Improving Pupils' Letter Recognition through Boom Cards

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ABSTRACT

Letter recognition is an important foundational skill that significantly contributes to early reading development in elementary school students. However, many Grade 2 students at Cateel Central Elementary School struggle with accurately identifying and differentiating letters. This pure experimental research study examined the effectiveness of an intervention utilizing Boom Cards in improving the letter recognition skills of these students. The results found that the students made significant progress in recognizing letters after using Boom Cards. The findings provided valuable information into the effectiveness of Boom Cards as a tool for improving letter recognition. This has important implications for teachers and experts who want to find effective ways to help children improve their letter recognition skills.

Keyword : *letter recognition, letter naming, letter sounding, phonemic awareness, boom cards*

1. INTRODUCTION

Letter recognition is one of the steps toward learning to read (Grainger et al., 2012). This is known as phonemic awareness, and it can be practiced without using written letters, unlike reading (Adams, 2014). However, there has been a growing issue regarding children that need to progress to early reading but need help connecting the letter sound and the physical representation of the letter. Hence, they have trouble reading (Gove & Cvelich, 2012).

Perfetti (2017) stated that children who cannot identify the visual representation of a letter, even if they know what sound a letter makes through oral, may struggle to recognize words and read. In most cases, students are still unable to recognize the shapes of the letters, name the letters, do letter-sound correspondence, and pass construction even at their grade level and age in some cases (Clark, 2012). Moreover, the pupils need help differentiating the letter shapes as too many letters have similar shapes (Ehri, 2016). This has caused them not to be able to name the letters correctly, as they cannot see the different patterns in letter development. As a result, the issue must be resolved (Kirby et al., 2013). Also, the students are more likely to confuse letters with similar features, such as E and F, than those with distinctive features, such as E and Q (Rumelhart, 2012).

Sperling & Melchner (2013) also found that searching for the target Z, for instance, took longer when the array contained letters with features that were different from the target but similar to it, such as O and G, which had rounded features, then when it contained letters with the target's opposite features, such as X and V, which had straight lines. This claim supports the idea that letter recognition depends on traits and shape.

Meanwhile, Boom Cards is an online platform designed for teachers to use for card-based instruction without needing a classroom (La Cruz, 2020). The idea is to provide students with a visually stimulating experience while practicing basic skills such as letters and numbers via any accessible device (Murray, 2012). This covers a wide range of ages and subject areas, with different times set aside for each, which can be adjusted by the teacher (Shanahan, 2016). The cards provide students with tasks to complete and are self-grading, making it an excellent way to teach while effectively saving time on planning and assessment (Miller, 2014). Moreover, teaching letter recognition is important because it helps beginning readers understand how printed text is related to spoken language (Armbruster, 2012). In addition, mastery of letter names can help learners learn letter sounds more easily. Also, any letter names have sounds closely related to the letter's sound (Jones et al., 2013).

Many researchers discuss the problems in letter recognition and the skills needed for letter recognition. However, most research does not include the tools to help

improve the learners this paper will offer (Benniti, 2012). Thus, the researchers are eager to explore utilizing a tool to improve students' letter recognition. Moreover, in the local setting, as the researchers' initial observation, naming

letters such as d and b, p, and q confuses students, and has difficulty matching lowercase and uppercase letters. Hence, this study aimed to explore the effectiveness of Boom Cards in improving the students' letter recognition.

1.1 Statement of the Problem

This research paper sought to answer the following specific questions:

1. What is the level of the pre-test scores of the experimental group?

2. What is the level of the post-test scores of the experimental group?

3. Is there any significant difference between the pre-test and post-test scores of the experimental group?

1.2 Scope and Delimitation

This action research is focused on the effectiveness of Boom Cards in improving students' letter recognition, specifically the three components or skills, which are letter recognition, letter naming, and letter sounds of the grade 2 pupils of Cateel Central Elementary School.
Meanwhile, this paper was delimited to the Grade 2 pupils with difficulty naming, sounding, and recognizing letters with similar features like b,d,p,q,e, and f. This employed experimental research design as an appropriate approach to achieve the objectives of this research. Furthermore, this research paper was conducted for three weeks, 2 hours per day, during the designated reading schedule, Mondays through Thursdays.

2. REVIEW OF RELATED LITERATURE

The review of related literature on the topics of this action research is discussed in this chapter. The discussion includes the nature of letter recognition, problems in letter recognition, and the relevance of Boom Cards in addressing problems in letter recognition. The researchers of this paper included topics from various reliable sources such as books, articles, journals, and other research in the discussion.

