



# BREAKING BARRIERS IN EARLY READING AND RELIGIOUS MODERATION: A DESIGN-BASED STUDY OF A DIGITAL MEDIA-ENHANCED MULTISENSORY TRILINGUAL PHONICS MODEL IN AN INDONESIAN ELEMENTARY SCHOOL

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## Abstract:

Early literacy development in multilingual contexts presents significant pedagogical challenges, particularly when elementary students must navigate multiple phonological systems simultaneously. Contemporary educational discourse increasingly emphasizes integrating character education and digital media into academic instruction. This study develops and evaluates a digital media-enhanced multisensory trilingual phonics instructional model that supports early reading development while fostering religious moderation values, including tolerance, respect, and appreciation for diversity. Employing a design-based research approach with the ADDIE framework, the research was conducted at Sinar Harapan National Trilingual Elementary School in Lumajang, East Java, which provides trilingual instruction in Indonesian, English, and Mandarin alongside character education emphasizing tolerance. Digital media integrated into the model included interactive phonics applications, augmented reality (AR) flashcards for tone visualization, gamified learning platforms (Quizizz and WordWall), digital audio recordings for pronunciation modeling, animated video tutorials, QR code-linked audio resources, and a simple learning management system for progress tracking. Data were collected through expert validation, classroom observations, teacher interviews, and pretest-posttest assessments measuring students' phonemic awareness across the three languages. Observational data examined how digital media-mediated literacy activities embedded religious moderation values within classroom interactions. Findings indicate the proposed digital media-integrated model significantly improved students' phonological awareness across all three languages while promoting attitudes associated with religious moderation. Expert validation yielded an overall score of 88.54% (highly feasible), and teacher feedback confirmed pedagogical relevance. Student phonemic awareness showed statistically significant gains: Indonesian (22.18%, Cohen's  $d=1.31$ ), English (25.67%,  $d=1.44$ ), and Mandarin (24.03%,  $d=1.21$ ). Observational data documented increased student behaviors reflecting tolerance, cooperation, and respect for cultural diversity. The study contributes to literature on multilingual literacy and character education by proposing an instructional model that bridges cognitive, linguistic, socio-cultural, and digital media dimensions of early learning while reinforcing religious moderation principles in elementary education.

**Keywords:** Multisensory phonics instruction; trilingual literacy education; early reading development; religious moderation; digital media-enhanced learning; design-based research; phonological awareness

## INTRODUCTION

The ability to read fluently and understand written text is widely recognized as a fundamental component of academic success and lifelong learning (National Reading Panel, 2000). Early reading instruction during the first years of elementary education plays a crucial role in establishing the cognitive and linguistic foundations required for subsequent learning (Ehri et al., 2001). These challenges become considerably more complex in multilingual learning environments where children must simultaneously process different phonological systems, orthographic

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conventions, and syntactic structures (Cenoz, 2013). In the contemporary digital era, the integration of various media into literacy instruction has emerged as a promising approach to address these pedagogical complexities (Ibad et al., 2024).

Research on multilingual literacy has shown that phonological awareness remains one of the most critical predictors of early reading success. Petrescu & Helms-Park (2024), in a longitudinal study of trilingual learners at risk of reading difficulties, identified limited phonological awareness as a major barrier to literacy development. Their findings suggest that learners in multilingual contexts benefit significantly from structured interventions that engage multiple sensory modalities. Digital media-mediated interventions, particularly those incorporating interactive, visual, and auditory features, have demonstrated enhanced effectiveness in supporting phonological awareness development (O'Brien et al., 2022).

Over the past two decades, multisensory approaches to literacy instruction have gained increasing attention within educational research. Neuroscience studies demonstrate that learning experiences involving multiple sensory pathways strengthen neural connections and improve memory retention (Shams & Seitz, 2008). Birsh (2011), further emphasizes that structured multisensory phonics instruction can effectively support students who experience difficulties in developing phonological awareness. The integration of digital media such as interactive touchscreens, audio visual feedback systems, animated videos, and educational games has expanded the possibilities for delivering multisensory instruction in more engaging and personalized ways (Zhang et al., 2020).

The strategic use of digital media in education has been extensively studied. Ibad et al., (2024) investigated digital literacy management based on Open Artificial Intelligence in student research development, concluding that when used correctly, Artificial Intelligence can be a very useful tool to improve the quality of student learning, research, and skill development. Their findings emphasize that the successful integration of technology depends on how users manage its use wisely a principle that applies equally to phonics instruction in elementary classrooms. Additionally, Ibad (2023) demonstrated the effectiveness of environmental exploration approaches in improving elementary student learning outcomes, showing that student centered, experience-based learning significantly enhances engagement and achievement. These prior studies provide a strong foundation for integrating digital media into trilingual phonics instruction.

Empirical studies have provided further evidence of the effectiveness of multisensory phonics strategies. Medina González & Hardison (2022), for example, developed the Assistive Design for English Phonetic Tools (ADEPT), which integrates visual, auditory, and tactile learning through picture-touch cards. Their findings showed significant improvement in students' pronunciation accuracy. Similarly, Guevara et al. (2025), conducted a large-scale study involving 649 early elementary students in Costa Rica and Ecuador and found that multisensory phonics instruction integrated with game-based learning significantly enhanced syllable recognition and word decoding skills.

In multilingual contexts, literacy instruction becomes even more complex because learners must negotiate differences across languages. O'Brien et al. (2022), demonstrated that technology-supported phonics instruction improved English word recognition among bilingual Mandarin-English learners. Their study highlighted the importance of providing structured support for phonological patterns that differ

across languages. Germain & Hummel (2025), further emphasized that early bilingualism influences how learners perceive and produce phonological structures in additional languages, suggesting that digital media-mediated exposure can facilitate cross-linguistic transfer.

