



## MindPlay online reading professional development: Enhancing teachers' skills for inclusive education

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### Abstract

Reading difficulties (RDs) present significant challenges for inclusive education, underscoring the need for professional development programs that equip teachers with evidence-based literacy instruction strategies. This study examined the effectiveness of the MindPlay Comprehensive Reading Course for Educators, an online professional development program combined with in-person training and coaching, used to enhance the knowledge and instructional skills of 48 in-service early childhood teachers in the United Arab Emirates working in inclusive classrooms. Using a mixed-methods design, the intervention included ten asynchronous online modules, a two-day face-to-face workshop, and ongoing coaching support. Quantitative findings revealed substantial gains in participants' reading-related knowledge, with post-intervention scores more than doubling pre-intervention scores across key domains, including phonological awareness, phonics, fluency, grammar, vocabulary, and reading comprehension. Results from the comprehensive reading test demonstrated statistically significant improvement with a large effect size, indicating a strong program impact. Qualitative findings indicated high participant satisfaction, highlighting the program's practical applicability, flexibility, and alignment with evidence-based reading instruction. Participants reported increased confidence in implementing explicit, structured literacy strategies in inclusive classrooms while recommending extended training time and practicum-based experiences. Overall, the findings support blended professional development as an effective and scalable model for strengthening teacher competencies and advancing inclusive literacy practices.

**Keywords:** Early childhood education, Inclusive education, MindPlay comprehensive reading course, Online professional development, Reading difficulties, Teacher training.

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**Transparency:** The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

**Competing Interests:** The authors declare that they have no competing interests.

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### **Contribution of this paper to the literature**

This study provides evidence from the UAE on the effectiveness of a blended professional development model combining online MindPlay modules, face-to-face training, and coaching to improve teachers' knowledge and practices in evidence-based reading instruction. It demonstrates a scientific approach to strengthening inclusive literacy teaching and supporting students with reading difficulties in early childhood classrooms.

## **1. Introduction**

Reading difficulties (RDs) are a concern for all nations and communities. Specific learning disabilities in reading that lead to problems with acquiring literacy have an estimated prevalence of about 10% or more in many countries worldwide (Abu-Hamour & Al-Hmouz, 2016; Yang et al., 2022). It is critical that reading teachers are provided with the knowledge and skills to address the unique needs of students with reading difficulties, including those with learning disabilities (Mather, Goldstein, & Eklund, 2015). The United Arab Emirates (UAE) is dedicated to inclusive education, ensuring that all learners, regardless of ability, have the right to participate fully in inclusive schools and develop essential reading skills. This commitment necessitates ongoing professional development and support for teachers to implement evidence-based reading practices and create inclusive learning environments. Recent studies highlight the importance of equipping educators with the necessary skills and knowledge to effectively support students with RDs and indicate a significant relationship between professional development in inclusive and special education and teachers' self-reported competence in implementing inclusive practices (Hill-Shaner, 2023; Oliver, 2024).

Reading is language in print. Reading science has confirmed the essential components of effective instruction. Good reading instruction is based on a deep understanding of these components as well as a deep knowledge of how our language works. "Educators need to know how language works" (Seidenberg, 2017). Developing this knowledge and skill in early childhood reading teachers is critical for inclusive education and meeting the needs of a diverse range of learners. Early reading proficiency is crucial for academic success, with research indicating a strong correlation between early reading difficulties and an increased risk of high school dropout. For example, a significant percentage of students who do not read proficiently by third grade are more likely to drop out of high school. National assessments, such as the National Assessment of Educational Progress in the United States, reveal persistent challenges in achieving widespread reading proficiency. Recent NAEP data indicate that a substantial portion of students are not performing at proficient levels (NAEP Reading, 2024). Similar findings may be predicted in the UAE (Gaad & Khan, 2007; Tibi, 2005). However, the science of reading confirms that we know how to teach reading effectively, and that investing in teachers is the key, says Dr. Nancy Mather, a well-known author in the field of reading and an expert on dyslexia. Our challenge now is to do it. We need to ensure that all of our students become successful readers (personal communication, April 20, 2024).

## **2. Literature Review**

Research on reading instruction, teacher professional development, and inclusive education emphasizes the importance of equipping educators with evidence-based literacy practices to support diverse learners. This section synthesizes research on effective reading instruction, teacher professional development, online and blended learning, technology-supported literacy interventions, and inclusive education within the UAE context to position the present study.