2.1 Nature of Letter Recognition

The ability to name letters, find characteristics specific to the said letter, and letter formation of all 26 uppercase and lowercase letter symbols used in English is called letter recognition (Pelli et al., 2016). Also, letter recognition is the ability to call out or select a letter from a group of letters (Share, 2014). Letter recognition is a fundamental component of learning to read. Without it, children have difficulty learning letter sounds and recognizing words (Noel Foulin, 2015).

Moreover, children who cannot identify and name letters using their sounds struggle to learn to read. Afflerbach et al. (2012) asserted that this includes distinguishing between distinct letters and their shapes, which should be taught before, or at the very least alongside, letter sounds. This means that letter recognition skills are critical and should be noticed for letter-sound practice (Noel Foulin, 2015). In addition to this, according to the investigation of Skibbe et al. (2013), when children first begin to learn their letters, it is important to understand that there are three components of letter recognition: first, letter recognition, which is the ability to recognize the shape and size of the letter; second, there is letter naming, which is recognizing that a letter's shape corresponds to a letter name, and letter-sound knowledge, which is determining what sound corresponds to a letter's shape or name.

Letter Recognition. It is the ability to understand that each letter has an individual and different shape and recognize the upper and lower case. It is the ability to understand that each letter has an individual and different shape and the ability to recognize upper- and lowercase letters (Share, 2014). Surprisingly, most current work on visual word recognition begins with the word form, omitting the steps from the printed letter string on the page to the visual word form stored in long-term memory (Norris, 2012). One goal of this special issue is to bring together functional and neural perspectives on the first reading stage, namely letter perception (Blair et al., 2016). Letter perception is the process of assembling visual features into letters. Interestingly, this front end of the reading system has received little attention in word recognition research (Rumelhart & McClelland, 2014).

Meanwhile, reading ability is a fundamental skill required for most, if not all, academic learning and success in school (Catts & Kamhi, 2015). Understanding the alphabet is a crucial early literacy skill. The speed with which

students can recognize a specific letter or group of letters is a good predictor of reading achievement (Daly et al., 2015). According to the findings, rapid letter and word recognition can differentiate good and poor readers early, with weaker readers demonstrating slower letter and word recognition speed (Catts & Kamhi, 2015).

Letter recognition is an important prerequisite for reading success. Correct letter labeling and identification enable children to store the information required for reading in long-term memory (Gibson, 2014; Howard et al., 2012). Children with delays in cognitive and communication development benefit greatly from pre-reading skill intervention. Early reading abilities, such as letter recognition, have been shown to strongly predict an individual's long-term academic success (Cunningham & Stanovich, 2014).

Letter Naming. According to research, learning and playing with letters often leads to an interest in their sounds and reading (Helman & Burns, 2013). Most letter names have an auditory link to their sounds, allowing them to do double duty (Bingham et al., 2017). It aids in the transition from phonemic awareness and letter identification to other phonics skills (Got & Mann, 2013). In addition, the approach of teaching reading through letter recognition has long been supported by research (Pitchford et al., 2016). The truth is that beginning readers' knowledge of the alphabet strongly predicts later reading success. The National Early Literacy Panel (NELP) (2012) meta-analyzed 52 studies that linked alphabetic knowledge (including letter recognition and sound generation) with the later decoding ability of 7,570 children and discovered a strong relationship between the two. The more letter names the children knew, the better their later decoding success (Catts & Kamhi, 2015).

Moreover, studies have shown that learning and playing with letters frequently leads to an interest in their sounds and reading. Many letter names have an auditory link to their sounds, bridging the gap between phonemic awareness, letter recognition, and other phonics skills (Lallier et al., 2013). The evolution of written language is a remarkable cultural and cognitive achievement, made all the more remarkable because it occurred so recently in our evolutionary history (Ortiz, 2019). Indeed, reading may be the most difficult skill for humans to master that cannot be attributed to a specific genetic predisposition (Halpem, 2012). Reading is an especially appealing domain of study for cognitive scientists because it involves a uniquely human and highly constrained form of visual pattern recognition (Saracho & Spodek, 2012). Furthermore, letters are ideal as experimental stimuli for various reasons, including the fact that they are highly overlearned visual patterns, are simple to construct and control, and, most importantly, are real, nameable objects (Erlandsson et al., 2018).

