

# The impact of integrating Jolly Phonics Lessons application into English literacy lessons on UAE preschoolers' phonics skills

Noora Almansoori<sup>1</sup>, Robin Ogdol<sup>2</sup>, Aisha Alteneiji<sup>3</sup>

**Abstract:** The Jolly Phonics Lessons application is a digital tool that is designed to enhance the preschoolers' reading and writing skills through synthetic phonics approach. This study examined the impact of integrating Jolly Phonics Lessons application into literacy lessons on the emergent reading and writing skills among kindergarten students, ages 4-6, in the United Arab Emirates through a comparative study between pupils (Group-A), whose literacy classes were integrated with the application, and pupils (Group-B) who were taught using the traditional method of teaching literacy. Mixed methods research design was followed to analyze the effects of integrating the application. The Phonemic Awareness Assessment Inventory (PAAI) tool, field notes, and artifacts were utilized to measure the development of students' letter-sound identification, letter formation, phoneme blending and segmenting abilities. In addition, the paper compared the growth on phonics skills between students in Groups A and B. The results showed that students in Group-A outperformed pupils who received literacy instruction through traditional methods. The findings from the PAAI scores exhibited dramatic growth in letter-sound recognition and letter formation, and substantial increase in phoneme blending and segmenting abilities of Group-A. The T-statistic for differences between two means at 95% confidence revealed that there is a significant difference between the performance of students in Groups-A and B. Implications from this study highlight the positive impact of incorporating Jolly Phonics Lessons application into literacy classes on low-achieving students. On this bases, future research of Jolly Phonics Lesson application to support mixed-ability classes or students with dyslexia.

## Article History

Received: 30 May 2023

Accepted: 20 October 2023

## Keywords

Jolly phonics lessons application; Letter-sound identification; Letter formation; Phoneme blending; Phoneme segmenting

## Introduction

This study investigates the effects of incorporating the Jolly Phonics Lessons application, an educational digital technology tool, on the phonics abilities of United Arab Emirates (UAE) kindergarten students. By examining the impact of this technology-based instruction, the research aims to shed light on the potential benefits and advantages of incorporating digital tools in the early childhood education for improving phonics acquisition among preschoolers in the UAE context.

Teachers are well aware of how critical literacy development is. The development of language and literacy abilities is the foundation of all learning. High-quality literacy instruction during the early years plays a crucial role in a child's educational journey, serving as a foundational element for success both in school and in later life. In this light, educators must possess fundamental understanding of language structure and be well-grounded in effective strategies to teach literacy (Crim et al., 2008). This would guarantee that students would be provided with best practices in early childhood literacy teaching.

However, there is a growing body of studies that reveal how the education system fails to deliver high-quality, effective, and research-supported early literacy instruction. Students' poor literacy skills, which include recognizing letters, pronouncing letter sounds, and sounding out words, are evident in kindergarten schools worldwide. Mohammed and Amponsah (2018) mentioned three main contributing

<sup>1</sup> Higher Colleges of Technology, Faculty of Education, Sharjah, United Arab Emirates, e-mail: [nuraalmansouri94@gmail.com](mailto:nuraalmansouri94@gmail.com), ORCID: <https://orcid.org/0009-0007-3372-6309>

<sup>2</sup> Higher Colleges of Technology, Faculty of Education, Sharjah, United Arab Emirates, e-mail: [rogdol@hct.ac.ae](mailto:rogdol@hct.ac.ae), ORCID: <https://orcid.org/0000-0001-8643-8457>

<sup>3</sup> Higher Colleges of Technology, Faculty of Education, Sharjah, United Arab Emirates, e-mail: [aalteneiji@hct.ac.ae](mailto:aalteneiji@hct.ac.ae), ORCID: <https://orcid.org/0000-0003-3329-8723>

factors of students' lack of motivation and exposure to literacy, which leads to poor reading and writing skills. These factors include under-developed understanding by teachers of effective literacy instruction, scarcity of appropriate teaching and learning resources, and lack of cohesion between classroom and learning support tools and programs.

Kindergarten teachers in the UAE default themselves to the traditional one-size-fits-all educational approach. The study of Diamond et al. (2015) cited the importance of tailoring the curricular requirements to the needs of individual learners instead of generalizing for all students. It suggests that teachers should provide students the opportunities to gear their learning experiences in a manner that is most suitable for their unique needs. Here is where integrating technology in the classroom can help. Beginning reading and writing skills can grow further if students are introduced to effective teaching practices for literacy while using digital technology as an instructional scaffold. Students can reinforce their learning and seek additional support through wide-range of activities, measure their learning from the assessments built into the technology, and reflect on their performance from the feedback that they will receive after each assessment (Ihmeideh, 2009). There is a need for educational revolution and innovation where incorporation of technology is highlighted. Teachers need to embrace technology-based learning approaches where the utilization of educational digital tools is maximized. These would enhance learning opportunities, aid and personalized learning, and connect learning to real-world contexts and applications.

Jolly Phonics Lessons application is a software that teaches children to read and write using synthetic phonics approach. Elizabeth Ohaka (2022), an early childhood educationist, mentioned that using Jolly Phonics program can address the problem of imbalanced learning on literacy particularly at the early learning stage. This program teaches letter-sounds identification, formation, blending, and segmenting in conjunction with developmentally-appropriate stories, songs, and actions that make learning engaging, fun and challenging.

One of the UAE Vision 2021 National Agenda that aims to develop a first-rate education system through innovation and sustainability (Vision 2021, 2018). Taking this into consideration, the Ministry of Education (MOE) started to equip all schools with smart systems and devices and set it as the foundation for effective teaching and learning, projects, and research. However, teachers are not maximizing the use of the facilities provided by the MOE. Therefore, to address the escalating issues, the current student explores the impact of using the Jolly Phonics lessons program.

There is a gap in the literature with regard to a descriptive study on the impact of integrating the Jolly Phonics Lessons application in early literacy classes in the UAE. The results will include how educators can enhance kindergarten literacy education to raise students' literacy achievement. This study would create the foundation for subsequent actions including the development of literacy pedagogies, curricula and further research.

### **Purpose of the Study**

This study investigates the impact of integrating the Jolly Phonics Lessons application into English literacy lessons on emergent phonics skills of UAE government kindergarten students. Ariati et al. (2018) have identified areas of early years' beginning literacy, including learning the letter sounds, letter formation, phoneme blending and phoneme segmenting. In this light, the researcher chose these skills as the main variables. To determine its effects, students' pretest and posttest scores in the Phonemic Awareness Inventory Assessment (PAAI) were compared.

Furthermore, this study also compares the growth on phonics skills of students who had English literacy lessons that were integrated with Jolly Phonics Lessons application and students who received literacy instructions in the traditional methods. This was attained by examining the PAAI posttest scores of the two groups.

### **Significance of the Study**

This study holds substantial importance in the field of early childhood education and language

acquisition. The research investigates the effects of incorporating Jolly Phonics lessons application, a systematic phonics program, into English literacy lessons for preschoolers in the United Arab Emirates.

The study gives great importance to the following stakeholders in early childhood education:

### ***Early Childhood Education Students***

Phonics is an essential component of early literacy development. This research seeks to examine how integrating Jolly Phonics lessons application can contribute to enhancing the phonics skills of UAE preschoolers. This is important as students' phonics abilities play a vital role in reading, writing, and overall language acquisition.

Furthermore, having solid phonics skills form a strong foundation for successful reading and writing abilities. This study aims to contribute to the long-term academic success and achievement of UAE preschoolers. Children's reading fluency, comprehension, and overall language competency can all benefit from improved phonics abilities, setting the children on a trajectory for future academic success and achievement.

### ***Educators***

The study focus on kindergarteners in the UAE, making it pertinent to the local educational context. The study offers insight into the effectiveness of this specific educational strategy and learning program within the cultural and linguistic context of the UAE preschoolers by examining the impact of the Jolly Phonics lessons application in the UAE. This body of knowledge can help teachers in establishing well-informed choices and decisions on early literacy interventions and programs.

In addition, the emphasis of the study on integrating Jolly Phonics application adds a practical components to the research. Understanding the effects of a phonics program offered through a digital platform might provide important insights into possible advantages and challenges of incorporating technology in early literacy instruction, especially in light of the expanding availability and use of technology in educational settings.

### ***Management, Curriculum Developers, and Policymakers***

The integration of Jolly Phonics lessons application into English literacy lessons may result to evidenced-based suggestions for designing, developing, and implementing innovative and effective phonics instructions, thereby supporting the development of early literacy skills of early childhood students.

### ***Parents***

The study gives parents a profound understanding of the positive impact of technology integration on their children's literacy skills. This can help the parents embrace the use of technology as an effective tool that benefits their children's phonics development. In addition, the research findings can inform the parents about the interventions, activities, exercises, and resources that they can utilize to support, practice, and reinforce their children's phonics abilities outside the classroom.