### **2.1. Effective Reading Instruction and Teacher Knowledge**

Effective reading instruction depends on the systematic development of foundational literacy skills and a clear understanding of how language supports reading acquisition. Research on early literacy consistently identifies core components, such as phonological awareness, phonics, fluency, vocabulary, and reading comprehension, as essential for successful reading development. Mastery of these foundational skills is particularly important for students with RDs, who require explicit, structured instruction to access the curriculum and participate fully in inclusive classrooms. Teacher expertise plays a central role in generalizing evidence-based reading practices into effective classroom instruction. Studies have shown that teachers' knowledge of language structure, reading development, and instructional strategies significantly influences students' literacy outcomes. For example, recent research indicates that teachers' knowledge of language and literacy constructs strongly predicts students' growth in foundational reading skills and comprehension, highlighting the importance of strengthening teacher preparation in these areas (Porter, Odegard, Farris, & Oslund, 2024). When teachers possess a deep understanding of how reading develops, they are better equipped to deliver explicit instruction, monitor student progress, and adapt strategies to meet diverse learning needs. Evidence from the UAE context suggests that gaps in teacher knowledge remain a concern. Tibi (2005) found that teachers demonstrated limited understanding of phonological awareness and were not adequately prepared to provide effective instruction in this critical area, regardless of whether they worked with students with or without RDs. Similarly, research on teacher preparation has highlighted challenges in translating theoretical knowledge into practical instructional skills, particularly in inclusive settings where students present diverse learning profiles. Explicit teaching approaches, including direct instruction, have been shown to improve literacy outcomes, especially for students who are disadvantaged or who experience learning difficulties. Teachers working in inclusive classrooms must therefore understand the foundations of reading and apply evidence-based instructional practices that address the needs of learners with specific RDs, who often require specialized and systematic instruction (Abu-Hamour & Al-Hmouz, 2014; Cohen, Mather, Schneider, & White, 2017). Synthesizing these findings, the literature indicates that effective reading instruction is closely linked to teachers' knowledge of language and literacy development and their ability to apply explicit, evidence-based practices. Strengthening teacher knowledge in foundational reading skills is therefore essential for improving literacy outcomes and ensuring appropriate learning opportunities for students with RDs in inclusive education settings.

## *2.2. Teacher Professional Development for Inclusive Reading Instruction*

The global expansion of inclusive education, including in the UAE, has increased expectations for teachers to support learners with diverse needs, including students with RDs. Meeting these expectations requires educators to possess strong instructional knowledge and the ability to apply it effectively in inclusive classrooms. Professional development (PD) is widely recognized as a central mechanism for strengthening teacher expertise and supporting effective instructional practices. Research indicates that well-designed, context-responsive PD initiatives enhance teachers' confidence and self-efficacy, as well as their inclusion-related instructional practices. Collaborative professional learning improves engagement with evidence-based strategies rather than focusing narrowly on categorizing student needs (Lelling & Alwall, 2022), while school leaders identify ongoing professional learning as essential for advancing inclusive practices despite time and resource constraints (Duncan, Punch, & Croce, 2021). These findings highlight the importance of PD models that are responsive to school contexts and emphasize practical application. In inclusive settings, PD must extend beyond strengthening knowledge to supporting teachers in transferring principles into classroom practice. Opportunities to deepen instructional knowledge, apply strategies in educational settings, and reflect on practice are especially important when learners present diverse profiles. Within the UAE, national priorities emphasizing quality teaching and inclusive education further reinforce the need for sustained professional learning that equips educators to address varied learning needs (United Arab Emirates Government, 2021). Professional development is particularly critical for strengthening teachers' capacity to deliver effective reading instruction. Systematic reviews indicate that comprehensive, sustained PD programs improve teacher practices and student literacy outcomes when they address specific instructional needs, including intensive reading interventions and literacy instruction for English learners (McMaster, Baker, Donegan, Hugh, & Sargent, 2021; Shelton, Hogan, Chow, & Wexler, 2023). However, concerns persist regarding the adequacy of teacher preparation and ongoing training. Reports note that many teacher education programs lack sufficient rigor in preparing educators to teach the science of reading, and research continues to identify weaknesses in teachers' understanding of language structures and their ability to deliver explicit, systematic instruction (National Council on Teacher Quality, 2020). These gaps are significant because teachers' knowledge of language and literacy constructs predicts students' foundational reading development (Porter et al., 2024).

Explicit instructional approaches, including direct and systematic teaching methods, have been shown to improve literacy outcomes, particularly for students with learning disabilities. Teachers in inclusive classrooms must therefore understand the foundations of reading and apply specialized strategies to support students who require structured and targeted intervention (Abu-Hamour & Al-Hmouz, 2014; Cohen et al., 2017). Effective PD provides a pathway for developing this expertise. High-quality PD for reading instruction is content-focused and incorporates sustained support mechanisms such as coaching, guided practice, and feedback. Technology-based PD may also support the development of teaching skills and, in certain areas, offer benefits comparable to in-person approaches (Darling-Hammond, Hyler, & Gardner, 2017). However, ensuring that teachers can translate new knowledge into effective classroom practice remains essential. The body of research underscores the need for sustained, content-focused, and context-responsive PD that strengthens teacher self-efficacy, deepens understanding of evidence-based reading instruction, and supports the implementation of inclusive instructional practices.

## *2.3. Online and Blended Professional Development*

Advances in digital learning have increased opportunities for PD, making online and blended models increasingly relevant for supporting teacher learning. Online Professional Development (OPD) offers flexibility and accessibility, enabling teachers to learn at their own pace and from any location. This flexibility is particularly valuable for educators balancing instructional responsibilities with ongoing professional learning. Research indicates that online formats can support the development of teacher knowledge and skills and may be comparable to in-person models for certain instructional competencies (Stavermann, 2025). Blended PD, which combines online learning with face-to-face training and coaching, has emerged as an effective approach for connecting theoretical knowledge with practical application. Studies suggest that integrating online components with in-person support enhances learning by providing both flexible access to content and opportunities for guided practice and feedback (Huang, Helgevoid, Lang, & Jiang, 2023; Martínez, Castejon, & Gonzalez-Pumariega, 2022). Such approaches allow teachers to engage with instructional materials independently while also benefiting from collaborative learning and contextualized support. Recent research also highlights the educational-building potential of online professional learning environments, including large-scale online courses, while noting challenges related to equitable access and alignment with local contexts (Brugha et al., 2024). Ensuring that online learning opportunities are responsive to teachers' professional needs and school environments is therefore essential for maximizing their effectiveness. Within the UAE, the growing adoption of online professional learning reflects efforts to accommodate teachers' schedules and expand access to specialized training that may not be readily available locally. When supplemented with face-to-face training and coaching, OPD can provide a comprehensive approach to strengthening instructional practices and supporting teachers in inclusive classrooms. The literature suggests that blended PD models combining online learning with in-person support provide a flexible and effective approach to strengthening teacher knowledge and instructional practice.