The integration of digital media in language learning has gained substantial momentum in recent years. Various media formats—including interactive videos, audio recordings, animations, digital flashcards, QR codes, and gamified platforms—have transformed how phonics instruction can be delivered (Ibad et al., 2024). These media enable personalized learning pathways, immediate corrective feedback, and engaging gamification elements that increase student motivation and sustained engagement. However, research examining the integration of such diverse media specifically within trilingual elementary contexts remains limited.

Indonesia offers a particularly interesting context for studying multilingual literacy development because educational institutions increasingly integrate academic learning with character education. Religious moderation has become an important educational priority within the Indonesian national curriculum, emphasizing values such as tolerance, respect for diversity, and balanced perspectives in social and religious life (Kementerian Agama RI, 2019). Scholars argue that these values are most effectively developed when embedded within everyday learning activities rather than taught as isolated subjects (Aflahah et al., 2023). Digital media can serve as a powerful medium for conveying these values through culturally responsive digital content, animated stories, and interactive cross-cultural learning experiences.

Within this context, trilingual schools represent unique learning environments where language education intersects with cultural diversity and digital media innovation. One institution that exemplifies this integration is Sinar Harapan National Trilingual Elementary School in Lumajang, East Java, which provides instruction in three languages Indonesian, English, and Mandarin while simultaneously emphasizing character formation and tolerance among students. The school has also begun incorporating digital learning tools, including interactive whiteboards, tablet-based learning applications, online assessment platforms, and QR code-linked resources. Such an environment offers valuable opportunities to integrate literacy instruction with broader socio-cultural educational goals and digital media advancements.

Although previous studies have explored multisensory phonics instruction and character education independently, and some have examined digital media-enhanced language learning, limited research has investigated how these approaches can be integrated within trilingual literacy instruction. The lack of structured instructional models that combine digital media-enhanced multisensory phonics-based literacy development with the values of religious moderation represents an important gap in the literature.

Therefore, this study aims to develop and evaluate a digital media-enhanced multisensory trilingual phonics instructional model that supports early reading development while simultaneously fostering values of tolerance, respect, and appreciation for diversity among elementary school students.

This study offers several novel contributions to the existing literature. First, while previous research has extensively examined multisensory phonics instruction in monolingual and bilingual contexts, relatively little attention has been given to its digital media-enhanced application in trilingual literacy environments. By focusing on

Indonesian, English, and Mandarin simultaneously, this research expands current understanding of how digital multisensory strategies can support phonological awareness across linguistically diverse systems.

Second, this study integrates literacy instruction with the concept of religious moderation, a value-based educational framework promoted within the Indonesian educational context, while leveraging digital media as a medium for values transmission. While character education has been widely discussed in the literature, empirical studies examining how moderation values can be embedded within digital media-mediated language instruction remain limited.

Third, the study adopts a design-based research approach to develop a practical instructional model grounded in real classroom contexts. Rather than merely testing an existing intervention, this research produces an instructional framework that can guide teachers in integrating digital media-enhanced multisensory phonics instruction with character education in multilingual classrooms.

## **RESEARCH METHODS**

This study utilises a Research and Development (R&D) approach by applying the ADDIE model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. According to Sugiyono (2017), research and development is a systematic process to produce and validate educational products through repeated testing and refinement stages. The ADDIE model introduced in learning design provides a structured framework for developing educational products effectively (Branch, 2009). This model was chosen because it offers a systematic workflow, emphasises continuous improvement based on feedback during the development process, and is in line with the principles of Design-Based Research as described by The Design-Based Research Collective (2003) and McKenney & Reeves (2018).

This study combines qualitative and quantitative approaches. Qualitative data were obtained through needs analysis interviews, input from expert validators, observations of learning activities in the classroom, and responses to open-ended questions in the questionnaire (Braun & Clarke, 2006). Meanwhile, quantitative data was collected from expert validation scores, teacher questionnaire results, and children's sound awareness test scores before and after the learning process took place (Arikunto, 2009).

This research was conducted at Sinar Harapan National Trilingual Elementary School in Lumajang, East Java. This location was chosen because the school has a strong identity as a trilingual educational institution that emphasizes the values of religious moderation. The school positions itself as 'the number one school of moderation in Lumajang,' highlighting its commitment to character development that encourages understanding of tolerance in diversity and the application of learning using three languages. The school is also equipped with basic digital media infrastructure, including Wi-Fi connectivity, interactive projectors, tablet devices for student use, and speakers for audio playback.

Participants involved in this study were purposively selected based on their relevance to the research objectives. Table 1 presents the distribution of research participants.

**Table 1. Research Participants**

| Category              | Number          | Description                                                                                                                              |
|-----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Teachers              | 26 individuals  | Participated in needs analysis interviews and completed user response questionnaires                                                     |
| Implementing Teachers | 8 individuals   | Four classroom teachers and four language specialist teachers                                                                            |
| Students              | 104 individuals | 28 Kindergarten children and 76 Grade 1 Elementary children                                                                              |
| Expert Validators     | 7 individuals   | Two literacy specialists, two trilingual education experts, two educational media specialists, and three character education specialists |
| Education Personnel   | 4 individuals   | Curriculum coordinators and religious education coordinators                                                                             |

Research participants were selected using purposive sampling, a method of determining samples based on specific considerations relevant to the research objectives. This technique is recommended in qualitative research because it allows researchers to select informants who are considered most capable of providing information relevant to the focus of the study (Sugiyono, 2018).