Overall, the study has significant implications for both research and practice in the field of early childhood care and education. It aims to increase our knowledge of effective instructional approaches, successful teaching strategies, contribute to existing body of knowledge, and eventually improve kindergarteners' educational results and experiences not only in the United Arab Emirates but on a worldwide scale.

## **Theoretical Framework**

Jolly Phonics is a multi-sensory approach to the teaching of phonics that uses a variety of techniques to engage different learning styles. The Jolly Phonics focus on reading and writing is heavily influenced by constructivism learning theory and the work of Jean Piaget (Brau, 2020). The constructivism learning theory emphasizes that individuals learn best when they are engaged in meaningful activities that allow them to

connect new information to their existing knowledge (Schunk, 2020). As a result, it implies that phonics instruction should be learner-centered, with learners discovering decoding rules. The program encourages children to engage through interactive activities such as songs, games, and finger tracing.

In a kindergarten classroom, using the Jolly Phonics Lessons application on the iPad can be used to support aspects of constructivism theory. The Jolly Phonics Lessons application serves children with different learning styles. For instance, visual students can use the application since it is full of colorful images that activate memory; auditory learners are provided with audio records for learning literacy skills; and kinesthetic learners use their fingers to trace the letter and complete touching games. Additionally, before moving on to a letter, a revision of the previous taken letter will be made, which will enable students to connect prior to new facts. Constructivism theory also posits that learning is most effective when it is relevant to the learner's life experiences (Brau, 2020).

Jolly Phonics is designed to be culturally sensitive and adaptable to different languages and dialects. This makes the program more relevant to the learner's life experiences, which in turn increases their motivation to learn. By using examples from the child's own environment and culture, Jolly Phonics allows learners to construct knowledge in a meaningful context. Moreover, constructivism theory emphasizes the importance of reflection in the learning process. Jolly Phonics incorporates regular review and assessment activities to help students reflect on their progress and identify areas where they need further support. Teachers can assess individuals using the application, as it offers assessments to be done after they receive the lesson to ensure lesson learning outcomes are achieved and understood. This allows learners to see their own progress and build on their successes. By reflecting on their own learning, children are able to construct meaning and understand the concepts they have been taught. By incorporating these principles into the teaching of phonics, Jolly Phonics provides an effective approach to literacy development that supports children's construction of knowledge (Shunk, 2020; Sun, 2019).

Teachers play a guiding role as promoters in this learning process (Brau, 2020). Thus, the educators' use of the Jolly Phonics application will highly contribute to the success of constructivism theory, and the Jolly Phonics application offers games that can be individually used by kindergarten learners and will allow them to make connections between the letters they already knew and the new ones through the iPad.

## **Literature Review**

### ***Jolly Phonics Lessons Application as an Instructional Scaffolding Tool***

The Jolly Phonics Lesson Application is a highly effective tool for scaffolding instruction in phonics for emerging readers. Scaffolding aims to provide a structure or tool to break instruction down into manageable chunks for the learner (Scheper, 2023). Research conducted by Tyler et al. (2015) indicates that providing structured, systematic phonics instruction at early stages can significantly benefit children's literacy outcomes. This aligns with the Common Core State Standards for English Language Arts (CCSS-ELA), which call for explicit and systematic phonics instruction (Lee et al., 2013). The Jolly Phonics Lesson Application offers engaging and enjoyable activities with colorful and interactive visuals that make learning feel effortless. Nazare et al. (2022) suggest that technology-assisted instruction can be more engaging and effective for children. Educators can scaffold students' learning by first understanding their individual and collective zone of proximal development (ZPD), which is the distance between what children are capable of and the next level they can achieve with the correct guidance (Smagorinsky, 2018). With the Jolly Phonics Lesson Application, teachers can provide a tailored approach that considers each student's ZPD, fostering foundational literacy skills essential for reading growth. Educators can use the app to break down vocabulary into individual sound bites, practice blending and segmenting words, progress towards letter formation, and design customized activities tailored to a pupil's level. The accessibility of the application ultimately provides opportunities for the learner to revisit learning challenges and strengthen foundational skills at any time.

### ***Strategies to Integrate Jolly Phonics Lessons Application in Literacy Classes***

Incorporating Jolly Phonics lessons into literacy classes can foster literacy skill growth and

development in an effective and engaging manner. A multitude of strategies and resources exist to integrate Jolly Phonics into daily literacy classes. For instance, Al-Awidi and Ismail (2014) suggest supplementing traditional lessons with technological software that includes phonics-based activities and games, such as the unique Jolly Phonics Lessons application. In addition, structured exercises such as teaching sight words while concurrently emphasizing corresponding letter sounds reinforce the critical link between letters and sounds found at the core of early phonics instruction (Ehri, 2017). The successful application of the Jolly Phonics approach lies in the correct sequencing of the instruction, starting with the simplest and building to the most complex skill. Bdeir et al. (2022) emphasize the importance of breaking down lessons, including letter sound, letter formation, letter blending, and (consonant-vowel-consonant) (CVC) word segmenting. In the class, educators can choose any letter sound from the lesson banner to view the full lesson, including the 4 skills, and deliver it to young individuals, which can be accomplished by screen mirroring the iPad to the computer or laptop and then to the data show so all learners can view the screen. Next, teachers can assess students formatively in circle time by allowing them to complete several exercises available, like spelling the sound out, forming the letter, and others. During the center's time, instructors might have a specific literacy center with iPads provided so children can play the games available in the lesson letter. The educator can offer scaffolding and monitoring while pupils are using the iPads. Teachers in the classroom can then assess kindergarteners using formative exercises, games that reinforce and scaffold identified weak areas, and the implementation of the tools in centers with tailored support while actively supervising children (Vadasy & Sanders, 2014). At-school assessment options provide individual scoring to guide instructors on essential points of intervention while indicating ways of improving student reading ability. The systematic application of Jolly Phonics in literacy classes through scaffolding provides an exciting and fun approach to foster early reading skills with universal application in all other academic subjects. Moreover, this approach targets children with reading difficulties, providing them with individualized attention meant to grow and advance their literacy level.

### **Research Hypotheses**

Based on the background, problem statements, and literature review, the following hypotheses were framed for this study:

- Integrating Jolly Phonics Lesson application into English literacy lessons has positive impact on kindergarten students' skills on: (a) letter-sound identification; (b) letter formation; (c) phoneme blending; and (d) phoneme segmenting
- There is a significant difference on the performance of Group-A students, who had English literacy lessons that were integrated with Jolly Phonics Lessons application, and Group-B students, who received literacy instructions in traditional methods, on: (a) letter-sound identification, (b) letter formation, (c) phoneme blending, (d) phoneme segmenting

### **Method**

#### **Research Design**

This education action research used analytical investigative techniques to improve the quality of teaching and learning in early childhood education. A comparative study was employed to compare and contrast instructional approaches. According to Coccia and Benati (2018), a comparative study is an extensive investigation between two or more comparison groups to offer relevant similarities and differences about how different instructional methods affect teaching and learning.

This comparative student employed a mixed-methods design. Mixed methods research is the process of collecting, analyzing, mixing, and drawing conclusions in a single study by combining qualitative and quantitative approaches to supplement findings with measurable statistics and provide deeper insights to researchers (Halcomb & Hickman, 2015). Quantitative data is information that is closed-ended and collected to analyze numerical data (Mkandawire, 2019). On the contrary, open-ended and descriptive qualitative data is used to describe phenomena, such as words, that can be observed for in-

depth analysis (Billups, 2019).

The quantitative analysis of testing statistical differences between the literacy achievements of the two groups is supported through mean interpretation and T-test statistics. On the other hand, the researcher's field notes and artifacts supported the qualitative analysis of the data.

### Research Procedures

The researcher obtained written consent from the school principal and mentor school teacher (MST) to carry out the study. The purposive sampling technique was used to select students in Groups A and B. The study research followed a structured approach by using William Edwards Deming's Plan-Do-Check-Act (PDCA) cycle process technique as shown in Figure 1 (Pietrzak & Paliszkievicz, 2015). The PDCA is a cycle of continual progression based on the scientific method of proposing a change, putting it into practice, evaluating the results, and responding appropriately through actions (Maruyama & Inoue, 2016). Plan, Do, Check and Act are the four stages of the cycle for improvement initiative. This recurrent process has been utilised as a structured procedure in order to tackle concerning problems and determine effective solutions. The researcher conducted pretest using the PAAI at the beginning of the study to gauge students' letter-sound identification, letter formation, phoneme blending, and phoneme segmenting skills.