## *2.4. Technology-Supported Literacy Interventions and MindPlay*

Technology-supported literacy interventions have increasingly been used to supplement reading instruction and support in-service teachers who require additional practice in foundational skills. Digital programs can provide structured, individualized learning opportunities and immediate feedback, allowing students to practice decoding, fluency, and comprehension skills at an appropriate pace. Such tools are particularly valuable in inclusive settings, where students demonstrate diverse learning needs and benefit from differentiated instructional supports. Among these interventions, the MindPlay Comprehensive Reading program has been examined across multiple educational contexts. Kloos, Sliemers, Cartwright, Mano, and Stage (2019) reported significant improvements in reading fluency among elementary students using MindPlay, although teachers noted concerns related to student engagement and classroom integration. Using a large sample of more than 15,000 students in grades K–6, May and Van Horne (2024) found that MindPlay use was associated with significantly greater reading growth compared to national averages,

with the strongest gains observed when students engaged with the program for more than 80 minutes per week. Their findings also suggested that the program helped mitigate learning loss associated with the COVID-19 pandemic. Research with older learners further supports the program's potential. Kealey (2024) found improvements in word reading fluency, phonics skills, and reading enjoyment among community college students, suggesting that MindPlay may support underprepared readers beyond the elementary level.

Similarly, Schechter, Robinson, and Teki (2024) identified a strong relationship between MindPlay use and literacy gains among students in grades 2–6, with those completing more than 60 hours demonstrating growth exceeding national norms. Collectively, these studies indicate that MindPlay can support reading development across a range of ages and educational settings.

However, existing research has focused primarily on student outcomes, while implementation challenges and cultural considerations remain important areas for further exploration. In particular, limited research has examined how technology-supported literacy programs, such as MindPlay, can be used within OPD to strengthen teachers' instructional practices for inclusive reading instruction.

### *2.5. Inclusive Education in the UAE Context and Study Positioning*

Inclusive education has become a central priority within the UAE, reflecting national commitments to equity and quality in schooling. One of the strategic goals outlined in UAE Vision 2021 is the development of a "First-Rate Education System," emphasizing high-quality teaching and equitable access to learning opportunities for all students (United Arab Emirates Government, 2021). Achieving this objective requires schools to effectively serve students with diverse learning needs, including those with RDs.

The UAE has formally embraced the inclusion of students with specific learning disabilities in mainstream schools through Federal Law 29/2006, which supports the integration of students with disabilities, including dyslexia/RDs, into general education settings. This commitment has been reinforced through the Ministry of Education's initiatives to strengthen school capacity and teacher competence in inclusive practices. The National Framework for Inclusive Education outlines competencies and standards expected of teachers, emphasizing the use of evidence-based instructional strategies tailored to diverse learners (Ministry of Education, 2020). Despite strong policy support, research suggests that teacher preparedness remains a concern. Studies conducted in the UAE indicate that educators may not feel adequately prepared to implement inclusive practices effectively. Tibi (2005) reported limited teacher knowledge of phonological awareness, a foundational skill in early reading instruction. More recently, Alhammadi (2024) found that although pre-service teachers expressed positive attitudes toward inclusion, they perceived gaps in their practical preparation and ability to apply knowledge in classroom settings. These findings underscore the need for targeted professional development that strengthens both theoretical understanding and instructional competence.

PD has therefore become a key component of education reform efforts in the UAE. Teacher quality is widely recognized as central to improving educational outcomes (Hathorn & Dillon, 2018), and PD is defined as structured learning that leads to changes in teacher knowledge, practice, and student achievement (Darling-Hammond et al., 2017). Enhancing teachers' capacity to deliver evidence-based reading instruction within inclusive classrooms is essential for advancing national goals and improving literacy outcomes for students with RDs. While the literature demonstrates advances in effective reading instruction, inclusive education, and teacher PD, important gaps remain. Concerns persist regarding the adequacy of teacher preparation and ongoing training in evidence-based reading instruction, particularly in inclusive settings where students present varied learning needs. Research on technology-supported literacy programs such as MindPlay has primarily focused on student outcomes. Although findings suggest strong potential for improving reading performance, less attention has been given to how such programs can be integrated into PD to enhance teachers' knowledge and instructional practices. Implementation considerations, including classroom integration and contextual alignment, also remain underexplored.

Within the UAE context, national policies emphasize inclusive education and evidence-based instruction; however, empirical research examining PD interventions that strengthen early childhood teachers' capacity to deliver inclusive reading instruction remains limited. The present study addresses these gaps by examining the effectiveness of a blended PD intervention that integrates the MindPlay Comprehensive Reading Course for Educators with in-person training and coaching. By focusing on early childhood teachers in inclusive education settings in the UAE, the study evaluates how such an intervention can enhance teachers' knowledge and instructional practices in foundational reading instruction and support inclusive literacy outcomes.