Letter Sound Knowledge. Letters and letter patterns representing speech sounds are also called 'graphemes', while the speech sounds of a language are also called 'phonemes' (Earl & Sayeski, 2017).

Letter-sound knowledge, also known as "graphemic information," aids pupils in learning new words by allowing them to employ letter-sound patterns to pronounce words foreign to them (Piasta & Hudson, 2022). These difficulties are telltale signs of the struggling reader. Research has demonstrated that teaching strategies that start by clearly teaching letter-sound links are far more effective than other methods of teaching reading, regardless of whether or not children have reading challenges (Moats, 2019). This method, known as "synthetic phonics," has received support from reading studies over the last several decades (Sayeski et al., 2017). There is no doubt about it: understanding letter sounds is essential for learning to read and spell since it enables students to teach themselves new words (Rajowski, 2019).

2.2 Problems in Letter Recognition

Piasta and Wagner (2012) defined alphabet knowledge as a "child's familiarity with letter forms, names, and corresponding sounds as measured by recognition and production and writing tasks (Swanson et al., 2012). These students risk falling behind their peers in reading acquisition, which creates gaps in reading comprehension, spelling, reading fluency, and vocabulary skills (Stanovich, 2016). However, participants from various studies showed different achievements between capital and small letters recognition (Smythe et al., 2012). The number of capital letters that the pupils can identify is higher than the number of small letters, with a percentage of 17% and 14%.

Children recognize uppercase letters before lowercase letters instead of which leads them to have confusion when they are tasked to name letters specifically with similar shapes and formation (Smythe et al., 2012; Worden & Boett-cher, 2012), largely due to more frequent exposure to uppercase letters in environmental print (Bowman & Treiman, 2014) and with initial uppercase letters in names. Through observation, the pupils easily recognize the capital letters

because there is more exposure to capital letter uses than small letters, such as textbook titles. Classroom signs and their name tag (Treiman et al., 2014), as cited in Richmond & Taylor, 2014).

In addition, the pupils begin writing their names with capital letters (Yu et al., 2019). The letter formation of capital letters for writing is a lot easier than writing small letters. The size of capital letters which is bigger, also credits to the letter's identification. The participants of this research study like to mix the letters when writing (Oshima & Hour, 2014). It shows that the pupils have difficulty discriminating the letters. However, the difference does not matter as long as both show improvement. This is why young students must start with alphabet knowledge; early exposure to letters is part of a rich literacy experience and helps young children build a strong literacy foundation" (Wasik, 2014). According to research, students who have mastered letter sounds and names will later master more complex literacy skills, such as phonological awareness and oral language (Piasta & Wagner, 2012).

English, for example, is taught as a second language in all primary and secondary schools in Malaysia (Darus & Subramaniam, 2014). English proficiency is required for students to access information and knowledge written in English (Ghasemi & Hashemi, 2011). Following the government's policy of English strengthening, the curriculum has been designed to produce fluent students (Cole & Feng, 2015). The curriculum's content and learning standards are intended to assist students in learning the language to use it in their daily lives and further their studies and work (Kibler et al., 2015). The English language curriculum also emphasizes the development of literacy and critical literacy. This ensures that primary school students are literate and have a solid foundation in the language to progress to secondary school level language proficiency (Lee & Buxton, 2013). However, statistics showed that a sizeable student population in Malaysia is still ill-equipped with basic literacy and numeracy skills because of ineffective teaching and learning pedagogies (Star Online, 2012).

Moreover, the main problem, according to Taylor (2014), in letter recognition is shape. There are multiple tasks that pupils have to do in letter recognition which are 1) distinguish shapes between capital letters, 2) distinguish shapes between small letters, and 3) associate the sounds of the letters. Gibson (2015) supports the problem related to letter discrimination tasks by pointing out that certain types of letter confusions were harder for children to distinguish than others, resulting in differing improvement rates. There are about 54 different letter shapes that the pupils need to understand and memorize as this is the most basic of their alphabetic knowledge (Wright & Ehri, 2014). For capital letters, the letters that always confused the pupils are B, D, Y, J, M, N, P. Q V.K. E, and W. Meanwhile, for small letters, are b, d, p, g, j, v, w, u, m, and n (Ehri & Sweet, 2012). At least 11 kinds of letters have similar shapes, and the pupils have to differentiate between those letters (Gough & Jul 2013). These claims are supported by Richmond and Taylor (2014), where, in their studies of comparison of letter difficulties where they have determined that the most difficult letter orientation for learners to identify is P, D, K. E, c, s, t, d, g, z. Mostly the participants do not recognize around 12-14 letters cache almost 58% of the alphabet