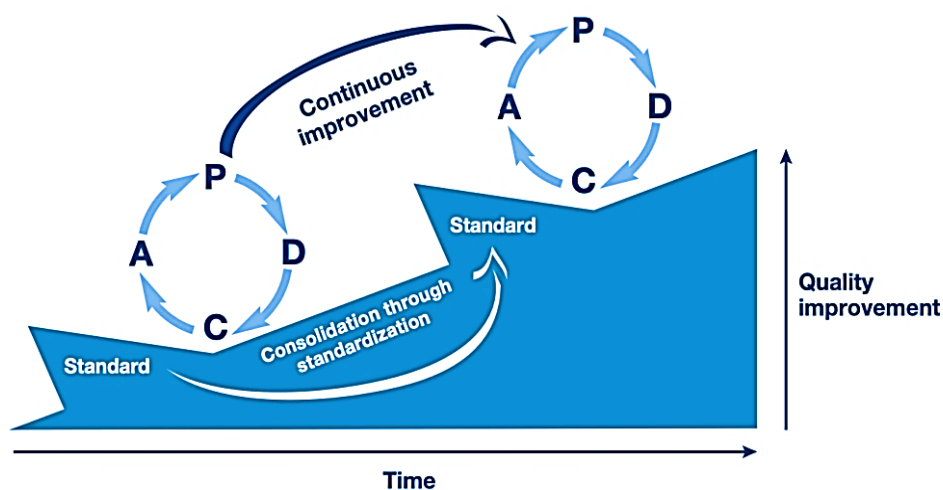


Figure 1. William Edwards Deming PDCA Cycle

Students were assigned into two groups. Group-A students experienced the treatment, which was the integration of the Jolly Phonics Lessons application into English literacy lessons. Group-B was not introduced to the same intervention. All literacy classes delivered to the were in traditional methods. Both groups contained students who are in their early development or emerging level in literacy. The main reason was in most of the Kindergarten schools in the UAE, English literacy subjects are not yet offered in KG 1 (Hania et al., 2022). In this view, it would be the first year of the KG 2 students to learn English literacy lessons. Since every student in Group-A had a counterpart in Group-B in term of skills and abilities, this ensured that the intervention was the mere source of potential similarities and differences in outcomes between the two groups. All other variables, aside from the examined intervention, remained constant between the two groups. Both groups were exposed to the same lessons, letters, vocabulary, and stories. The timing of the classes was a control variable. Both groups followed it as it was allocated by the UAE Emirates School Establishment – Ministry of Education. The durations and the number of delivered lessons throughout the study were the same for both groups.

Diagnostic assessment using the PAAI was given to both groups to determine students' beginning phonics skill before the start of the study. Data was gathered and analyzed before introducing the intervention to establish a strong understanding on the students' literacy skills. These procedures of gathering data and determining areas for development enabled the research to attain the first stage of the cycle which was planning effective interventions. Interventions integrated were explicit and synthetic

phonics activities with extensive reading. Reading aloud, shared reading, guided reading, and choral reading approaches were incorporated with phonics, sight words instruction, and word study. Every two to three days, new letter and sound were introduced through interactive lessons, songs, short poems, stories, and explicit instruction in regard to letter-sound relationship.

The next step was carrying out the plan by integrating the gradual release of responsibility instructional framework. At the start of each week, the teacher delivered read-aloud and phonics lessons. While reading stories and reciting short poems, the teacher introduced and revised on the letter and sound identification, and letter formation. Then, the Jolly Phonics Lessons application was incorporated throughout the lesson. Students were also given opportunities to use smart gadgets and tablets, open the application, and do learning activities involving letters and sounds. From there, the responsibility moved from the instructor to the students through shared and guided reading, and independent writing. In between these approaches, students received instructional scaffold through shared reading and writing. Homework included reading, and phonics activities available from the software. Activities that develop literacy skills were emphasized in the learning centers and groupings on a day-to-day basis. The literacy learning centers included hands-on and technology-based activities from Jolly Phonics application on writing letters, letter-sound recognition, blending sounds to form words, and determining individual sounds in a word.

All observed changes were documented during the implementation process. Data was gathered using the data collection tools for evaluation. The next step was to check and reflect on the data collected in the previous stage. Every two weeks, the collected information was analyzed to evaluate and reflect if the set plans attained the intended goals. Students' learning portfolios were collected as well to monitor and differentiate their literacy growth from the start to the end of the study. Lastly, the final phase of the cycle was to take appropriate actions based on the results of the previous three stages. Activities were consistently adjusted and improved, and interventions were implemented based on students' needs and interests. The integration of the Jolly Phonics Lessons application was frequently planned, implemented, and assessed, repeating the iterative cycle. At the end of the research, post-tests using the PAAI were administered to both groups to determine their literacy performance. T-test statistic was employed to check for significant difference between the performance of the two groups.

### **Research Site and Participants**

The research was conducted in a government kindergarten located in Umm Al Quwain, United Arab Emirates. The participants in this study were 36 students in KG-2 level, ages 4 to 6. The criteria for choosing the participants in both groups were determined through the use of purposive sampling. Purposeful sampling is a non-probability sampling in which researchers use their discretion in selecting participants of the population to participate in tests and other forms of data collection (Suri, 2012).

All 36 selected participants are at their emerging level of language development. Students at this level are commonly in the early stages of acquiring language abilities and skills. At this stage, they are starting to understand and use words, but their vocabulary and grammar are very limited, and their communication may be simplified or fragmented. The goal of choosing emerging-level students was to ensure that the selected samples were representatives of the classroom population in most of the government schools in the UAE (Hania et al., 2022). In UAE kindergarten schools, English literacy subjects are not yet offered in KG-1. In this view, students in KG-2 are at their emerging-level in the English language since this is something new to them. To ensure that both groups were as similar as possible, the researcher chose groups from classes at the same kindergarten level, which is KG-2, and at the same government school. These measures helped the researcher to find participants that share some similar characteristics and attributes such as age, nationality, and native language which is Arabic. In addition, the researcher consulted the school kindergarten coordinator, the MST, a professional kindergarten teacher, and the school's guidance counselor in selecting participants. They all made sure that the selected students had the same ability level by looking at the students' past and present academic records. Lastly, the mentor college teacher (MCT), a professional college teacher, and the internship mentor, a doctoral-degree holder

college instructor assisted in confirming if the selected participants were from homogeneous ability grouping. These actions were intended to increase the internal validity of the research by eliminating confounding variables (Emmel, 2013).

The researcher then divided the participants into two groups. The participants in Group-A were introduced to the Jolly Phonics Lessons application. This application was integrated throughout the teaching of phonics lessons. On the contrary, participants in Group B were not introduced to the Jolly Phonics lessons application and were taught using the traditional approach to teaching phonics. The aim of this research was to investigate the impact integrating jolly phonics lessons application in teaching phonics on emerging-level students.

### **Data Collection Tools**

The data collection tools employed to gauge students' emerging phonic skills in the study included four types: phonemic awareness assessment tools, interview, field notes, and artifacts

#### ***Phonemic Awareness Inventory (PAAI)***

Phonemic Awareness Assessment Inventory, adapted from Heggerty (2020), consists of numerous tests that measure students' letter and sound identification, letter formation, phoneme blending, and segmenting skills. The PAAI was employed in Groups A and B – at the beginning of the instruction to measure the skills that students have already developed (pretest), and after the period of eight weeks of the study (posttest). All the tools were utilized with the support of the MST, MCT, and internship mentor.

Letter-sound recognition is an essential part of learning to read and getting better at noticing problems from a young age to be settled (Lonigan et al., 2013). This test provides information about emerging readers' ability to define the sounds of lowercase letters. The sheet contains instructions of how the teacher should utilize the tool, and a two-column grid. The first column contained the lowercase letter to be identified, and the second column was for the teacher to record the score.

According to Neumann (2016), letter formation is a crucial attribute for pupils to master not only because it makes their writing more legible but also because it helps them increase their writing speed and efficiency. Neat letter formation is important to assist children in writing fluently (Eckert & Labov, 2017). The letter formation assessment provides model letters to follow, and space for students to write the letters. The letter formation test was conducted to record children's ability to correctly form the letters of the alphabet using the bottom-up approach, from left to right. The procedure was that the researcher chose any letter and required the student to form it first using their index finger, then using a pencil. The letter formation test was discontinued whenever the child missed three consecutive items. Each learner was required to form the letter he or she knew individually before and after integrating the Jolly Phonics Lessons application. The sheet contains the instructions of how it would be utilized, the model letters to follow, and space to put the score.