### *2.6. Research Objectives and Questions*

The objectives of the current study are threefold: (a) to evaluate the effectiveness of the MindPlay Comprehensive Reading Course, combined with in-person training and ongoing coaching, in improving the knowledge and skills of early childhood teachers in foundational reading instruction areas, including phonology, reading and spelling development, phonics fundamentals, advanced phonics, fluency, grammar, vocabulary, and reading comprehension; (b) to assess the impact of the MindPlay Comprehensive Reading Course, along with in-person training and coaching, on early childhood teachers' overall performance in foundational reading instruction; and (c) to explore teachers' perceptions of the effectiveness of the professional development intervention in enhancing their knowledge and skills for reading instruction in inclusive education. The study aims to address the following research questions:

Study Question 1: How does the MindPlay Comprehensive Reading Course, combined with in-person training and coaching, impact early childhood teachers' knowledge and skills in foundational reading instruction areas such as phonology, reading and spelling development, phonics fundamentals, advanced phonics, fluency, grammar, vocabulary, and reading comprehension?

Study Question 2: To what extent does participation in the MindPlay Comprehensive Reading Course, in-person training, and coaching improve early childhood teachers' overall performance on a comprehensive reading test?

Study Question 3: How do teachers perceive the impact of the professional development intervention on their knowledge and skills in key reading areas for inclusive classrooms?

### **3. Method**

#### **3.1. Participants**

The study involved 48 early childhood teachers working in public inclusive schools in the United Arab Emirates (UAE), specifically in the emirates of Abu Dhabi and Dubai. These schools operate under government educational authorities and serve diverse learners within inclusive education frameworks. These teachers were selected from a pool of 350 candidates identified through alumni data from a public university in the UAE and recruited via a local educational authority's mailing list and professional development network. This recruitment approach ensured access to teachers actively working in inclusive classrooms and engaged in ongoing professional learning. The participants teach students with RDs in inclusive settings, aligning with the study's focus on enhancing instructional practices for diverse learners. To protect confidentiality, the names of schools and any identifying details are not disclosed in accordance with ethical approval requirements and participant consent agreements. The university offering the Bachelor of Science in Education with a concentration in Early Childhood Education prepares graduates to teach children from birth to age eight. The program includes courses on foundational literacy and language skills (e.g., phonological awareness, phonics, grammar, vocabulary, and reading comprehension) as well as specialized courses such as "People with Special Needs" and "Inclusive Classrooms," which equip teachers to support diverse learners, including those with RDs. Practical training is provided through three practicums and a final internship to enhance hands-on teaching experience. The inclusion criteria for participation in this study were as follows: (a) Participants must be fluent in English, with a minimum IELTS band score of 6; (b) Participants must score in the top 50th percentile on the Reading Knowledge Test; (c) Participants must be able to complete all ten Online Professional Development (OPD) modules, and (d) Participants must teach reading and have at least two students with RDs in their classrooms. The participants were all Emirati female teachers, aged between 24 and 34 years old, with two to ten years of teaching experience. Of the 48 teachers, 12 were based in Dubai, while 26 were working in Abu Dhabi. These participants were enrolled in the study from September 2023 to February 2024.

#### **3.2. Intervention**

The intervention for this study incorporated an online professional development program, in-person training, and ongoing coaching to enhance early childhood teachers' knowledge and skills in inclusive education settings. The MindPlay Comprehensive Reading Course for Educators was selected as the primary component of the intervention. The program addressed various aspects of reading instruction, including phonological awareness, reading and spelling development, phonics fundamentals, advanced phonics concepts, fluency, grammar, vocabulary, and reading comprehension. The course consisted of ten asynchronous modules, which participants completed over an estimated total duration of 26 hours at a guided pace of approximately 6.5 hours per week. In addition to the online modules, participants attended a 2-day in-person workshop within one to two weeks of completing the digital content. This workshop reinforced the knowledge and skills gained from the online modules and provided hands-on practice and collaborative learning opportunities. Key topics included phonological awareness, reading and spelling development, fluency, vocabulary, and reading comprehension. The workshop was facilitated by the project team and conducted at local school campuses. Coaching and mentoring were integral to the intervention, ensuring that participants effectively applied their learning in classroom settings. Over approximately one month, participants engaged in weekly virtual check-ins with the research team, who provided personalized feedback and guidance. Two reflective journal submissions for each participant were reviewed, and suggestions for improvement were tailored to individual needs. Weekly Zoom meetings were also held by the project research team to discuss the participants' progress, address challenges, and foster a supportive learning environment. The intervention concluded with an active discussion session conducted after the face-to-face workshop. This one-hour session used a lecture-discussion format, enabling participants to engage with the project team and peers to consolidate their learning through interactive dialogue.

#### **3.3. Instrumentation**

The study utilized multiple assessment tools to evaluate the effectiveness of the intervention, including content-specific tests, a teacher satisfaction questionnaire, and reflective journals. These tools were designed to measure participants' knowledge, progress, and perceptions regarding the PD course. All instruments were validated by three professors specializing in reading research from public universities in the UAE and Jordan. They confirmed the high content validity of these tools in measuring the intervention's content, participant progress, and perceptions. The content-specific tests were the primary quantitative measures for this study. Two types of tests were administered: a comprehensive test consisting of 50 multiple-choice questions covering all ten modules of the MindPlay Comprehensive Reading Course. This test was used in both pre- and post-intervention phases to assess participants' overall progress and acquired knowledge. This measure demonstrated good internal consistency (Cronbach's  $\alpha = 0.88$ ), indicating a reliable assessment of participants' understanding across the course content.