In this study, data was collected through several techniques, namely observation, interviews, documentation, and questionnaires (Sugiyono, 2017). Observations were made by directly observing the learning process in the classroom, including how literacy activities were carried out, the level of student involvement in digital media-mediated multisensory activities, and student behavior that could reflect the values of religious moderation. These observations were conducted periodically over 14 weeks while the learning model was being tested. In addition, interviews were conducted with teachers, educators, and religious education coordinators to gain a deeper understanding of current literacy teaching practices, the implementation of character education in schools, various challenges faced, expectations for the development of new learning models, and their experiences with digital media. The interviews used a semi-structured guide to ensure that the main topics were covered while allowing space for additional relevant information to emerge. Meanwhile, documentation was carried out by collecting various secondary data sources, such as the literacy curriculum used in schools, available teaching materials, school policy documents related to religious moderation values, digital learning resources (audio files, video tutorials, QR code materials), and examples of student work.

The questionnaire was given to expert validators and teachers who implemented the model. The questionnaire for expert validators was used to assess various aspects of the model, including its theoretical basis, content accuracy, learning design, multisensory integration, digital media integration, language material suitability, integration of religious moderation values, and the practicality of the model in its application. Meanwhile, the questionnaire for teachers focused on assessing the ease of use of the model, its effectiveness in supporting the learning process, the usability of the digital media components, and the extent to which teachers felt capable of applying the model in classroom practice.

Data analysis in this study was conducted through three main stages, namely data reduction, data presentation, and conclusion drawing and verification (Miles et al., 2014; Sugiyono, 2017). The data reduction stage was carried out by selecting, organizing, and grouping information relevant to the research focus, particularly

related to learning design, the integration of a multisensory approach, digital media integration, and the instilling of values of religious moderation. To support the coding process and systematic theme identification, qualitative data analysis was assisted using NVivo software (Braun & Clarke, 2006).

The data presentation stage was carried out by arranging the data reduction results into a structured form, such as tables, graphs, and narrative descriptions, so that patterns of information could be seen more clearly and facilitate the interpretation process. Next, the conclusion drawing and verification stage was carried out by interpreting the analyzed data to answer the research questions, synthesizing the main findings, and double-checking through comparison of various data sources and confirmation with participants.

Meanwhile, quantitative data derived from expert validation scores and teacher questionnaires were analysed using descriptive statistical techniques, including calculations of mean values, percentages, and standard deviations. Furthermore, the product's feasibility level was determined by referring to the assessment categories proposed by Arikunto (2009). To determine the difference in student test results before and after the implementation of learning, a paired t-test was used to assess the significance of the improvement in learning outcomes.

## RESULTS AND DISCUSSION

### 1. Findings in the Needs Analysis Stage

The needs analysis stage produced a number of important findings regarding current practices and the need for trilingual phonics learning development that integrates the values of religious moderation at Sinar Harapan National Trilingual Elementary School. Based on classroom observations and interviews with teachers, it was found that phonics learning is still conducted separately for each language, so that coordination or integration between languages is still very limited (Sugiyono, 2016). Additionally, the use of digital media for phonics instruction remains minimal, with teachers primarily relying on traditional flashcards and printed worksheets.

One teacher noted:

*"We have tablets and a projector in the classroom, but we don't really know how to use them effectively for phonics instruction. The children sometimes watch educational videos on YouTube, but we haven't found good applications or media for teaching sounds in three different languages in an integrated way."*

Teachers expressed interest in incorporating various digital media that could provide consistent pronunciation models, especially for English and Mandarin sounds that do not exist in Indonesian. They particularly desired media that could offer visual representations of sound production (mouth movements, tone contours) and immediate feedback mechanisms.

As Ibad et al. (2024) emphasized in their study on digital literacy management, the successful integration of technology depends on how users manage its use wisely. This principle guided the development of digital media components in the present model, ensuring that technology serves pedagogical goals rather than becoming an end in itself.

Meanwhile, character education and religious moderation values are generally conveyed through separate activities, such as morning assemblies, religious studies, or specific thematic activities. Teachers expressed their hope that character education could be integrated more systematically into the academic learning process in the

classroom (Lickona, 1991). One of the religious education coordinators explained:

*'So far, religious moderation values have been taught separately from language lessons. Children do learn about tolerance in religious classes, but they do not always relate it to the language learning activities they do. Therefore, we need a way to incorporate these values into everyday learning in the classroom.'*

Teachers of all three languages also identified various sound difficulties that students often experience, which is consistent with previous research findings (Petrescu & Helms-Park, 2024; Seymour et al., 2003). Indonesian language teachers explained that students often have difficulty distinguishing between long and short vowels and the use of nasal consonants. English language teachers highlighted the challenges of learning 19 vowels, consonant clusters, and the inconsistency between letters and sounds in English (O'Brien et al., 2022). Meanwhile, Mandarin language teachers mentioned that the greatest difficulty for students is learning tones, as well as the transition from an alphabet-based system to a character-based writing system that carries meaning.

Teachers also expressed that digital media could help address these challenges. They suggested that audio recordings of native speakers could provide accurate pronunciation models, that animated videos showing mouth movements could demonstrate correct articulation, that visual tone contour animations could make abstract tone differences concrete, and that interactive games could make repetitive practice more engaging.