2.3 Relevance of Boom Cards in Addressing Problems in Letter Recognition

Boom Cards as a tool increase the positive effect on the understanding, use of alphabetic principles, and children's reading levels (Bura et al., 2012). The Multisensory Approach offered by the Boom Cards will help the pupils to recognize the letters better (Turanian, 2013). The activities carried out in using the Boom Cards, starting with letter shapes, letter sounds, then writing, gives a meaningful learning experience to the learners. According to Lachman and Geyer (2013), it is generally accepted that primary school learners need to develop many prerequisite skills, including motor and eye-hand coordination, visual perception, letter perception (including the ability to recognize forms, likenesses, and differences), and orientation of the printed language in order to write correctly and legibly.

Meanwhile, letter recognition is needed for alphabetic knowledge, one of four areas for young children's early literacy experiences, oral language, phonological awareness, alphabet knowledge, and print knowledge (National Institute for Literacy, 2014). Hence, students need to master letter recognition in the course of improving their alphabetic knowledge first in order to become proficient readers, and unattractive teaching techniques applied by teachers in the classroom-flashcards, and exercise book, must be limited and begin incorporating the Boom Cards in improving the alphabetic knowledge of the learners particularly, letter recognition (Noordin et al., 2012). Additionally, learning the alphabet through Boom Cards at a young age is a huge help in a child's academic success (Shidler & Harrigan, 2014; Wasik, 2011; & Piasta & Wagner, 2012). It helps to lay a solid foundation for reading.

Bradley and Jones (2014) pointed out Mason's (2014) four components of alphabet knowledge for students to fully grasp alphabet knowledge. Mason's components consist of: a) letter-shape knowledge, (b) letter-name knowledge (c)

letter-sound knowledge. (d) letter writing ability. Instruction should encompass all of these components in a fun and stimulating way. With this, Wasik (2011) discussed that Boom Cards has several ways to teach the alphabet to engage children in meaningful learning experiences. One of them is incorporating a visuo-haptic and haptic (actual-kinesthetic) exploration of letters in training which includes the skills needed for alphabet knowledge, similar to Mason's (2014) four components of alphabet knowledge.

Furthermore, Boom Cards involve the use of our senses. It focuses primarily on using visual, auditory, and kinesthetic-tactile elements and helps to relate the symbols (letter) with the sounds (letter/sounds/correspondence) (Stanley, 2014). Boom Cards uses moveable pieces in some cases, making it ideal for those using any gadget, and it can work well for students who are more engaged with that type of interaction (Shaffer, 2012). Also, Anderson (2012) claimed that because the platform as a tool is completely editable, teachers can easily create their boom decks comprised of their boom cards - ideal for precise targeted testing and learning, for instance, in improving the students' letter recognition.

In addition, teachers can develop their do-it-yourself (DIY) Boom Cards in far-flung areas through the PowerPoint presentation. It will be handier and more accessible for them and the learners if, in any case, their school is located in an area where the internet is not accessible (Steinhoff et al., 2020). Additionally, Boom Cards can be assigned via Google Classroom, making it very simple for schools already set up in that system (Crawford et al., 2020). There is also the option to overlay sound, which is a great way to provide accessible learning and guidance to students who are learning remotely (Solomon & Schrum, 2017). This is why Boom Cards are essential and relevant in addressing the problems in letter recognition (Boddington, 2017).

3. METHODOLOGY

3.1 Research Locale and Duration

The research was conducted in Cateel, particularly at Cateel Central Elementary School, Castro Avenue, Poblacion, Cateel, Davao Oriental. Shown in Figure 1 is the research locale of this paper. The Cateel Central Elementary School is one of the schools in Cateel, District 1, which offers Kinder to Grade six level. Each grade level comprises four to six sections. There are also fifty-two (52) professional teachers on duties, teaching and non-teaching.

Figure 1. Research Locale Map of Cateel Central Elementary School

3.2 Research Design

This paper utilized a pure experimental research design. The researchers used this research design because studies like this aim to evaluate interventions but do not use randomization (Aussems et al., 2011). Moreover, in experimental studies, pre- and post-intervention measurements and no randomly selected control groups can be used (Handley et al., 2018), which is the same as this paper. Like randomized trials, experiments seek to demonstrate causality between an intervention and an outcome (Adelman, 2012). As for that, this research design was utilized since this is the appropriate research design for experimental research that aims to identify an intervention's effectiveness. Also, this paper conducted a pre-test and post-test to find out if the intervention achieved the aim of the paper.