A module-specific test comprising 10 multiple-choice questions was developed for each of the following 8 modules: Module 2: Phonology, Module 3: Reading and Spelling Development, Module 4: Phonics Fundamentals for Reading and Spelling, Module 5: Advanced Phonics for Reading and Spelling, Module 6: Fluency, Module 7: Grammar, Module 8: Vocabulary, and Module 9: Reading Comprehension. Modules 1 (Introduction) and 10 (Conclusion) were excluded from the assessment as they primarily provided an overview of the course and reinforced key takeaways, rather than delivering new, assessable instructional content. These tests were also administered pre- and post-intervention to evaluate participants' specific progress and acquired knowledge for each module. Sample questions included items such as identifying the definition of a phoneme, distinguishing phonological from phonemic awareness, and understanding the alphabetic principle. These questions measured foundational knowledge in areas like phonological awareness, phonics, grammar, vocabulary, fluency, and reading comprehension. Internal consistency estimates for the module-specific tests ranged from .80 to .89, indicating good to high reliability.

The teacher satisfaction questionnaire measured participants' perceptions of the training program's social validity. This tool featured a Likert scale with options ranging from "Strongly Disagree" to "Strongly Agree" to assess satisfaction with various aspects of the training, including its relevance, pace, interactivity, and overall impact.

Example items included: "The training was effective in enhancing my knowledge of phonological awareness," and "The training materials were well-organized and easy to understand." The questionnaire demonstrated good internal consistency (Cronbach's  $\alpha = .86$ ), supporting the reliability of participants' responses. In addition, two open-ended questions were included to gather qualitative feedback on helpful aspects of the training, suggestions for improvement, and plans to apply the learned knowledge in classrooms. Participants also completed two reflective journals during the intervention. These journals served as a qualitative measure to explore participants' experiences, self-reflections, and plans for applying the intervention's content in their teaching practices. Open-ended prompts encouraged participants to describe their training experience and reflect on how the program influenced their approach to supporting students with RDs. These tools, implemented at various stages of the intervention, provided a comprehensive evaluation of the program's effectiveness in enhancing teachers' knowledge and skills and their perceptions of its impact.

### *3.4. Procedure*

Participants were recruited through a local educational authority's mailing lists and invited to apply for the PD program. Forty-eight teachers meeting the inclusion criteria were selected. Candidates were required to score at or above the 50th percentile on the Reading Knowledge Test, which also served as a baseline measure during the pre-intervention phase. Before participation, informed consent was obtained from all participants. They were informed that participation was voluntary and that they could withdraw at any time without penalty. The intervention proceeded after consent was secured. Participants who completed the program received a certificate of completion for the MindPlay OPD, which served as an incentive and supported sustained engagement. Data collection included pre- and post-intervention content-specific tests, two reflective journals, and a teacher satisfaction questionnaire. Data entry accuracy ranged from 99% to 100%, with discrepancies promptly corrected. Qualitative data from reflective journals and open-ended responses were analyzed using content analysis. The research team collaboratively refined themes and reached full agreement to support analytic rigor. Throughout the study, researchers maintained communication with participants, addressing inquiries and providing clarification as needed.

### *3.5. Data Analysis*

The study utilized both quantitative and qualitative research methods to analyze data collected from participants. Descriptive statistics, including means, standard deviations, and frequencies, were used to analyze participants' demographic data and describe their knowledge and competencies in the reading modules. Paired-samples t-test was performed to compare participants' pre- and post-intervention scores on the comprehensive reading test, assessing within-group differences in overall reading knowledge after completing the PD program. Prior to analysis, assumptions were evaluated. Test scores were continuous, measurements were paired for the same participants, and participants' scores were independent of one another. The distribution of the difference scores was examined for normality and screened for extreme outliers; no serious violations were detected. These analyses were conducted using SPSS. Graphing procedures illustrated the mean performance across key reading skills in the MindPlay Comprehensive Reading Course and the individual progress of participants during the pre-intervention and post-intervention phases. The teacher satisfaction questionnaire, which used a Likert-scale format, was analyzed using descriptive statistics to summarize participants' perceptions of the program's effectiveness. Responses on the questionnaire were categorized into frequencies and percentages for each item, providing an overview of the participants' evaluation of the training.

Qualitative data from reflective journals and open-ended questionnaire responses were analyzed using content analysis. Two members of the research team independently reviewed the responses, identified meaning units, and assigned initial codes. The team then compared coding decisions, resolved discrepancies through discussion, and refined the codes into broader themes until consensus was reached. Recurring themes were collaboratively refined to ensure validity and to provide deeper insight into participants' experiences with the MindPlay OPD and training, as well as their plans for applying the knowledge they acquired to support students with RDs. To enhance reliability, analytic notes were maintained to document coding decisions and theme development. Researcher reflexivity was addressed through team discussions that considered how professional backgrounds and assumptions might influence interpretation, helping ensure that the themes accurately reflected participants' perspectives. All analyses were conducted collaboratively by the researchers and three research assistants holding bachelor's degrees in education, who were trained to contribute to the analysis.

## **4. Results**

The results of this study are organized to address the research objectives and questions through an analysis of both quantitative and qualitative data. Findings are presented in alignment with the study's focus on evaluating the effectiveness of the PD program, the progress achieved by participants, and their perceptions of the training.