The phoneme blending test was designed to teach children how to sound out words. Blending is a method for teaching children to read that involves combining different sounds, also known as phonemes, to form words (Metsala & Ehri, 2013). It is an important skill in learning to read because the ability to mentally connect speech sounds to form words allows students to decode unfamiliar words when reading using letter-sound patterns (Caravolas et al., 2012). Blending difficulties are a defining feature of the struggling reader. The tool consists of the instructions, ten phoneme CVC exercises to be completed, and a space to record the score. Before and after integrating the Jolly Phonics Lessons application into literacy lessons, each learner was required to sound out random CVC words. The researcher chose random words from the provided ones, made sounds of the individual phonemes of each letter, and required the student to connect the sounds and spell the word. If three straight sounds to blend were missed and the child appeared confused or frustrated, the researcher stopped this section.

The phoneme segmenting assessment is employed to measure students' ability to identify the individual sounds in a word. Segmenting is a vital skill that young learners will pick up over the course of



their early phonics education, resulting in the long-term development of their reading and writing skills (Swanson et al., 2015). The researcher utilised the test to record scores of student’s replies. Each child was asked to break the word told by the researcher into individual sounds. The exam is discontinued if the student missed three consecutive items or if appears confused or frustrated.

### Artifacts

Artifacts are students’ work products that display their performance after the teaching and learning process (Wolsey et al., 2020). In this research, artifacts such as work samples and audio were collected to monitor and measure students’ growing literacy skills, and included within the literacy portfolio. The portfolio collection form adapted from Gronlund and Linn (1990) includes the date of the observation, the time spent on each activity, and anecdotal notes. The researcher organized the materials in a way that the growth on literacy skills were highlighted over time by including the exact dates and time for each collected artifact. The research wrote anecdotal notes to document the child’s performance. The researcher utilized the gathered information from the portfolio to monitor student’s language growth and development throughout the study, plan appropriate responsive instructions, and compare the work, progress and performance of the students from Groups A and B.

### Field Notes

The field notes include a list of things that the researcher will look at when observing a class or a student (Genc & Buyukkarci, 2013). The research included activities to be observed, target goals, guiding questions, comments, reflection, and new aim activity to observe in the field notes. This study used the researcher’s daily notes throughout the eight-week period to further investigate the progress of both groups in letter-sound identification, letter formation, blending and segmenting.

## Results

### The Effects of Integrating Jolly Phonics Lessons Application on Students’ Letter-Sound Identification

The letter sound identification assessment of the PAAI (Phonemic Awareness Assessment Inventory) was intended to respond to the first research question: How does the Jolly Phonics Lessons application affect kindergarten learners’ skills in learning letter sound identification? The Groups A and B were measured twice over the course of eight weeks. Figure 2 illustrates Group-A scores prior to and after the integration of the Jolly Phonics Lessons application intervention. Figure 3 displays the outcomes of Group-B without receiving the Jolly Phonics Lessons application intervention.

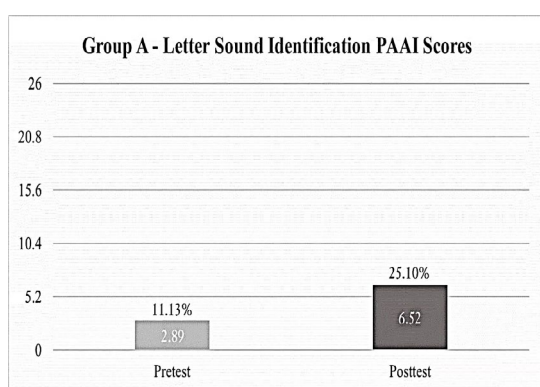


Figure 2. Group-A pretest/ posttest scores

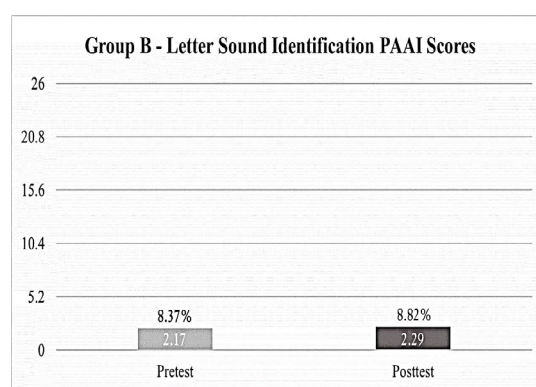


Figure 3. Group-B pretest/ posttest scores

The results in the pretest reveal that both groups have dismal results. Students failed to distinguish between similar sounds and, as a result, mistake letters and sounds resulting in problems in pronunciation and spelling. One of the identified factors for the poor performance of both groups, as shown in Figures 2 and 3, was due to the insufficient number of times they take English lessons in a week. Students only have English lessons three times a week. In this view, teachers are often forced to squeeze in teaching letter-sound identification, letter formation, and examples of words that start with that letter in one lesson. They

could not dedicate enough time to focus on teaching letter-sound identification alone. Furthermore, these children, who come from non-English-speaking households, have barely any contact with English sounds, making it challenging for them to decode letter sounds and distinguish between similar sounds (Gass, 2017).

However, results show that Group-A gradually improved compared to Group-B, as apparent in Figure 2. A few of the contributing factors that influenced the progress of the Group-A were due to some of the distinct features of the Jolly Phonics lessons application such as digital stories and poems, electronic flash cards, rhyme songs, and Sound Bees game. Despite that, the level of improvement varied among students in Group-A, all of them demonstrated progressive growth after the intervention interval.

The findings were consistent with Alqahtani's (2020) research, which reported that using the Jolly Phonics Lessons application with children showed a higher level of engagement, interest, retention, and recall of the letter sound identification rules they had learned. Children who use technology tool for learning phonics, according to Cotter (2012), have significantly better pronunciation, fluency, and comprehension than those who learn phonics through traditional methods.

The data were then analyzed statistically in order to infer the students' letter-sound identification assessment mean scores, as shown in Table 1. The mean interpretation table was adapted from Rouse and Dreyfus (2021).

**Table 1.** Mean score interpretation (Rouse & Dreyfus, 2021)

Mean Score	Interpretation
21.66 – 26.00	Mastery
17.33 – 21.65	Expert
13.00 – 17.32	Proficient
8.67 – 12.99	Competent
4.34 – 8.66	Advanced Beginner
0 – 0.433	Novice

**Table 2.** Mean scores of students on PAAI letter-sound identification assessment

Group	Mean Pretest	Standard Deviation	Interpretation	Mean Posttest	Standard Deviation	Interpretation	Gain
Group A	2.89	1.44	Novice	6.52	3.90	Advanced Beginner	3.63
Group B	2.17	1.66	Novice	2.29	1.35	Novice	0.11

Table 2 presents means scores of students' letter-sound identification assessment in both pretest and posttest. Both groups had mean scores less than 4.33 on the pretest, indicating that they were in the novice stage of skill acquisition. The Group-A obtained a mean score of 6.52 after eight weeks. In line with the mean score interpretation table, their level progressed from novice to advanced beginner. The Group-B, which was taught phonics in the traditional method, remained in the novice stage. Comparing the means, it is evident that students in Group-A outperformed their counterparts in Group-B in letter-sound identification as they gained a score of 3.63, while those in Group-B gained 0.11.

This results supports Griffith et al. (2020) discoveries that the Jolly Phonics Lessons application is a useful tool for teaching children develop their letter-sound identification skill in engaging and distinctive way that has a high effect on promoting their self-directed and movitation.

Table 3 shows the results after utilizing the two sample T-test statistic. This aimed to check if posttest mean scores between Groups-A and B on the Letter-Sound Identification Assessment has statistical difference.

**Table 3.** PAAI letter-sound identification assessment results comparing groups-A and B

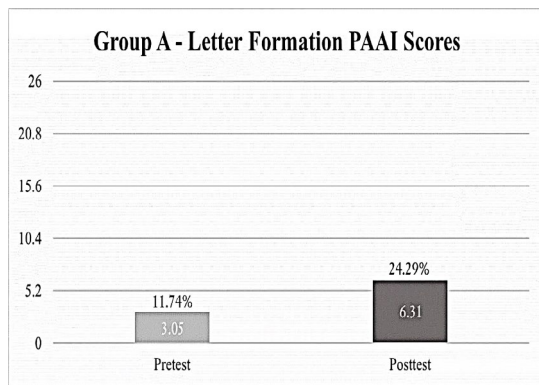
	Group A	Group B
Mean	6.5263	2.2941
Variance	15.2632	1.8456
Observations	19	17
Pooled Variance	8.9490	
Hypothesized Mean Difference	0	
df	34	
t Stat	4.2377	
P(T<=t) one-tail	8.15088E-05	
t Critical one-tail	1.6909	
P(T<=t) two-tail	0.0002*	
t Critical two-tail	2.0321	

\*p<.05 margin of error

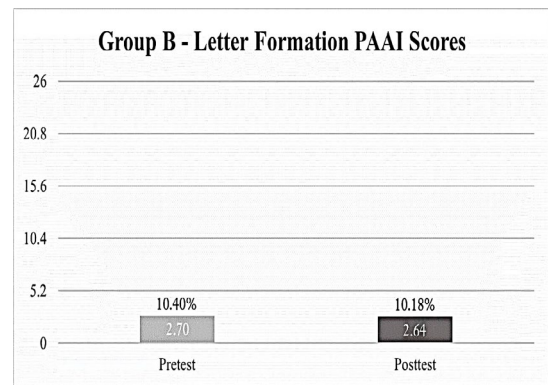
The results show that there is a significant difference between the letter-sound identification assessment mean scores between Group-A and Group-B. This implies that Group-A score is significantly greater than Group-B. This data supports the study conducted by Jones, Clark, and Reutzel (2018) that children learn letters and sounds better when they are repeated in the same story and through audio-visual games. The use of technology in Jolly Phonics education has the potential to greatly enhance students' achievements (Chmiliar, 2017).