One of the Mandarin teachers, Mrs Mei, revealed in an interview:

*"Tones are very difficult for children because neither Indonesian nor English have them. I see them trying hard, and sometimes they get frustrated. But I tell them, 'Learning tones is like learning to sing a new song. Your Mandarin-speaking friends have been singing this song since they were little. Now you are learning to sing it too.' And I see their faces relax. If we had an animation that could show them the tone contours visually – like a line going up, down, or staying flat – and let them record and compare their voices, I think that would help tremendously."*

Teachers and educators also see many opportunities in trilingual phonics learning to foster values of religious moderation (Kementerian Agama RI, 2019; Umar et al., 2023). One classroom teacher said that when students realise that different languages have different ways of expressing the same meaning, this naturally opens up opportunities for discussion about diversity and mutual respect. Therefore, according to him, a more structured approach is needed to take advantage of these learning moments. Another teacher added that the three languages taught at school bring different cultural backgrounds and religious traditions. Indonesian reflects the national culture, which is heavily influenced by Islamic values, English opens up perspectives on Western culture, while Mandarin introduces Chinese culture. This diversity is seen as a valuable opportunity to instil tolerance.

In one observation in a Year 1 English lesson, the teacher showed the pupils pictures of various types of food. When a picture of a hamburger was shown, one pupil spontaneously said that the food was haram. Another pupil immediately responded that for some people the food might be permissible, because his uncle worked with people who ate it. The teacher then responded by emphasising that everyone has different customs and that the most important thing is to respect each other. This brief conversation—which lasted only about two minutes—shows that language learning can be an important space for instilling values of tolerance, not just enriching

vocabulary.

Teachers also clearly expressed their need for a new learning model. They hoped for guidelines explaining the interrelationship between sounds in different languages (Cenoz, 2013; De Angelis, 2007), a coordinated learning sequence among the three languages, and digital media-enhanced multisensory activities that can be adapted to the characteristics of each language (Birsh, 2011; Medina González & Hardison, 2022). In addition, teachers also want practical and ready-to-use digital teaching materials (audio files, video tutorials, QR code resources), a structured way to integrate the values of religious moderation into digital media-mediated phonics learning, and assessment tools that can monitor the development of reading skills as well as the growth of students' character (Arikunto, 2009).

## **2. Model Development and Description**

Based on the findings from the needs analysis and review of various previous studies, a multisensory phonics learning model integrated with religious moderation values was developed. This model was developed with reference to the principles of learning development in the ADDIE model (Branch, 2009; Sugiyono, 2016).

The developed model is based on five main ideas. First, an integrated trilingual approach that harmonises the interlingual learning process and explicitly shows the similarities and differences in the sound systems of each language (Cenoz, 2013; De Angelis, 2007). Second, the application of a digital media-enhanced multisensory approach that teaches each sound through a combination of hearing (digital audio recordings), seeing (animated videos, visual articulatory diagrams, AR tone visualizations), and movement or touch activities (touchscreen interaction, gesture-based games) simultaneously (Birsh, 2011; Shams & Seitz, 2008).

Third, the application of developmental sequencing, which is the introduction of sounds adjusted to the developmental readiness of children and the possibility of sound transfer between languages (Ehri et al., 2001; Seymour et al., 2003). Fourth, an emphasis on explicit interlanguage connections by highlighting the relationships between the sound systems of different languages, thereby helping students build a cognitive framework for understanding and organising their phonological knowledge in three languages (Bialystok, 2017).

Fifth, systematic integration of values, namely incorporating values of religious moderation into every phonics learning activity. This integration is designed to gradually foster attitudes of tolerance, mutual respect, appreciation of differences, and develop a balanced view of social life (Kementrian Agama RI, 2019; Lickona, 1991). As Ibad (2023) demonstrated in his study on environmental exploration approaches, student-centered, experience-based learning significantly enhances engagement and achievement. The present model extends this principle to digital media-enhanced phonics instruction.

Digital Media Components: The model incorporates several digital media resources:

- a. Interactive Phonics Applications: Custom-developed mobile applications for each language that present phonemes with visual articulatory diagrams (animated mouth movements), high-quality audio recordings by native speakers, and interactive tracing activities where students trace letters on the touchscreen while hearing the corresponding sound. The applications include:
  - 1) Indonesian Phonics App: Focuses on vowel length distinctions and

- nasal consonants (/ŋ/, /ɲ/)
- 2) English Phonics App: Emphasizes the 19 vowel sounds with visual vowel charts and common consonant clusters
- 3) Mandarin Phonics App: Features animated tone contour visualizations (rising line for second tone, falling line for fourth tone, etc.) and stroke order animations for basic characters
- b. Animated Video Tutorials: Short (1-2 minute) animated videos for each phoneme that show:
  - 1) A close-up animation of mouth movements from front and side views
  - 2) A cartoon character demonstrating the sound in a memorable way
  - 3) Example words with corresponding images and the target sound highlighted
  - 4) These videos are accessible via QR codes in student workbooks and classroom posters
- c. QR Code-Linked Audio Library: Professionally recorded audio for all phonemes, syllables, words, and short sentences in each language. QR codes are printed on:
  - 1) Classroom phonics charts (students can scan to hear correct pronunciation)
  - 2) Student flashcards (each card has a QR code for self-study at home)
  - 3) Worksheets (students can scan to check their answers)
  - 4) Homework assignments (parents can help children practice even if they don't speak the language)
- d. Augmented Reality (AR) Flashcards: Physical flashcards that, when scanned with a tablet or smartphone camera using a free AR app, display:
  - 1) 3D animations of mouth movements for each phoneme
  - 2) For Mandarin tones: a moving line showing the tone contour that rises, falls, or stays flat as the sound plays
  - 3) For English vowels: a visual representation of tongue position (high/mid/low, front/back)
  - 4) For all languages: an image of a child from a different cultural background saying the word
- e. **Gamified Learning Platforms:** Integration of Quizizz and WordWall for phonics games that provide immediate feedback and track progress. These platforms include:
  - 1) Sound discrimination games where students identify which of two similar sounds they heard
  - 2) Matching games connecting letters/characters to their sounds
  - 3) Tone identification challenges for Mandarin where students match a spoken tone to its visual contour
  - 4) Memory games matching words with pictures across languages
- f. Digital Audio Player with Slow-Motion Feature: A simple audio player interface where students can:
  - 1) Listen to a phoneme or word at normal speed
  - 2) Listen at 50% or 75% speed to hear individual sound components
  - 3) Record their own pronunciation and compare with the model
  - 4) Play back their recording to self-assess