### *4.1. Quantitative Findings*

The findings indicated that all participants improved in their overall performance, as measured by the major skills covered in the modules (see Figure 1). The progress of the 48 participants in the MindPlay Comprehensive Reading Course was substantial. Across key areas such as phonology, reading and spelling development, phonics fundamentals, advanced phonics, fluency, grammar, vocabulary, and reading comprehension, significant growth was documented. On average, participants more than doubled their scores on the individual modules, with pre-intervention scores ranging from 3.91 to 4.52 and post-intervention scores ranging from 8.22 to 8.64. These results underscored the effectiveness of the MindPlay Comprehensive Reading Course in enhancing participants' literacy skills. Additionally, the overall pattern of improvement revealed that participants who scored the highest during the pre-intervention phase also tended to achieve the highest scores in the post-intervention phase. This trend was supported by similar chart patterns in Figure 2 and a positive correlation of 0.67 between the pre- and post-intervention scores. Regarding overall performance across all modules, participants achieved significantly higher scores on the comprehensive reading test after the intervention ( $M = 39.40$ ,  $SE = 0.91$ ) compared to before ( $M =$

19.08, SE = 0.40),  $t(47) = 27.37, p < 0.001, d = 3.95$ . The large positive effect size (Cohen's  $d = 3.95$ ) highlights the intervention's significant impact. A detailed assessment of the 48 participants' perceptions was conducted using a Likert-scale questionnaire. Most participants provided positive feedback on knowledge enhancement, with 56.25% strongly agreeing that the training improved their phonological awareness. Similar patterns of strong agreement were observed for other areas. The training components were rated as engaging and interactive by 97%, and 95.84% appreciated the content's relevance. While 85.42% found the pace appropriate, 14.58% expressed dissatisfaction. The materials were considered well-organized and easy to understand by 91.08%, and 95.08% strongly agreed that the project team was helpful and responsive. Overall, most participants expressed satisfaction or strong satisfaction with the program (see Table 1).

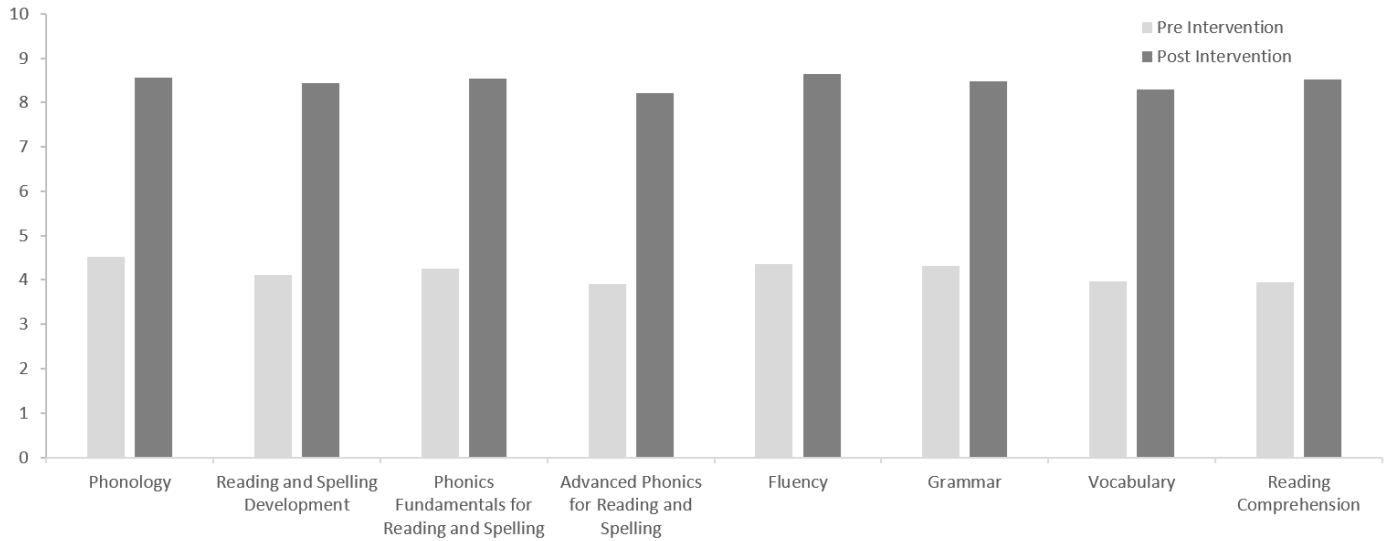


Figure 1. The mean performance of the 48 participants on the major skills of the MindPlay Comprehensive Reading Course for the pre-intervention and post-intervention phases.