### The Effects of Integrating Jolly Phonics Lessons Application on Students' Letter Formation

To answer the second question, a diagnostic test on the letter formation was utilized. During the eight-week duration, the letter formation of both the experimental and control groups was evaluated twice, in weeks 1 and 8. Figure 4 represents Group-A scores, indicating the effect of the Jolly Phonics Lessons application intervention on their letter formation skills. On the other hand, figure 5 portrays the outcomes of the Group-B, which did not receive the same intervention.



**Figure 4.** Group-A pretest/ posttest scores



**Figure 5.** Group-B pretest/ posttest scores

The result show that students' letter formation skills in the pretest were similar. Struggles with letter formation were discovered while taking the assessment. Errors like letter backward writing, inability to write in a straight line, and cramped fingers while holding a pencil were seen among students in both groups. The root causes for this were that their teachers in KG1 were not able to dedicate time to teach holding pencil correctly when writing, and students were not given many opportunities to practice writing. In previous years, classes were mostly delivered online due to the global outbreak of coronavirus. In this view, very minimal learning opportunities that develop writing were provided to the students. According to Cameron et al. (2016), fine motor skills, pencil grip, and pencil control are the key skills that children need to develop in order to properly form the letters of the alphabet by hand.

Nevertheless, after the eight weeks, results show that Group-A performed better in the posttest. The Jolly Phonics application includes explicit visual instruction on how hands should be moved to form letters, games focusing on using index finger to form letters, and letter formation activities, which can all be

repeated indefinitely helped the students develop their letter formation skills. In addition, the immediate constructive feedback that students received about their accuracy, speed, and stroke order for every completed activity gave them clear ideas of how to improve their skills further. The results were consistent with the previous study by Ploog et al. (2013), who found that technology-based approaches provide richer, more varied and useful feedback to students than traditional pencil-and-paper activities.

Students' letter formation competency levels were determined based on the adapted mean score interpretation in Table 4. The averages of performance of both groups on letter formation assessment are shown in Table 5.

**Table 4.** Mean score interpretation (Rousse & Dreyfus, 2021)

Mean Score	Interpretation
21.66 – 26.00	Mastery
17.33 – 21.65	Expert
13.00 – 17.32	Proficient
8.67 – 12.99	Competent
4.34 – 8.66	Advanced Beginner
0 – 0.433	Novice

**Table 5.** Mean scores of students on PAAI letter formation assessment

Group	Mean Pretest	Standard Deviation	Interpretation	Mean Posttest	Standard Deviation	Interpretation	Gain
Group A	3.05	1.95	Novice	6.31	3.28	Advanced Beginner	3.26
Group B	2.70	1.61	Novice	2.64	1.53	Novice	-0.05

The Table 5 displays that both groups scored less than 4.33 on the pretest, indicating that students were in the novice stage of skill acquisition. After the eight weeks, the Group-A achieved a mean score of 6.31, representing advanced beginner level, while the Group-B garnered a mean score of 2.64, implying that the students remained in novice stage. The research findings support Haywood & Getchell (2021) research that indicated that technology facilitates children's building fine motor skills as they tap on the screen, which will further develop their writing skills.

**Table 6.** PAAI letter formation assessment results comparing groups-A and B

	Group A	Group B
Mean	6.3158	2.6471
Variance	10.7836	2.3676
Observations	19	17
Pooled Variance	6.8232	
Hypothesized Mean Difference	0	
df	34	
t Stat	4.2070	
P(T<=t) one-tail	8.91066E-05	
t Critical one-tail	1.6909	
P(T<=t) two-tail	0.0002*	
t Critical two-tail	2.0322	

\*p<.05 margin of error

As presented in Table 6, the data were analyzed using the two sample T-test statistic. This helped in checking for statistical difference between posttest mean scores of Group-A and B on the Letter Formation Assessment.

The results reveal that there is a significant difference between the mean scores of the two groups on their letter formation posttest. This indicates that Group-A outperformed Group-B in this area. Findings support the results of researcher Butler et al. (2019) who discovered that handwriting-supporting phonics

digital software is excellent for helping children develop their tracing abilities, starting with traceable letters for the beginning writer to help them write neatly and inside the lines.

### The Effects of Integrating Jolly Phonics Lessons Application on Students' Phoneme Blending

The PAAI phoneme blending assessment was given to the student to address the third question. Once children learn the sounds of the letters, it starts to become more complex, and they start blending single sounds into words (Treiman & Zukowski, 2013). Blending is a method for teaching children to read that involves combining different sounds, also known as phonemes, to form words (Slater & Backett, 2019). Throughout the period of study, both the two groups underwent evaluation of their letter blending skills on two separate occasions, during the first and eighth weeks, respectively. Figure 6 represents the scores observed in the Group-A, clarifying the impact of the Jolly Phonics Lessons application intervention on their letter blending abilities. Figure 7 outlines the results from the Group-B, which did not receive the same intervention

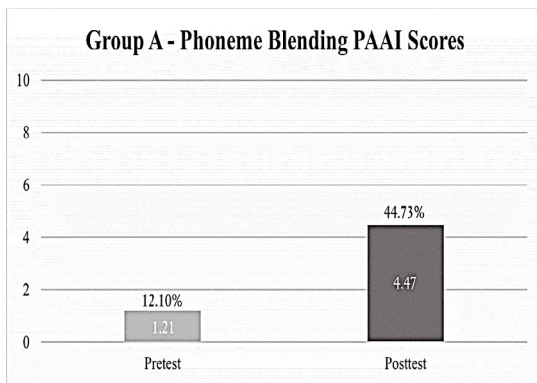


Figure 6. Group-A pretest/ posttest scores

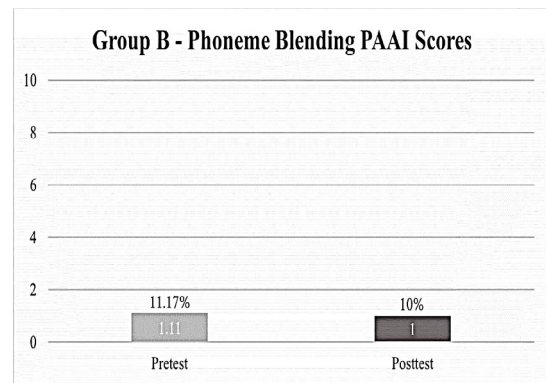


Figure 7. Group-B pretest/ posttest scores

The results of the assessment, supported by student artifacts and field notes for the qualitative data, indicated that students' phoneme blending performance in the pretest was similar. Furthermore, it revealed notable challenges associated with phoneme blending. Children had difficulty in connecting sounds correctly, leading to pronunciation and spelling obstacles. The main reason is that since English is the UAE students' second language, they find blending letters to produce sounds challenging. Arabic language as different phonetic rules and structures that necessitate various ways to teach phonetic abilities that also differ from English. Some students were mixing up phonemes of English and Arabic letters.