3.3 Respondents of the Study

The respondents of this research were the Grade 2 officially enrolled learners of Cateel Central Elementary School, the school year 2022-2023. In each section of the said grade level, there are 32 learners, and 20 of them are chosen to be the respondents to the said study. This grade level was chosen because it was observed to be prominent with the problem observed by the researchers in terms of recognizing letters and the skills needed for it, including recognizing letter shapes, names, and sounds.

3.4 Research Instrument

The research instrument was a researcher-made fifty-two-item (52) checklist. The checklist contained 26 items in uppercase letters and another 26 items in lowercase letters. The checklist measured whether the learners could recognize, name, and sound all the alphabet's uppercase and lowercase letters.

4. RESULTS AND DISCUSSION

This chapter presents the results and discussion of this study. The chapter compares the pre-and post-intervention performance of the Grade 2 pupils and analyzes the findings.

4.1 Pre-test Scores of the Grade 2 Pupils

Table 2 presents the pre-test scores for the respondents in letter recognition, letter sound, and letter naming. The pre-test scores were analyzed to understand the respondents' initial abilities in the mentioned areas. Results showed that the respondents had a very satisfactory level of letter recognition, obtaining a grade percentage of 85.67 on the pre-test. This suggests that, on the whole, they were able to identify individual letters quite well. However, their performance associating sounds with letters fell short of expectations, as indicated by a grade percentage 67.98. This highlights an area that needs improvement: pupils struggled to connect sounds to the corresponding letters. On a positive note, the participants excelled in letter naming, achieving an outstanding grade percentage of 97.60. This indicates their strong ability to recognize and name individual letters accurately.

Table 1.Level of pre-test scores of participants

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Letter Recognition	26	5.42	18.55	85.67	Very Satisfactory
Letter Sound	26	4.58	9.35	67.98	Did Not Meet Expectations
Letter Naming	26	5.59	24.75	97.60	Outstanding
Overall	26	4.30	17.55	83.75	Satisfactory

The participants' relatively good performance in letter recognition is linked to their exposure to print-rich environments at home and in school which provided ample opportunities for the pupils to interact with letters and develop familiarity with their visual forms (Giacovazzi et al., 2021). Regular exposure to books, labels, and other print materials allowed them to practice identifying individual letters and reinforce their recognition skills (Wasik, 2014). The pupils' cognitive development also played a role, as their growing perceptual abilities and visual processing skills enabled them to discriminate and recognize different letter shapes effectively (Lachman & Geyer, 2013). Moreover, the emphasis on letter recognition in early literacy instruction, including letter-focused activities and games, contributes to developing their proficiency in this area.

The challenges observed in letter sounding are linked to the complexity of mapping sounds to letters (Boerleffs et al., 2019). It presented a significant cognitive demand, especially when multiple letters can represent the same sound or when phonics rules involve exceptions. The pupils needed help applying phonics knowledge consistently or blending sounds to form words accurately (Reinking & Reinking, 2022). Insufficient exposure to explicit phonics instruction and limited practice opportunities also hinder their ability to develop strong sound-letter association skills. Inconsistent reinforcement of sound-letter connections in the classroom and at home may further contribute to letter-sounding difficulties (International Literacy Association, 2019). Additionally, individual differences in

auditory processing abilities, phonological awareness skills, and the extent of exposure to spoken language can influence participants' proficiency in discerning and manipulating sounds within words (Kalaiah, 2015).
Moreover, the outstanding performance in letter naming is linked to the early introduction of letter names in early childhood education, often through alphabet songs, rhymes, and interactive educational tools, contributing to the participants' familiarity with letter names. The repetition and reinforcement of letter names in various educational resources and activities enable them to quickly recall and accurately name individual letters (Piasta & Wagner, 2010). Furthermore, the participants' motivation and engagement in letter-focused learning activities played a significant role. Their interest in letters, whether through personal preferences, positive experiences with letter-related tasks, or supportive learning environments, may lead to active exploration and practice, enhancing their proficiency in letter naming (Booren et al., 2012). Additionally, the participants' exposure to print materials, such as alphabet books or environmental print, further reinforces letter names and strengthens their skills in this area (Wasik, 2014).

