–2 / 3–5 / 6–10 / 10+
12. School type: Public / Private
13. School location: Urban / Rural / Semi-urban
14. Class size: < 15 students / 15–25 students / > 25 students

Section 2: Professional Context

15. Have you ever received training related to ADHD or special educational needs (SEN)? Yes / No
16. If yes, please briefly describe the training you received (open-ended).

Section 3: ADHD Knowledge and Confidence

17. How would you rate your overall knowledge of ADHD? Good / Moderate / None
18. How familiar are you with the symptoms of ADHD? Strong / Moderate / None
19. How confident do you feel in responding to a child who displays ADHD-like behaviors? Very capable / Somewhat capable / Not capable

Section 4: Observed Behaviors

20. Have you ever suspected that a child in your class might have ADHD? Yes / No

21. How often do you observe the following behaviors in your classroom? (0 = Never; 1 = Rarely; 2 = Sometimes; 3 = Often; 4 = Always)
22. Inattention (difficulty sustaining focus, easily distracted)
23. Hyperactivity (excessive movement, difficulty sitting still)
24. Difficulty following instructions
25. How do you currently respond when you observe these behaviors? (open-ended)

Section 5: Institutional Support

26. Does your school have a formal referral or support mechanism for children suspected of having ADHD or other SEN? Yes / No / Unsure
27. If yes, please describe the mechanism (open-ended).
28. If no, what do you do when you suspect a child requires additional support? (open-ended)

Section 6: Openness to Digital Tools

29. Would you be willing to use a digital tool designed to help you identify early signs of ADHD in your classroom? Yes / Maybe / No
30. What features would be most important to you in such a tool? (Select all that apply) Ease of use / Multilingual interface / Printable reports for parents / Printable reports for administrators / Guidance on next steps / Other (please specify)
31. What language interfaces would you need? Arabic / French / Darija / Other
32. What concerns, if any, would you have about using such a tool? (open-ended)
33. Any additional comments or suggestions? (open-ended)