However, technology can enhance kindergarten letter-blending skills. One way is through the use of interactive games that combine visual and audio tasks to teach phonemic awareness skills (Killeen, 2013). This is evident in Table 6 as the results show that Group-A demonstrated slight increase on their phoneme blending performance compared to Group-B. The incorporated games in the application about blending sounds contributed on their of understanding the sound that the letters represent and be able to blend those sounds to create words. The findings underpin the studies of Aleven et al. (2016) who mentioned that adaptive learning technology can to significantly better gains in letter-blending skills among young students, and Reichert and Mouza (2018) who indicated that digital technology can be highly effective in helping students, especially with hearing challenges, improve their phoneme blending skills

Table 7. Mean score interpretation (Rousse & Dreyfus, 2021)

Mean Score	Interpretation
21.66 – 26.00	Mastery
17.33 – 21.65	Expert
13.00 – 17.32	Proficient
8.67 – 12.99	Competent
4.34 – 8.66	Advanced Beginner
0 – 0.433	Novice

**Table 8.** Mean scores of students on PAAI phoneme blending assessment

Group	Mean Pretest	Standard Deviation	Interpretation	Mean Posttest	Standard Deviation	Interpretation	Gain
Group A	1.21	0.91	Novice	4.37	1.34	Advanced Beginner	3.26
Group B	1.11	0.92	Novice	1	0.86	Novice	-0.11

As presented in Tables 7 and 8, phoneme blending skill levels were identified based on the mean score interpretation table. Both groups got low pretest mean scores implying that students were in the novice stage of phoneme blending skills. After eight weeks of integrating Jolly Phonics application in the literacy classes, the Group-A achieved a mean score of 4.47, which denotes an advanced-beginner level of proficiency. However, the Group-B remained in the novice stage with a mean score of 1. The results reveal that the traditional methods of teaching phonics have no positive remarkable impact on young learners; phoneme blending activities. Gee (2018) claimed that children must be exposed to technological applications that support repetition, as to read a word, and understand the sounds that the letters represent and be able to blend those sounds to produce the correct word.

Table 9 presents the T-statistic for difference between the posttest means scores of Groups-A and B on the Phoneme Blending Assessment at 95% confidence level.

**Table 9.** PAAI phoneme blending assessment results comparing groups-A and B

	Group A	Group B
Mean	4.474	1
Variance	1.8187	0.75
Observations	19	17
Pooled Variance	1.3158	
Hypothesized Mean Difference	0	
df	34	
t Stat	9.080832	
P(T<=t) one-tail	6.66E-11	
t Critical one-tail	1.6909	
P(T<=t) two-tail	1.33E-10*	
t Critical two-tail	2.0322	

\*p<.05 margin of error

The data reveal that there is statistical difference between the PAAI phoneme blending assessment mean scores of Groups-A and B. This indicates that Group-A performed better compared to the Group-B. This supports the study stating that digital applications improve the cognitive capacity required for learning the letter blending skill through highly interactive multisensory integration of learning experiences, which captures their interest and attention by using colorful graphics, engaging animations, and appealing audio inputs (Zugarramurdi et al., 2022). The Jolly Phonics Lessons application is designed intentionally to best represent characters and sounds to enhance students' memory, develop vocabulary acquisition, and improve recall abilities to help them master the phoneme blending skill (Vanden et al., 2021).

### **The Effects of Integrating Jolly Phonics Lessons Application on Students' Phoneme Segmenting**

According to Treiman & Zukowski (2013) phonological awareness hierarchy, the most difficult component of children's reading and writing development is sound segmentation. In this study, Groups A and B completed two evaluations, testing their CVC word segmentation abilities during the first and eighth weeks.

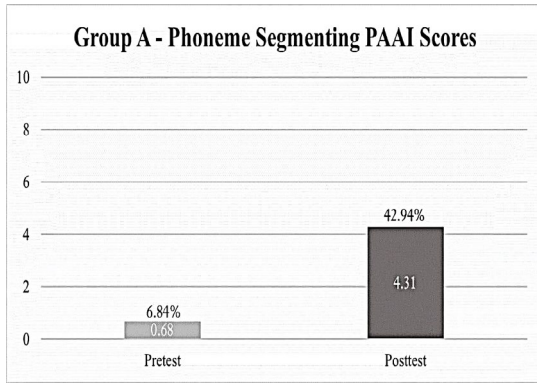


Figure 8. Group-A pretest/ posttest scores

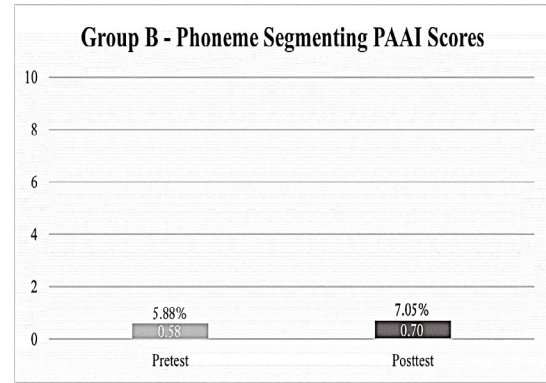


Figure 9. Group-B pretest/ posttest scores

It is apparent that both groups performed poorly on the phoneme segmenting pretest, as presented in Figures 8 and 9. One of the influencing factors is that since the learners are Arabs, they were mixing up the phonemes of Arabic and English letters. Another pertinent point is traditional CVC word segmenting instructions focus on only a limited range of words and do not encompass all different types of words children encounter in everyday lessons and readings. In this view, the practice provided to the students that familiarized them with the words was very limited. According to Teixeira and Santos (2018), teaching specific and common words in CVC word segmentation limits children's reading abilities and causes them to struggle with unfamiliar words and phrases. Moreover, CVC word segmenting instruction can focus on breaking down words into their component sounds, sometimes at the expense of comprehension. This means that children may learn to segment words without fully understanding what they are reading, which can slow the development of reading comprehension skills (Paige et al., 2018).

Nevertheless, an evident increase in phoneme segmenting skill after the intervention was seen in Group-A. Their post-test scores were way better than their counterpart group. Students were highly engaged in playing CVC word games incorporated in the application as they were supported with developmentally-appropriate and eye-catching visuals. According to Vega (2016), kindergarten students become more active in their reading through phonics education on digital technology, which promotes achievement in subjects other than English. The results underpin the study that highlighted that students who used interactive software to learn CVC word segmenting had an increase in achievement compared to those who did not use technology (Wei et al., 2018).

The phoneme segmenting skills were determined identified based on the mean score interpretation in Table 10. The averages of both groups for phoneme segmenting assessment is shown in Table 11.

Table 10. Mean score interpretation (Rousse & Dreyfus, 2021)

Mean Score	Interpretation
21.66 – 26.00	Mastery
17.33 – 21.65	Expert
13.00 – 17.32	Proficient
8.67 – 12.99	Competent
4.34 – 8.66	Advanced Beginner
0 – 0.433	Novice

Table 11. Mean scores of students on PAAI phoneme segmenting assessment

Group	Mean Pretest	Standard Deviation	Interpretation	Mean Posttest	Standard Deviation	Interpretation	Gain
Group A	0.68	0.74	Novice	4.31	1.33	Advanced Beginner	3.63
Group B	0.58	0.61	Novice	0.70	0.77	Novice	0.18

The results show that both groups had mean scores below 4.33 in the pretest, indicating that they were all in the novice stages for this skill. After the eight weeks of integrating Jolly Phonics application, the

Group-A mean score improved dramatically to 4.31, demonstrating a progression to advanced beginner in comparison to Group-B that stayed in novice level. Group-A surpassed the performance of Group-B. The outcome suggests that conventional way of teaching phonics had few or no effects on the development of students' phoneme segmenting skills. The interactive nature of the Jolly Phonics Lessons application and the ability to practice phoneme segmenting skills independently are factors that contributed to its effectiveness for young students (Vega, 2016).

**Table 12.** PAAI phoneme blending assessment results comparing groups-A and B

	<b>Group A</b>	<b>Group B</b>
<b>Mean</b>	4.3158	0.7059
<b>Variance</b>	1.7836	0.5956
<b>Observations</b>	19	17
<b>Pooled Variance</b>	1.2245	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	34	
<b>t Stat</b>	9.7714	
<b>P(T&lt;=t) one-tail</b>	1.05E-11	
<b>t Critical one-tail</b>	1.6919	
<b>p(T&lt;=t) two-tail</b>	2.1E-11*	
<b>t Critical two-tail</b>	2.0322	

\*p<.05 margin of error

The results show that there is a significant difference between the posttest scores of Groups-A and B on phoneme segmenting assessment. This implies that Group-A exceeded the performance of Group-B in terms of segmenting CVC words into its individual sounds. The results support the study of Culata et al. (2022) who underscored that digital tools like iPads enhance phonics, especially CVC word segmenting, as the most complex skill proficiency level among difficult learners over time, but traditional phonics learning techniques do not provide rich learning experiences for struggling learners

### Conclusion and Discussion

Addressing the first research question on letter-sound identification, kindergarten students were assessed using the PAAI letter-sound identification assessment, and artifacts to gauge their letter-sound recognition abilities. During the integration of the Jolly Phonics Lessons applications in the daily teaching of phonics, Group-A was exposed to extensive reading sessions and letter-sound identification instructions. At the end of eight weeks, it was apparent that students in Group-A performed better in letter-sound recognition than their counterpart group. All students in Group-A demonstrated significant gain in letter-sound identification, verifying the findings of researchers who advocate for the integration of Jolly Phonics application to developing students' letter-sound recognition (Alqahtani, 2020; Chmiliar, 2017; Cotter, 2012; Griffith et al., 2020; Jones et al., 2018;)