- g. Simple Learning Management System (LMS) Dashboard: A teacher-facing dashboard that tracks:
- 1) Individual student progress through each phoneme
  - 2) Time spent on each activity
  - 3) Accuracy scores on gamified assessments
  - 4) Areas where the class as a whole is struggling (to inform whole-group instruction)

**Model Structure:** The developed model consists of five interconnected and mutually supportive components in its implementation process (McKenney & Reeves, 2018). The first component is the Digital Sound Mapping Framework, which is a comprehensive digital map accessible via tablet or computer that describes the sound system in Indonesian, English, and Mandarin. This framework shows the sounds that are common to all three languages, the sounds that are unique to a particular language, and the sounds that are similar but not entirely the same in different languages (Germain & Hummel, 2025). Each sound is accompanied by an audio recording, an animated video of mouth movement, an AR visualization, and a QR code for quick access.

The second component is Coordinated Digital Learning Sequences, which is a 36-week learning plan delivered through the LMS that aligns phonics teaching in all three languages. Weeks 1 to 12 focus on common sounds and basic skills. Weeks 13 to 24 introduce sounds that are unique to each language, emphasizing cross-linguistic comparisons. Weeks 25 to 36 focus on strengthening understanding and applying skills in an integrated manner (National Reading Panel, 2000). Each week includes digital assignments (videos to watch, audio to listen to, games to play) that can be completed on tablets at school or on parents' phones at home.

The third component is the Multisensory Digital Media Library, which contains approximately 150 digital media-enhanced multisensory learning activities. These activities are grouped based on language, sound category, media type (video, audio, AR, gamified, mixed), and how religious moderation values are integrated into learning activities (Guevara et al., 2025; Medina González & Hardison, 2022).

The fourth component is the Religious Moderation Values Framework, which is a structured guide for integrating religious moderation values into the digital media-mediated learning process. This integration is carried out through:

- a. Selection of digital content that respects cultural diversity (e.g., culturally diverse images in AR flashcards, stories about children from different backgrounds in animated videos)
- b. Application of cooperative learning through tablet-based collaborative games where students must help each other identify sounds
- c. Reflective practices using digital journals where students record short voice notes or draw pictures in response to prompts like "What did you learn about another culture today?" and "How can you show respect to someone who speaks a different language?"
- d. Teacher modeling of respect for all languages and cultures, reinforced by video examples
- e. Classroom routines that support these values, such as playing recorded greetings in multiple languages through classroom speakers and holding appreciation circles where students share something they learned about another culture from

the digital activities (Berkowitz, 2012).

The fifth component is Teacher Digital Media Support Materials, which includes various support tools for teachers, such as:

- a. Video tutorials for using all digital media components
- b. Detailed lesson plans integrating digital media with clear time allocations
- c. Phonics teaching guides for each language with QR codes linking to audio examples and video demonstrations
- d. Guidelines for integrating religious moderation values into digital media-mediated learning activities, including sample discussion questions
- e. Digital assessment instruments and rubrics to monitor student learning progress (Arikunto, 2009)
- f. A quick-reference guide for troubleshooting common technical issues

Value Integration Strategy: The integration of religious moderation values in this model is carried out through several main approaches.

First, the selection of learning content that respects cultural and religious diversity, for example through the use of words, images, animated characters, and stories that represent various cultural backgrounds in a fair and inclusive manner (Umar et al., 2023). The AR flashcards include images of children from different cultural backgrounds wearing various traditional clothing, celebrating different holidays (Eid, Christmas, Chinese New Year, Nyepi), and participating in daily activities. The animated video tutorials feature a diverse cast of characters.

Second, the application of cooperative learning structures that encourage students to work with peers from different linguistic backgrounds, facilitated through tablet-based collaborative games where students must help each other identify sounds. For example, in one game, one student sees a picture and must say the word, while another student must select the correct written form on their tablet—they cannot succeed without communicating with each other (de Oliveira et al., 2026).

Third, the use of reflective practices through simple questions that help students rethink their learning experiences (Kristiantari et al., 2025). After each lesson, students record a short voice note or draw a picture in response to a prompt that appears on their tablet. Prompts include: "What new word did you learn in another language today?", "How did you help a friend who was struggling with a sound?", and "What is something interesting you learned about another culture?"

In addition, teachers are also directed to be role models in showing respect for all languages and cultures. This model also develops classroom routines that support these values, such as:

- a. Starting each day by playing a recorded greeting in a different language through the classroom speakers
- b. Displaying a "Word of the Day" from each language on the interactive whiteboard, with QR codes for pronunciation
- c. Holding weekly "Culture Share" circles where students share something they learned about another culture from the digital activities
- d. Creating a "Respect Wall" where students can post (using tablets) drawings or messages about respecting differences, which are then displayed on the interactive whiteboard

In the process of designing learning activities, the research team attempted to

integrate these values in a tangible way. One example of this was when designing activities to introduce the sound /m/. Initially, the word 'mother' was chosen as an example. However, it was then considered that this word had different equivalents in the three languages being taught, namely ibu in Indonesian, mother in English, and māma in Mandarin. Instead of choosing just one word, all three were displayed together in an animated video, with pictures of mothers from various cultural backgrounds wearing different traditional clothing. When this activity was tested in class, one student pointed to a picture of a mother from Chinese culture and said that the picture reminded him of his friend's mother. Another student added that his mother wore a hijab like the one in another picture. The teacher then responded by saying that mothers in different places may look different and speak different languages, but they all have the same love for their children. The teacher then played a short audio clip of "I love you" in all three languages and invited students to say it in the language of their choice. This simple moment shows how digital media can make abstract values concrete and how phonics learning can also be a means of fostering understanding and appreciation of diversity.