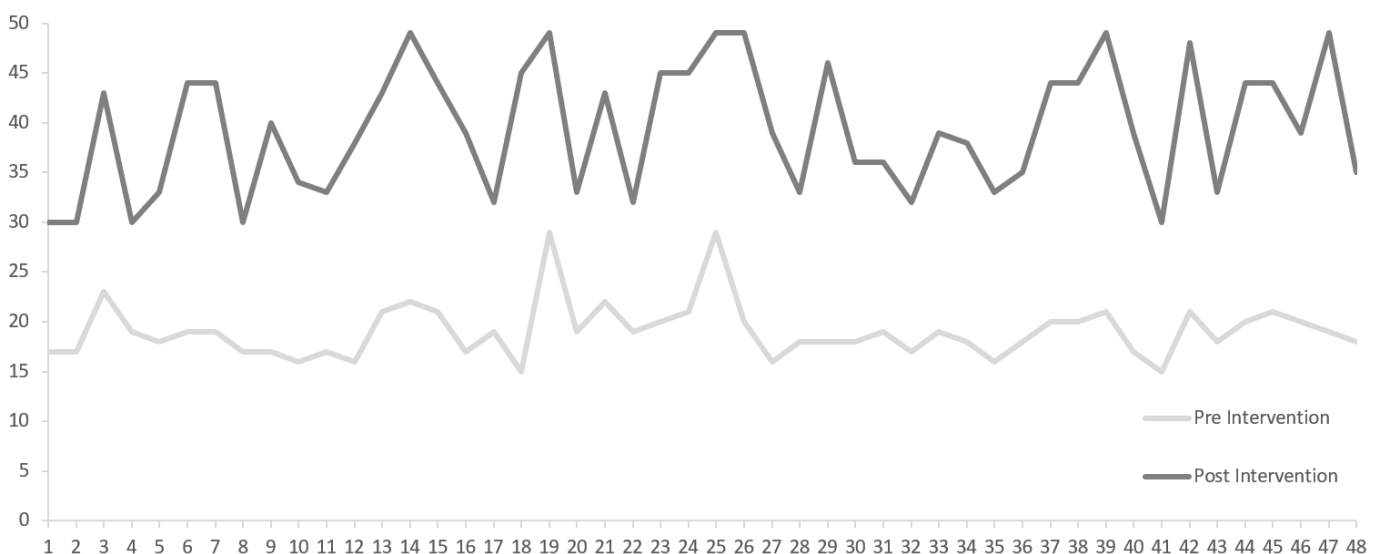


Figure 2. The individual performance of each of the 48 participants on the comprehensive reading test for the pre-intervention and post-intervention phases.

#### 4.2. Qualitative Findings

Participants provided rich insights into their perceptions and experiences of the online professional development program through reflective journals and open-ended questionnaire responses. A recurring theme was the comprehensive nature of the program, covering essential reading-related subjects such as phonological awareness, phonics, spelling development, fluency, grammar, vocabulary, and reading comprehension. This breadth of coverage was highly valued, as was the program's alignment with the science of reading framework, which provided participants with actionable strategies for teaching foundational literacy skills. The practical application of the training was also emphasized, with participants reporting successful implementation of explicit phonics instruction, multisensory teaching methods, and structured progress monitoring in their classrooms. Beyond the content itself, the online format was praised for its flexibility, cost-effectiveness, and accessibility, allowing participants to learn at their own pace and convenience. The opportunity to earn a certificate of completion was also seen as beneficial for career advancement. While the program was largely well-received, participants offered constructive feedback for improvement. Suggestions included incorporating practicum field experiences to bridge the gap between theory and practice, extending the training timeframe to reduce pressure, and promoting more opportunities for peer collaboration and knowledge sharing through discussion forums or similar platforms. This desire for practical application and collaborative learning reflects a strong commitment among participants to apply evidence-based instructional methods, such as individualized learning plans and progress monitoring, to effectively support students with RDs. Overall, the qualitative data revealed a high level of satisfaction with the program's content, format, and perceived impact on participants' teaching practices. The feedback also highlighted areas for potential enhancement, such as incorporating more hands-on experiences, providing opportunities for peer interaction, and allowing more time to complete the training.

**Table 1.** Percentages and frequencies of the 48 participants' perceptions of the training program's effectiveness.

Item/Item's response	Strongly disagree	Disagree	Agree	Strongly agree
1- The training was effective in enhancing my knowledge of phonological awareness.	0 (0%)	0 (0%)	21 (43.75%)	27 (56.25%)
2- The training was effective in enhancing my knowledge of reading.	0 (0%)	0 (0%)	20 (41.67%)	28 (58.33%)
3- The training was effective in enhancing my knowledge of spelling development.	0 (0%)	0 (0%)	22 (45.83%)	26 (54.17%)
4- The training was effective in enhancing my knowledge of phonics fundamentals.	0 (0%)	0 (0%)	20 (41.67%)	28 (58.33%)
5- The training was effective in enhancing my knowledge of advanced phonics concepts.	0 (0%)	0 (0%)	19 (39.58%)	29 (60.42%)
6- The training was effective in enhancing my knowledge of fluency.	0 (0%)	0 (0%)	25 (52.08%)	23 (47.92%)
7- The training was effective in enhancing my knowledge of grammar.	0 (0%)	0 (0%)	28 (58.33%)	20 (41.67%)
8- The training was effective in enhancing my knowledge of vocabulary.	0 (0%)	0 (0%)	30 (62.50%)	18 (37.50%)
9- The training was effective in enhancing my knowledge of reading comprehension.	0 (0%)	1 (2.08%)	35 (72.92%)	12 (25.00%)
10- The online professional development modules were engaging and interactive.	0 (0%)	1 (2.08%)	32 (66.67%)	15 (31.25%)
11- The face-to-face training workshop was engaging and interactive.	0 (0%)	1 (2.08%)	26 (54.17%)	21 (43.75%)
12- The content presented in the training was relevant to my work.	0 (0%)	2 (4.16%)	26 (54.17%)	20 (41.67%)
13- The pace of the training was appropriate.	1 (2.08%)	6 (12.50%)	31 (64.59%)	10 (20.83%)
14- The training materials were well-organized and easy to understand.	1 (2.08%)	3 (6.25%)	25 (52.09%)	19 (39.58%)
15- The support provided by the project team was helpful and responsive.	1 (2.08%)	1 (2.08%)	21 (43.76%)	25 (52.08%)
16- Overall, I am satisfied with the training.	0 (0%)	1 (2.08%)	24 (50.00%)	23 (47.92%)