In response to the impact of the intervention on student's letter formation skills, based on artifacts, and letter formation assessment, the letter formation competency of students in Group-A grew over the four phases of the research. In addition, no significant increase has been seen to Group-B. The incorporated explicit visual and auditory instructions and immediate constructive feedback in the application were one of the influencing factors that solidified students' letter formation abilities. This conclusion supports studies suggesting that digital technology helps children build their fine motor abilities as they tap on screens and navigate the tools, which contribute in developing emerging writing skills (Butler et al., 2019; Haywood & Getchell, 2021; Ploog et al., 2013)

Regarding the achievement of the students on phoneme blending and segmenting, the PAAI phoneme blending and segmenting assessments disclosed that students in Group-A, who attended literacy classes integrated with the Jolly Phonics Lessons application, exceeded the performance of students in Group-B in terms of blending and segmenting capabilities. Findings from the current research indicate that extensive reading, backed-up with purposeful e-learning games, digital stories, and activities offered in the



Jolly Phonics application, were effective for building students' phoneme blending and segmenting skills. The findings verify studies of researchers (Aleven et al., 2016; Cullata et al., 2022; Gee, 2018; Reichert & Mouza, 2018; Vanden et al. 2021; Vega, 2016; Wei et al., 2018; Zugarramurdi et al., 2022) who highlighted that children benefit from the Jolly Phonics Lessons application's interactive features, aside from intensive independent practice, contributes in the development of the blending and segmenting competencies.

Results also revealed that there is a significant difference between the post-test performance of students in Group A and B in the PAAI letter-sound identification, letter formation, phoneme blending and segmenting assessments. Using the T-statistic for the difference between mean scores at 95% level of confidence, findings showed that Group-A students outperformed their counterpart group in terms of achievements on letter-sound recognition, letter formation, phoneme blending and segmenting. This implies that integrating the Jolly Phonics Lesson applications in literacy lessons has a positive impact on students' phonics achievement.

## Declarations

### *Authors' Declarations*

**Acknowledgements:** We thank the participating students, teachers, and management of the school for their cooperation.

**Authors' contributions:** All authors have equal contributions.

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

**Funding:** The publishing of this study is not supported and funded by any institution.

**Ethics approval and consent to participate:** The researchers got approval from the school principal and the mentor school teacher to conduct the study by signing the data collection request form and research ethics form. In addition, the researchers used pseudonyms to conceal the identity of the participants.

### *Publisher's Declarations*

**Editorial Acknowledgement:** The editorial process of this article was carried out by Dr. Stamatios Papadakis.

**Publisher's Note:** Journal of Childhood, Education & Society remains neutral with regard to jurisdictional claims in published maps and institutional affiliation.

## References

- Al-Awidi, H. M., & Ismail, S. A. (2014). Teachers' perceptions of the use of computer assisted language learning to develop children's reading skills in English as a second language in the United Arab Emirates. *Early Childhood Education Journal*, 42(1), 29-37. <https://doi.org/10.1007/s10643-012-0552-7>
- Aleven, V., McLaughlin, E. A., Glenn, R. A., & Koedinger, K. R. (2016). Instruction based on adaptive learning technologies. In R. E. Mayer & P. Alexander (Eds.), *Handbook of research on learning and instruction* (2nd ed., pp. 522-560). Routledge.
- Alqahtani, S. S. (2020). Technology-based interventions for children with reading difficulties: A literature review from 2010 to 2020. *Educational Technology Research and Development*, 68(6), 3495-3525. <https://doi.org/10.1007/s11423-020-09859-1>
- Ariati, N. P., Padmadewi, N. N., & Suarnajaya, I. W. (2018). *Jolly Phonics: Effective strategy for enhancing children's English literacy*. SHS Web of Conferences, 42, 00032. <https://doi.org/10.1051/shsconf/20184200032>
- Bdeir, M., Bahous, R., & Nabhani, M. (2022). Improving reading readiness in kindergarten children through early phonological awareness interventions. *Education 3-13*, 50(3), 348-360. <https://doi.org/10.1080/03004279.2020.1851740>
- Billups, F. (2019). *Qualitative data collection tools: Design, development, and applications (qualitative research methods)*. SAGE Publishing.
- Brau, B. (2020). Constructivism. In R. Kimmons & S. Caskurlu (Eds.), *The students' guide to learning design and research*. Edtechbooks. <https://edtechbooks.org/studentguide/constructivism>
- Butler, C., Pimenta, R., Tommerdahl, J., Fuchs, C. T., & Caçola, P. (2019). Using a handwriting app leads to improvement in manual dexterity in kindergarten children. *Research in Learning Technology*, 27, 1-10. <https://doi.org/10.25304/rlt.v27.2135>
- Cameron, C. E., Cottone, E. A., Murrah, W. M., & Grissmer, D. W. (2016). How are motor skills linked to children's school performance and academic achievement?. *Child Development Perspectives*, 10(2), 93-98. <https://doi.org/10.1111/cdep.12168>
- Caravolas, M., Lervåg, A., Mousikou, P., Efrim, C., Litavský, M., Onochie-Quintanilla, E., Salas, N., Schöffelová, M., Defior, S., Mikulajová, M., Seidlová-Málková, G., & Hulme, C. (2012). Common patterns of prediction of literacy development in different alphabetic orthographies. *Psychological Science*, 23(6), 678-686. <https://doi.org/10.1177/0956797611434536>

- Chmiliar, L. (2017). Improving learning outcomes: The iPad and preschool children with disabilities. *Frontiers in Psychology*, 8, 1-11. <https://doi.org/10.3389/fpsyg.2017.00660>
- Coccia, M., & Benati, I. (2018). Comparative studies. In A. Farazmand (Ed.), *Global Encyclopedia of public administration, public policy, and governance* (pp. 1-7). Springer. [https://doi.org/10.1007/978-3-319-31816-5\\_1197-1](https://doi.org/10.1007/978-3-319-31816-5_1197-1)
- Cotter, J. (2012). *Understanding the relationship between reading fluency and reading comprehension: Fluency strategies as a focus for instruction* [Master's thesis]. St. John Fisher University.
- Crim, C., Hawkins, J., Thornton, J., Rosof, H.B., Copley, J., & Thomas, E. (2008). Early childhood educators' knowledge of early literacy development. *Issues in Teacher Education*, 17(14), 72-73.
- Culatta, B. E., Setzer, L. A., & Hall-Kenyon, K. M. (2022). Incorporating digital literacy materials in early childhood programs: Understanding children's engagement and interactions. In C.-A. Lane (Ed.), *Handbook of research on acquiring 21st century literacy skills through game-based learning* (pp. 671-696). IGI Global. <https://doi.org/10.4018/978-1-7998-7271-9.ch034>
- Diamond, J., Grob, B., & Reitzes, F. (2015). *Teaching kindergarten: Learner-centered classrooms for the 21st century*. Teachers College Press.
- Eckert, P., & Labov, W. (2017). Phonetics, phonology and social meaning. *Journal of Sociolinguistics*, 21, 467-496. <https://doi.org/10.1111/josl.12244>
- Ehri, L. C. (1992). Reconceptualizing the development of sight word reading and its relationship to recoding. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 107-143). Lawrence Erlbaum Associates, Inc. <https://doi.org/10.4324/9781351236904-5>
- Emmel, N. (2013). Purposeful sampling. In *Sampling and choosing cases in qualitative research: A realist approach* (pp. 33-45). SAGE Publishing. <https://doi.org/10.4135/9781473913882.n3>
- Gass, S. M. (2017). *Input, interaction, and the second language learner*. Routledge. <https://doi.org/10.4324/9781315173252>
- Gee, J. P. (2018). Reading as situated language: A sociocognitive perspective. In D. E. Alvermann, N. J. Unrau, M. Sailors, & R. B. Ruddell (Eds.), *Theoretical models and processes of literacy* (pp. 105-117). Routledge. <https://doi.org/10.4324/9781315110592-7>
- Genc, B., & Buyukkarci, K. (2013). An assessment of pre-service language teachers' practicum observation forms: Descriptive observation vs. critical observation. *Educational Research eJournal*, 2(2), 83-91. <http://dx.doi.org/10.5838/erej.2013.22.01>
- Griffith, S. F., Hagan, M. B., Heymann, P., Heflin, B. H., & Bagner, D. M. (2020). Apps as learning tools: A systematic review. *Pediatrics*, 145(1), 15-16. <https://doi.org/10.1542/peds.2019-1579>
- Gronlund, N., & Linn, R. (1990). *Measurement and evaluation in teaching*. Macmillan Publishers.
- Halcomb, E., & Hickman, L. (2014). Mixed methods research. *Nursing Standard*, 29(32), 41-47. <https://doi.org/10.7748/ns.29.32.41.e8858>
- Hania, I., Fauzi, M. S. D., Pangestu, E. S., & Rosyada, M. F. (2022). The phonics method in Aşwat learning and its influence on the reading ability of Ibtidaiyyah Madrasah Students. *Al Mahāra: Jurnal Pendidikan Bahasa Arab*, 8(2), 231-247. <https://doi.org/10.14421/almahara.2022.081-01>
- Haywood, K. M., & Getchell, N. (2021). *Life span motor development*. Human Kinetics.
- Heggerty, M. (2020). *Phonological and phonemic awareness*. Literacy Resources. <https://heggerty.org>
- Ilmeideh, F. (2009). The role of computer technology in teaching reading and writing: Preschool teachers' beliefs and practices. *Journal of Research in Childhood Education*, 24(1), 60-79. <https://doi.org/10.1080/02568540903439409>
- Jones, C. D., Clark, S. K., & Reutzell, D. (2013). Enhancing alphabet knowledge instruction: Research implications and practical strategies for early childhood educators. *Early Childhood Education Journal*, 41(2), 81-89. <https://doi.org/10.1007/s10643-012-0534-9>
- Killeen, E. (2013). A framework for using iPad to build early literacy skills. *The Reading Teacher*, 66(7), 531-537. <https://doi.org/10.1002/TRTR.1155>
- Lee, O., Quinn, H., & Valdés, G. (2013). Science and language for English language learners in relation to Next Generation Science Standards and with implications for Common Core State Standards for English language arts and mathematics. *Educational Researcher*, 42(4), 223-233. <https://doi.org/10.3102/0013189X13480524>
- Lonigan, C. J., Purpura, D. J., Wilson, S. B., Walker, P. M., & Clancy-Menchetti, J. (2013). Evaluating the components of an emergent literacy intervention for preschool children at risk for reading difficulties. *Journal of Experimental Child Psychology*, 114(1), 111-130. <https://doi.org/10.1016/j.jecp.2012.08.010>
- Maruyama, T., & Inoue, M. (2016). Continuous quality improvement of leadership education program through PDCA cycle. *China-USA Business Review*, 15(1), 42-49. <https://doi.org/10.17265/1537-1514/2016.01.004>
- Metsala, J. L., & Ehri, L. C. (2013). *Word recognition in beginning literacy*. Routledge. <https://doi.org/10.4324/9781410602718>
- Mkandawire, S. B. (2019). *Selected common methods and tools for data collection in research*. Marvel Book Publishers.