### 3. Expert Assessment Results

The developed model was then reviewed by seven experts to assess various important aspects of the resulting product (Sugiyono, 2017). The experts were asked to assess several components of the model, such as the theoretical basis, content accuracy, learning design, integration of a multisensory approach, digital media integration, interlanguage integration, and integration of religious moderation values. The results of the experts' assessment are presented in Table 2.

**Table 2. Expert Validation Results**

| Validation Aspect                       | Maximum Score | Score Received | Percentage    | Category               |
|-----------------------------------------|---------------|----------------|---------------|------------------------|
| Theoretical Foundation                  | 20            | 18             | 90.00%        | Highly Feasible        |
| Content Accuracy                        | 24            | 21             | 87.50%        | Highly Feasible        |
| Instructional Design                    | 32            | 29             | 90.63%        | Highly Feasible        |
| Multisensory Integration                | 24            | 22             | 91.67%        | Highly Feasible        |
| Digital Media Integration               | 24            | 21             | 87.50%        | Highly Feasible        |
| Language Appropriateness                | 20            | 17             | 85.00%        | Highly Feasible        |
| Religious Moderation Values Integration | 32            | 28             | 87.50%        | Highly Feasible        |
| Practical Feasibility                   | 16            | 14             | 87.50%        | Highly Feasible        |
| <b>Total</b>                            | <b>192</b>    | <b>170</b>     | <b>88.54%</b> | <b>Highly Feasible</b> |

A total score of 88.54% places the developed model in the 'highly feasible' category based on the assessment criteria proposed by Arikunto (2009). The aspect with the highest score was multisensory integration, which scored 91.67%, indicating that this model is capable of effectively applying multisensory learning principles in phonics activities (O'Brien et al., 2022; Shams & Seitz, 2008). Digital media integration scored 87.50%, indicating that the digital media components were well-designed, age-appropriate, and appropriately integrated with non-digital activities. The educational media specialists particularly appreciated the AR tone visualization feature for Mandarin, the QR code-linked audio library for independent practice, and the slow-

motion audio player for phoneme discrimination.

These validation results align with Ibad et al.'s (2024) findings that digital literacy management, when implemented wisely, significantly enhances the quality of learning and skill development. The high feasibility score confirms that the digital media components serve pedagogical goals effectively.

Meanwhile, the aspect of integration of religious moderation values scored 87.50%, indicating the model's suitability for character education objectives (Ministry of Religious Affairs of the Republic of Indonesia, 2019; Thomas Lickona, 2018). The aspect with the lowest score was language suitability, at 85.00%, where the validators suggested that the model provide stronger support in teaching tones in Mandarin (Germain & Hummel, 2025; O'Brien et al., 2022).

In addition to providing quantitative assessments, the experts also submitted written comments that helped clarify aspects that could still be improved. A literacy expert stated that the integration of character education in phonics learning is an innovative approach with a strong theoretical foundation. According to him, the use of reflective questions and collaborative activities among students creates natural opportunities for the development of character values without reducing the focus on literacy skills development (Berkowitz, 2012). He also praised the AR features and animated videos for making abstract sound concepts more concrete and engaging for young learners.

An educational media specialist commented: "The use of QR codes is particularly clever. It allows students to access high-quality audio models at any time, even at home, without needing to install complex software. The AR for tone visualization is innovative and addresses the most challenging aspect of Mandarin instruction. The slow-motion audio player is simple but effective – students can really hear the individual components of consonant clusters."

Meanwhile, a character education expert assessed that this model demonstrates a good understanding of the concept of religious moderation and how to integrate it into learning at the primary school level. He also emphasised that the selection of learning content in this model accurately represents various traditions and respects diversity (Umar et al., 2023). He particularly appreciated how the digital reflection prompts naturally encouraged students to think about respect and diversity without being didactic, and how the diverse characters in the animated videos normalized cultural diversity.

#### **4. Model Trial Results**

The developed learning model was then implemented for 14 weeks to 104 students involving 8 teachers at Sinar Harapan National Trilingual Elementary School. During the implementation process, data was collected through teacher questionnaires, observation of learning activities in the classroom, student ability tests, and recording of behaviour that emerged during the activities (Sugiyono, 2017).

**Teacher Responses.** The results of the questionnaires completed by the teachers showed an average score of 83.50%, which placed this model in the 'highly feasible' category based on the assessment criteria proposed by Arikunto (2009). The scores given by Mandarin teachers were slightly lower, ranging from 80–82%, which is understandable given the complexity of teaching tones in Mandarin when integrated with a multisensory approach (O'Brien et al., 2022). Nevertheless, the teachers still rated this model as feasible to highly feasible for implementation in learning.

Teachers particularly appreciated the digital media components. One teacher

noted: "The QR codes were a lifesaver. Before, students would ask me to repeat pronunciation many times, and I couldn't always give individual attention. Now they can scan the code and listen as many times as they need, at their own pace. They've become much more independent learners."