4.2 Post-test Scores of the Grade 2 Pupils

Table 2 shows the post-test scores of the participants in letter recognition, letter sound, and letter naming. Notably, the participants made significant improvements across all areas. In letter recognition, they achieved an outstanding grade percentage of 98.85. This indicates a notable enhancement in their ability to identify individual letters accurately. Similarly, the participants obtained an outstanding grade percentage of 99.42 in letter sounds. It indicates notable progress in their skills to associate sounds with letters. Furthermore, in letter naming, the participants excelled with an outstanding grade percentage of 100.00, showcasing their improved proficiency in recognizing and naming individual letters. The participants' overall performance in the post-test, with an average score of 25.70 and an outstanding grade percentage of 99.42, demonstrates their significant growth in letter recognition, letter sound, and letter naming skills.

Table 2. Level of post-test scores of participants

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Letter Recognition	26	1.27	25.40	98.85	Outstanding
Letter Sound	26	0.92	25.70	99.42	Outstanding
Letter Naming	26	0.00	26.00	100.00	Outstanding
Overall	26	0.64	25.70	99.42	Outstanding

The results suggest that using Boom Cards as an intervention significantly enhanced the participants' skills. The interactive and engaging nature of the digital platform motivated the participants to actively participate in letter-related activities, resulting in increased effort and concentration. It corroborates with Turanian's (2013) study, which demonstrated that targeted practice and reinforcement through Boom Cards improved participants' familiarity with different letter shapes and their ability to distinguish and identify individual letters accurately.

Regarding letter sounding, success is associated with the effectiveness of the structured approach and guided practice offered by Boom Cards, which helped the participants understand the connections between sounds and letters more effectively (Baker et al., 2018). By repeatedly blending sounds and applying phonics rules in various contexts, they developed the skills to sound out letters and decode words more accurately (Carreker et al., 2021). The immediate feedback provided by the intervention facilitated their learning process, enabling them to make necessary adjustments and refine their sound-letter associations (Moats, 2019).
Regarding letter naming, the outstanding results are associated with the early introduction of letter names in the participants' education and consistent practice using Boom Cards (Sharp, 2015). Additionally, exposure to print materials and environmental print in their daily lives may have reinforced their letter-naming skills and provided practical context for letter recognition (Neumann, 2012).

Furthermore, the outstanding progress in letter recognition, letter sounding, and letter naming is linked with the experiential learning approach embedded in Boom Cards. The interactive and immersive nature of the digital platform provided participants with opportunities for firsthand experiences, allowing them to actively engage with the letter-related activities (Muir et al., 2022). Boom Cards, as a digital learning tool, facilitated hands-on and interactive learning experiences for the participants, aligning with the principles of experiential learning by David Kolb. Through actively engaging in activities like blending sounds, manipulating letters, and applying phonics rules, the participants had firsthand experiences with letter recognition, sounding, and naming (Pullen & Lane, 2016). It allowed them to reflect on their learning, make connections, and develop a deeper understanding of letters. The immediate feedback and guided practice provided by Boom Cards encouraged them to experiment and refine their skills, leading to enhanced letter recognition abilities (Kolb, 2014; McLeod, 2017).

4.3 Difference Between Pre-test and Post-test Scores of the Participants in Letter Recognition

Table 3. Mean comparison between pre-test and post-test scores in letter recognition

Type of Test	Mean	Standard Deviation	t-value	p-value	Interpretation
Pre-Test	18.55	5.42	6.606	0.000	Pre-test and post-test scores differ significantly.
Post-Test	25.40	1.27			

The significant difference observed between the pre-test and post-test scores in letter recognition is influenced by several factors. The intervention utilizing Boom Cards as an interactive and engaging learning tool was crucial in improving the participants' letter recognition skills. The targeted practice and reinforcement offered by the digital platform allowed the participants to engage repeatedly with letter recognition tasks. The interactive nature of the activities, such as drag-and-drop exercises or matching games, may have increased their motivation and active participation, thereby leading to enhanced learning outcomes (Gennari et al., 2017).

Another reason for the significant difference is the increased exposure and practice provided through the Boom Cards intervention. Regular use of the digital platform exposed the participants to various letter stimuli, including letter shapes, sizes, and fonts (Garcia, 2016). Their repeated exposure and practice allowed them to become more familiar with the characteristics of letters, thereby improving their ability to identify them accurately (Husk & Yu, 2017).

Furthermore, the immediate feedback and reinforcement provided by the Boom Cards platform played a significant role in the participants' improved letter recognition skills (Macri & Patel, 2015). The digital platform offers instant feedback, correcting errors and providing reinforcement when participants make correct choices. This immediate feedback helped the participants better understand letter recognition concepts and allowed for timely corrections, contributing to their progress in this area (Williamson, 2018).