- Mohammed, I., & Amponsah, O. (2018). Predominant factors contributing to low reading abilities of pupils at Elsie Lund Basic School in the Tamale Metropolis, Ghana. *African Educational Research Journal*, 6(4), 273-278. <https://doi.org/10.30918/AERI.64.18.071>
- Nazare, J., Woolf, A., Sysoev, I., Ballinger, S., Saveski, M., Walker, M., & Roy, D. (2022). Technology-assisted coaching can increase engagement with learning technology at home and caregivers' awareness of it. *Computers & Education*, 188, 104565. <https://doi.org/10.1016/j.compedu.2022.104565>
- Neumann, M. M. (2018). Using tablets and apps to enhance emergent literacy skills in young children. *Early Childhood Research Quarterly*, 42, 239-246. <https://doi.org/10.1016/j.ecresq.2017.10.006>
- Ohaka, E. (2022, July 14). How 'jolly phonics' can fix learning imbalance in Nigeria. Business Day (Nigeria). <https://businessday.ng/features/article/how-jolly-phonics-can-fix-learning-imbalance-in-nigeria/>.
- Paige, D. D., Rupley, W. H., Smith, G. S., Olinger, C., & Leslie, M. (2018). Acquisition of letter naming knowledge, phonological awareness, and spelling knowledge of kindergarten children at risk for learning to read. *Child Development Research*, 2018, 2142894. <http://dx.doi.org/10.1155/2018/2142894>
- Pietrzak, M., & Paliszkiwicz, J. (2015). Framework of strategic learning: The PDCA Cycle. *Management*, 10(2), 149-161.
- Ploog, B. O., Scharf, A., Nelson, D., & Brooks, P. J. (2013). Use of computer-assisted technologies (CAT) to enhance social, communicative, and language development in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 43(2), 301-322. <https://doi.org/10.1007/s10803-012-1571-3>
- Reichert, M., & Mouza, C. (2018). Teacher practices during year 4 of a one-to-one mobile learning initiative. *Journal of Computer Assisted Learning*, 34(6), 762-774. <https://doi.org/10.1111/jcal.12283>
- Rousse, B. S., & Dreyfus, S. E. (2021). *Teaching and learning for adult skill acquisition: Applying the Dreyfus and Dreyfus model in different fields*. Information Age Publishing, Inc.
- Scheper, J. (2023). Zine pedagogies: Students as critical makers. *Radical Teacher*, 125(2023), 20-32. <https://doi.org/10.5195/rt.2023.963>
- Schunk, D. H. (2020). *Learning theories: An educational perspective* (8th Edition). Pearson.
- Slater, T., & Beckett, G. (2019). Integrating language, content, technology, and skills development through project-based language learning: Blending frameworks for successful unit planning. *TESOL Journal*, 43(1), 1-14.
- Smagorinsky, P. (2018). Deconflating the ZPD and instructional scaffolding: Retranslating and reconceiving the zone of proximal development as the zone of next development. *Learning, Culture and Social Interaction*, 16, 70-75. <https://doi.org/10.1016/j.lcsi.2017.10.009>
- Sun, W. (2019). The effects of group early childhood scaffolding and cognitive load in technology-supported learning. *The Internet and Higher Education*, 42, 13-24. <https://doi.org/10.1016/j.iheduc.2019.03.002>
- Suri, H. (2012). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal*, 11(2), 63-75. <https://doi.org/10.3316/OR1102063>
- Swanson, H. L., Orosco, M. J., & Lussier, C. M. (2015). Growth in literacy, cognition, and working memory in English language learners. *Journal of Experimental Child Psychology*, 132, 155-188. <https://doi.org/10.1016/j.jecp.2015.01.001>
- Teixeira, J., & Santos, M. E. (2018). Language skills in children with benign childhood epilepsy with centrotemporal spikes: A systematic review. *Epilepsy & Behavior*, 84, 15-21. <https://doi.org/10.1016/j.yebeh.2018.04.002>
- Treiman, R., & Zukowski, A. (2013). *Levels of phonological awareness*. In *Phonological processes in literacy* (pp. 95-112). Routledge.
- Tyler, E. J., Hughes, J. C., Beverley, M., & Hastings, R. P. (2015). Improving early reading skills for beginning readers using an online programme as supplementary instruction. *European Journal of Psychology of Education*, 30(3), 281-294. <https://doi.org/10.1007/s10212-014-0240-7>
- Vadasy, P. F., & Sanders, E. A. (2014). Efficacy of supplemental phonics-based instruction for low-skilled kindergarteners in the context of language minority status and classroom phonics instruction. *Journal of Educational Psychology*, 102(4), 786-803. <https://doi.org/10.1037/a0019639>
- Vanden Bempt, F., Economou, M., Van Herck, S., Vanderauwera, J., Glatz, T., Vandermosten, M., Wouters, J., & Ghesquière, P. (2021). Digital game-based phonics instruction promotes print knowledge in pre-readers at cognitive risk for dyslexia. *Frontiers in Psychology*, 12, 720548. <https://doi.org/10.3389/fpsyg.2021.720548>
- Vega, M. (2016). *ICT and Jolly Phonics. A comparative study between England and Spain* [Unpublished doctorate thesis]. National University of Distance Education.
- Vision 2021. (2018). *First-rate education system*. <https://www.vision2021.ae/en/national-agenda-2021/list/first-rate-circle>
- Wei, C. W., Kao, H. Y., Lu, H. H., & Liu, Y. C. (2018). The effects of competitive gaming scenarios and personalized assistance strategies on English vocabulary learning. *Journal of Educational Technology & Society*, 21(3), 146-158.

Wolsey, T. D., Lenski, S., & Grisham, D. L. (2020). *Assessment literacy: An educator's guide to understanding assessment, K-12*. Guilford Publications.

Zugarramurdi, C., Assis, M. S., & Valle-Lisboa, J. (2022). Technology on our side: Using technology for transferring cognitive science to education. In M. V. Alves, R. Ekuni, M. J. Hermida, & J. Valle-Lisboa (Eds.), *Cognitive sciences and education in non-weird populations: A Latin American perspective* (pp. 287-303). Springer. [https://doi.org/10.1007/978-3-031-06908-6\\_17](https://doi.org/10.1007/978-3-031-06908-6_17)