## 5. Discussion

This study aimed to evaluate the effectiveness of the MindPlay Comprehensive Reading Course for Educators, in-person training, and coaching, in enhancing the reading-related knowledge and skills of early childhood teachers in inclusive classrooms in the UAE. Specifically, the program focused on areas such as phonological awareness, phonics, grammar, and reading comprehension, while also examining participants' perceptions of its flexibility, relevance, and applicability to supporting students with RDs. The findings of the study revealed significant improvements in the knowledge and skills of participating teachers. Quantitatively, participants demonstrated substantial progress in all reading skills, with post-intervention scores more than doubling their pre-intervention scores across key areas such as phonology, reading and spelling development, phonics, fluency, grammar, vocabulary, and reading comprehension. The results of the comprehensive reading test revealed significant growth, with participants scoring much higher after the intervention than before. The strong effect size further underscored the intervention's substantial impact. Moreover, participants who performed well before the intervention generally maintained high scores afterward, as indicated by the positive correlation. Qualitative findings supported these results, providing deeper insights into participants' experiences. Teachers valued the program's comprehensive coverage of reading-related topics, its alignment with the science of reading framework, and the practical strategies it offered for teaching foundational literacy skills. Participants reported successfully applying explicit phonics instruction, multisensory teaching methods, and structured progress monitoring in their classrooms. They appreciated the program's flexibility, which allowed self-paced learning, and recognized the career advancement benefits of earning a certificate of completion. Suggestions for improvement included incorporating practicum experiences to bridge theory and practice, extending the training timeframe to reduce time pressure, and promoting peer collaboration through discussion forums or similar platforms. These findings align with existing literature on professional development for reading teachers. The significant improvements observed in teacher knowledge and skills are consistent with previous research emphasizing the importance of PD in enhancing teacher practices and literacy outcomes (McMaster et al., 2021; Shelton et al., 2023). The marked growth in foundational reading skills aligns with Porter et al. (2024), who identified teacher knowledge as a critical predictor of student success in literacy. In addition, the participants' positive perceptions of the program's flexibility and relevance are in line with research highlighting the potential of OPD to support teacher learning (Huang et al., 2023; Martínez et al., 2022). Suggestions for improvement, such as adding practicum experiences, mirror recommendations by Alhammadi (2024) to better connect theoretical training with practical application. The results also underscore the importance of evidence-based PD programs in fostering inclusive literacy education. Similar to findings from Kloos et al. (2019) and May and Van Horne (2024), this study demonstrated that MindPlay effectively enhances foundational reading skills. Furthermore, the flexibility of the online format addresses challenges related to equitable access and the scalability of professional development programs, as noted by Brugha et al. (2024).

### 5.1. Limitations, Future Research, and Implications

This study, while offering valuable insights into the effectiveness of OPD for early childhood reading instruction, has certain limitations that should be acknowledged. First, the sample size, while sufficient for the quantitative analyses conducted, was relatively small and drawn from a specific context in the UAE. This limits the

generalizability of the findings to other populations and settings. Second, the study focused specifically on public schools within this context, potentially excluding valuable perspectives and experiences from private school settings. Future research should consider including private schools to provide a more comprehensive understanding of the program's effectiveness across different educational sectors in the UAE. This broader representation would provide insights into the unique challenges and opportunities associated with implementing OPD, combined with in-person training and coaching, in diverse school environments. In addition, some of the study investigations relied on self-reported data from participants through questionnaires and reflective journals. While valuable for understanding participants' perceptions and experiences, self-reported data can be susceptible to biases, such as social desirability bias and recall bias. Future research should incorporate more objective data sources, such as classroom observations, student assessment data (e.g., standardized reading tests, curriculum-based measures), and analysis of teacher-student interactions. Triangulating data from multiple sources would provide a more robust and nuanced evaluation of the program's impact on both teacher practice and student learning outcomes. Furthermore, the study's relatively short timeframe did not allow for an examination of the long-term effects of the PD program. Longitudinal studies are needed to track the sustained impact of the training on teachers' instructional practices and student learning trajectories over time. This would provide valuable insights into the program's efficacy in promoting lasting changes in teaching and learning within inclusive early childhood settings.

Despite these limitations, the current study offers several important implications for practice and policy. The findings underscore the potential of OPD, combined with in-person training and coaching, to serve as a scalable and accessible means of equipping early childhood educators with the knowledge and skills necessary to effectively teach reading to students with RDs in inclusive education. Prioritizing the development and implementation of high-quality OPD programs can be a cost-effective and efficient strategy for supporting teachers and enhancing students with RDs' learning. By investing in such programs, policymakers and school districts can foster a more inclusive and responsive educational environment that caters to the holistic growth and achievement of all learners. Further research exploring the contextual factors influencing the implementation and effectiveness of these programs within inclusive educational environments will be crucial for maximizing their impact.

## 6. Conclusion

In conclusion, this study provides compelling evidence for the effectiveness of an online PD program, combined with in-person training and coaching, in preparing early childhood teachers to deliver inclusive, evidence-based reading instruction. The findings suggest that a comprehensive, research-aligned curriculum delivered through a flexible online format can significantly enhance teachers' knowledge and skills in the core components of reading, ultimately benefiting the diverse learning needs of their students. This research yielded both practical and research implications. Practically, it underscored the significance of programs like Mindplay OPD in enhancing early childhood teachers' readiness to support students with RDs, with the training demonstrating substantial positive outcomes. The commitment of participants and their positive feedback confirmed the importance of such initiatives in reinforcing education and literacy support for students with RDs. In terms of research implications, these findings advocated for the adoption of similar OPD programs by educational institutions to augment teachers' preparedness in addressing the needs of students with RDs. This approach could result in more effective education and foster inclusive learning environments. Moreover, the results encouraged further exploration of the impact of OPD on educators' knowledge and skills, promoting scientific research in this field.

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