Another teacher commented: "The AR flashcards for Mandarin tones were amazing. Students could actually see the tone contour moving, and they loved scanning the cards themselves. They would practice independently during free time, which never happened with traditional flashcards. I also noticed that students who were shy about speaking in front of the class were more willing to practice quietly with the AR feature."

A third teacher added: "The gamified platforms (Quizizz and WordWall) were very popular. Students would ask to play the phonics games during free time and even asked if they could access the games at home. The competitive element motivated them to practice more, and the immediate feedback helped them learn from their mistakes without embarrassment."

These positive responses confirm that digital media, when thoughtfully integrated, can effectively support student-centered, autonomous learning. The model's success in engaging students independently validates the value of providing accessible, interactive learning resources.

One of the English teachers, Mrs Sarah, said in an interview that this coordinated learning approach has brought about changes in her teaching practices. According to her, through this model, she can understand more clearly the material studied by students in Indonesian and Mandarin, so that she can relate it to English language learning. She also considers that the integration of values in this model feels natural because students spontaneously notice the similarities and differences between languages, which can then be used as an opportunity to discuss mutual respect and appreciation of diversity.

A Mandarin teacher, Mrs Mei, also shared her experiences during the implementation of the model. According to her, the combination of tone gestures (physical movement), AR visualizations (seeing the tone contour), and the slow-motion audio player (hearing the tone extended) greatly helped students remember Mandarin tones. When tones are presented through multiple media simultaneously, children find them easier to understand and remember. She also added that the cultural elements incorporated into the digital learning process (diverse characters in videos, culturally varied images in AR flashcards) helped students realize that Mandarin comes from a rich cultural tradition, so that cultural differences can be understood as something interesting and valuable rather than strange or threatening.

Another class teacher, Mr Rudi, shared some interesting observations during the learning process. He noticed a change in the students' social interactions, especially during free play. According to him, the students seemed more open to their friends, more interested in getting to know each other's backgrounds, and more willing to help friends who had difficulty pronouncing certain sounds. This shows a positive change in the way students view the differences between them.

Observations during the learning process showed that students were highly engaged in digital media-enhanced multisensory activities. The level of student engagement—as demonstrated by active participation, ability to maintain focus, and positive attitude towards learning activities—reached an average of 88% across all sessions observed. Kinesthetic and tactile activities, such as tracing letters in sand or

using touchscreens, showed the highest level of engagement at around 95% (Birsh, 2011; Medina González & Hardison, 2022).

Students were particularly engaged when using the AR tone visualization feature. One observer noted: "Students spent significantly more time practicing tones when using the AR flashcards compared to the paper ones. They would scan the card, watch the animation, try to produce the tone, and then immediately scan again to check if they were right. This self-directed practice was not observed with traditional methods."

The gamified platforms (Quizizz and WordWall) also generated high engagement. Students requested to play the phonics games during free time and even asked if they could access the games at home. Teachers reported that students who were typically shy about speaking in class were more willing to participate in the digital games where they could respond anonymously.

This high level of engagement reflects the effectiveness of student-centered, autonomous learning approaches enabled by digital media. The digital media components empowered students to take control of their phonics practice, moving beyond teacher-dependent learning.

In addition, various learning sessions also revealed student behaviour that reflected the values of religious moderation (Kementarian Agama RI, 2019). In approximately 73% of the sessions observed, students demonstrated at least one behaviour that reflected the development of tolerance, mutual respect, or appreciation of differences. For example, students voluntarily helped friends who had difficulty pronouncing certain sounds in a particular language, asked questions about cultural elements that appeared in example words, and greeted each other using various languages while making positive comments about the differences that existed (Umar et al., 2023).

One particularly notable moment occurred during a Mandarin language lesson. One student was having difficulty pronouncing one of the tones. His friend then approached him and said that his sister had also experienced the same difficulty, then showed him a hand gesture that could be used to help remember the tone. He also suggested using the AR flashcard to see the tone contour. After trying again using the gesture and the AR visualization, the student who had previously struggled was finally able to pronounce the tone correctly. Both of them smiled with satisfaction. Interestingly, the teacher did not need to give any instructions; the students spontaneously helped each other overcome their language difficulties. This situation shows how interactions between students can support the learning process while fostering an attitude of mutual assistance.

In another session, a student spontaneously commented that in Mandarin, people use different characters to write, and that this is not wrong, but simply different—just like different eating habits in each person's home. Comments like this became more frequent over time during the implementation of the model (Petrescu & Helms-Park, 2024).

**Improvement in Student Learning Abilities.** To observe the development of students' phonological abilities, a sound awareness test was conducted before and after the 14-week learning programme. The results of the test scores are presented in Table 3.

**Table 3. Student Phonemic Awareness Assessment Results**

| Language | Pre-Test | Post-Test | Gain (%) | t-value | p-value | Cohen's d |
|----------|----------|-----------|----------|---------|---------|-----------|
|----------|----------|-----------|----------|---------|---------|-----------|

|            | Mean (%) | Mean (%) |       |       |         |      |
|------------|----------|----------|-------|-------|---------|------|
| Indonesian | 62.84    | 85.02    | 22.18 | 9.12  | < 0.001 | 1.31 |
| English    | 51.23    | 76.90    | 25.67 | 10.23 | < 0.001 | 1.44 |
| Mandarin   | 44.18    | 68.21    | 24.03 | 8.45  | < 0.001 | 1.21 |

The results of the analysis show that there was a statistically significant improvement in students' abilities in all three languages studied. The p-value was below 0.001 with a large effect size, namely Cohen's d above 1.2 for each language (Arikunto, 2009). The greatest improvement occurred in English language learning with an increase of 25.67%, which is understandable because English has a relatively more complex sound system, making it the biggest challenge for students at the beginning (National Reading Panel, 2000; O'Brien et al., 2022). Mandarin language learning also showed a strong increase of 24.03%, even though students had to face the additional challenge of the tone system. This shows that a multisensory approach can help students understand the unique aspects of Mandarin (Germain & Hummel, 2025).