Moreover, the individualized learning experience facilitated by Boom Cards has influenced the significant difference in scores. The customization feature of the digital platform allowed educators to target specific letter recognition skills and adapt activities based on the participant's progress. This individualized approach allowed each participant to work independently and receive targeted support where needed, enhancing their letter recognition abilities (Twyman, 2018).

Lastly, the increased confidence and self-efficacy of the participants in letter recognition influenced the significant difference in scores. The regular practice and positive reinforcement provided by the intervention may have boosted their confidence in their ability to identify letters correctly (Lynch,.2020). The students' increased confidence translated into improved performance during the post-test as the participants approached it with greater self-assurance.

4.4 Difference Between the Pre-test and Post-test Scores of the Respondents in Letter Sound

Table 4 presents the mean comparison between the pre-test and post-test scores in letter sounds. The results indicate a substantial improvement in the participants' letter sound skills after the intervention using Boom Cards. The higher average score on the post-test suggests a significant enhancement in their ability to identify and produce letter sounds accurately.

Table 4. Mean comparison between pre-test and post-test scores in letter sound

Type of Test	Mean	Standard Deviation	t-value	p-value	Interpretation
Pre-Test	9.35	4.58	15.730	0.000	Pre-test and post-test scores differ significantly.
Post-Test	25.70	0.92			

The significant difference observed between the pre-test and post-test scores in letter sound is influenced by many factors. Firstly, the intervention utilizing Boom Cards as an interactive and engaging learning tool was crucial in improving the participants' letter sound skills (Pullen & Lane, 2016). The digital platform provided practice and reinforcement, allowing participants to actively engage with phonics exercises and enhance their understanding of letter sounds. The interactive nature of the activities, coupled with the engaging visuals and interactive elements, contributed to a more enjoyable and motivating learning experience (Piasta & Wagner, 2010).

Moreover, the systematic instruction and immediate feedback offered by the Boom Cards intervention were instrumental in the participants' progress. The structured approach provided by the digital platform helped participants grasp sound-letter correspondences and phonics rules more effectively (Williamson, 2018). The immediate feedback feature allowed for timely corrections and positive reinforcement, supporting participants' learning and encouraging accurate sound production (Carreker et al., 2021).

Additionally, the intervention increased participants' exposure to letter sounds and provided ample practice opportunities. Through the diverse range of Boom Cards activities, participants encountered various letter-sound combinations and phonetically diverse words (International Literacy Association, 2019). The repeated exposure and practice enabled participants to develop greater familiarity with letter sounds, improving their ability to recognize and produce them accurately (Wasik, 2014).

Furthermore, the intervention enhanced participants' phonological awareness, essential for sound-letter proficiency. Blending sounds and identifying initial sounds are interactive activities that engage participants in phonological processing tasks (Shamir et al., 2012). Through actively manipulating sounds in words, participants developed a deeper understanding of the individual sounds that make up words, contributing to their improved letter sound recognition (Reading Rockets, 2022).

Lastly, the motivating and engaging nature of the Boom Cards activities fostered participants' active participation and enjoyment of the learning process. The interactive and game-like features of the platform captured participants' attention, promoting sustained engagement with letter sound tasks (Graham, 2022). The students' increased motivation and engagement, combined with the effective learning design of the Boom Cards, contributed to the significant improvement in participants' letter sound skills.

4.5 Difference Between Pre-test and Post-test Scores in Letter Naming

Table 5 presents the mean comparison between the pre-test and post-test scores in letter naming, a p-value of 0.330 indicates no significant difference between the pre-test and post-test scores in letter naming. The results suggest that the participants' performance in letter naming remained consistent before and after the intervention using Boom Cards. The lack of significant improvement does not necessarily lessen the value of the intervention, as it may have provided reinforcement and maintained the participants' current level of proficiency in letter naming.

Table 5. Mean comparison between pre-test and post-test scores in letter naming

Type of Test	Mean	Standard Deviation	t-value	p-value	Interpretation
Pre-Test	24.75	5.59	1.000	0.330	Pre-test and post-test scores do not differ significantly.
Post-Test	26.00	0.00			

The absence of a significant difference between the pre-test and post-test scores in letter naming is linked to the participants' initial performance in letter naming, which was already outstanding, with an average score of 24.75 out of 26 on the pre-test. This suggests that they had already attained a high level of proficiency in this skill prior to the intervention. As a result, there may have been limited room for further improvement, leading to a lack of significant difference in the post-test scores. The participants may have had prior exposure to extensive letter-naming

instruction or possessed a strong foundation in this skill, contributing to their already outstanding level in letter naming (Lynch, 2020).