These significant learning gains demonstrate the effectiveness of the digital media-enhanced approach, supporting Ibad's (2023) earlier findings that student-centered, experience-based learning approaches significantly improve learning outcomes. The integration of multiple digital media formats created rich, engaging learning experiences that traditional methods could not provide.

## 5. Factors Supporting the Success of the Model

Based on the entire research process, there are several main factors that contribute to the successful implementation of this integrated learning model (Sugiyono, 2019). First, this model is built on a strong theoretical foundation by combining the concepts of multisensory learning, digital media integration, and character education frameworks, thus providing a solid basis for its development (Berkowitz, 2012; Shams & Seitz, 2008). Second, the use of the ADDIE development model allows for a systematic design process and facilitates evaluation at each stage of development (Branch, 2009; McKenney & Reeves, 2018).

Third, the strategic integration of various digital media—including AR, animated videos, QR codes, gamified platforms, and slow-motion audio players—addressed specific pedagogical challenges identified in the needs analysis. As Ibad et al. (2024) emphasized, the wise management of digital technology is crucial for its successful implementation in educational contexts. The present model exemplifies this principle by ensuring that each digital media component serves a clear pedagogical purpose.

Fourth, full support from school leaders strongly committed to trilingual education and religious moderation values also created an environment conducive to successful model implementation. Active teacher involvement during the development process ensured the resulting model meets real classroom needs (Sugiyono, 2017). The model aligns with the school's identity as an educational institution emphasizing moderation values, enabling natural values integration without feeling forced (Kementerian Agama RI, 2019). Additionally, the revision process, which was carried out repeatedly based on input from experts and practitioners, also strengthened the quality of the resulting model (The Design-Based Research Collective, 2003).

The school principal, Mr Ahmad, provided a reflection that illustrates the impact of this model very well. He stated that initially, this program was expected only

to help students improve their reading skills in three languages. The test results did show such an improvement. However, what was unexpected was the change in students' social interactions. According to him, the children became friendlier, more curious about their friends' backgrounds, and more open to differences. For him, this change in attitude was a clear illustration of how the value of moderation can grow in the daily lives of primary school children.

## CONCLUSION

This study successfully developed and validated a digital media-enhanced multisensory trilingual phonics instructional model that supports early reading development while fostering religious moderation values at Sinar Harapan National Trilingual Elementary School in Lumajang, Indonesia. The findings demonstrate that systematic, coordinated phonics instruction across three languages—Indonesian, English, and Mandarin—delivered through integrated multisensory learning activities enriched with diverse digital media (interactive applications, AR flashcards, animated videos, QR codes, gamified platforms), combined with intentional cultivation of religious moderation values, significantly improves early elementary students' phonemic awareness across all three languages. Simultaneously, the approach fosters attitudes of tolerance, mutual respect, and appreciation for diversity among students.

The instructional model addresses critical gaps in both trilingual literacy education and character education resources by offering teaching frameworks and learning materials that are grounded in theory and supported by empirical evidence. These materials integrate cognitive learning objectives with affective development in a unified instructional design. Expert evaluations confirmed the model's theoretical and practical validity, achieving an overall feasibility score of 88.54%, while character education specialists rated the integration of religious moderation values at 87.50%. Feedback from implementing teachers indicated a high level of practicality and satisfaction, with an average usability rating of 83.50%. Additionally, students demonstrated substantial learning progress across the three languages, with improvements ranging from 22.18% to 25.67% and large effect sizes. Classroom observations further supported these results by documenting student behaviors that reflected growing religious moderation values.

The findings confirm that literacy development and character formation can be cultivated simultaneously within a single instructional framework. Digital media played a crucial role in this success by providing consistent, accessible pronunciation models (through QR codes), making abstract concepts such as Mandarin tones concrete and visual (through AR and animated videos), offering immediate non-judgmental feedback (through gamified platforms), and enabling students to learn independently at their own pace. Moreover, trilingual education inherently provides meaningful opportunities to strengthen students' understanding and appreciation of cultural and linguistic diversity when learning experiences are intentionally designed to support these outcomes.

This study also contributes to broader discussions on how multisensory learning strategies operate across different linguistic systems and how values related to religious moderation can be naturally integrated into academic instruction through strategic use of digital media. The research extends prior work by Ibad et al. (2024) on digital literacy management and Ibad (2023) on environmental exploration approaches, demonstrating that technology-enhanced, student-centered learning can

significantly improve educational outcomes across multiple domains.

For trilingual elementary schools, curriculum designers, and teacher education programs, these findings highlight the importance of combining academic and character development within literacy instruction. Effective trilingual literacy programs should incorporate coordinated learning across languages, multisensory strategies that activate multiple learning pathways, strategic integration of digital media, and structured opportunities to embed values through culturally responsive materials, collaborative activities, and reflective learning processes.

In the broader context of Indonesia's efforts to prepare citizens who are capable of participating in a globalized world while maintaining a balanced and tolerant religious and cultural identity, research-grounded approaches that address both literacy skills and character education are increasingly necessary. The digital media-enhanced multisensory phonics model developed in this study represents one such approach, offering a practical contribution to preparing Indonesia's younger generation to engage successfully in an interconnected global community while upholding the values needed for harmonious life within the country's diverse and pluralistic society.

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