Individual differences among the participants also could have played a role in the consistent performance in letter naming. Varying levels of letter proficiency or cognitive abilities among the participants may have influenced their letter-naming abilities, resulting in a range of performance levels (Knight, 2017). These individual differences remained relatively stable throughout the intervention, leading to consistent performance across the pre-test and post-test. While some participants may have naturally possessed stronger linguistic skills or cognitive abilities that facilitated their letter-naming abilities, others may have faced challenges that limited their potential for significant improvement (Reutzel, 2019).

Furthermore, it is important to consider the specific focus of the Boom Cards intervention. During the intervention aimed to enhance letter recognition, sound, and naming, it is likely that the activities and exercises used in the intervention placed a greater emphasis on letter recognition and sound rather than letter naming (Huang & Invernizzi, 2014)). This discrepancy in focus may have impacted the extent to which the intervention influenced participants' letter-naming abilities, potentially leading to a less significant difference between the pre-test and post-test scores in this area (Invernizzi & Buckrop, 2018).

Overall Difference of Pre-test and Post-test scores of the Respondents

Table 6 compares the pre-test and post-test scores overall, combining the scores from letter recognition, letter sound, and letter naming. The results suggest that the Boom Cards intervention substantially impacted the participants' overall performance. The significant improvement in the post-test scores indicates that the intervention effectively enhanced the participants' letter recognition, letter sound, and letter naming abilities.

Table 6. Mean comparison between pre-test and post-test as overall

Type of Test	Mean	Standard Deviation	t-value	p-value	Interpretation
Pre-Test	17.55	4.30	9.565	0.000	Pre-test and post-test scores differ significantly.
Post-Test	25.70	0.64			

The Boom Cards intervention provided focused and targeted instruction to enhance letter recognition, letter sound, and letter naming skills. The interactive and engaging nature of the digital activities increased the participants' motivation and engagement, creating a conducive learning environment (Turanian, 2013).

In addition, the intervention may have offered ample opportunities for practice and reinforcement (Sharp, 2018). Consistent exposure to letter recognition exercises, phonics drills, and interactive tasks allowed the participants to consolidate their learning and develop a deeper understanding of letter-sound relationships. The repetitive nature of the activities enabled the participants to reinforce their skills and improve their accuracy and speed in recognizing letters, associating sounds, and naming letters (Clark, 2019).

Furthermore, the intervention incorporated various instructional strategies tailored to the participants' needs. Differentiation and individualized support have been provided to address any specific difficulties or challenges faced by the participants in the pre-test (Luff, 2019). The intervention included explicit instruction, modeling, guided practice, and feedback, which are effective strategies for promoting phonics acquisition (International Literacy Association, 2019).

Another contributing factor is the participants' active engagement and investment in the learning process. Their enthusiasm, curiosity, and willingness to learn were crucial to their improvement (Graham, 2022). The positive learning environment created by the intervention has fostered a sense of enjoyment and achievement, encouraging the participants to put forth their best effort and actively participate in the activities (Bilodeau, 2012). It is also important to recognize that the participants' prior knowledge, readiness, and individual differences in cognitive abilities and language development can influence the overall difference in scores. Some participants have had a stronger foundation in phonics skills, which could have improved their scores more than others (Kennen, 2017). External factors such as parental involvement, home literacy environment, and classroom support may have also influenced the participants' progress (Neuman et al., 2013).

4.6 Implication of Boom Cards in Teaching Letter Recognition, Sounding, and Letter Naming

1.The results suggest that using Boom Cards can improve the letter recognition, sounding, and letter naming abilities of Grade 2 Pupils.

2.The outstanding progress made by the respondents after receiving intervention through Boom Cards suggests that interactive and engaging learning approaches positively impact pupils' abilities on letter-related concepts. Digital platforms like Boom Cards offer an interactive and immersive learning experience that motivates and captivates students, increasing their active participation and concentration.

5. CONCLUSION

Based on the study's findings, the following conclusions were drawn:

1. The participants demonstrated a very satisfactory level in their pre-test scores for letter recognition, did not meet expectations in letter sound, and achieved an outstanding level in letter naming. This means that before the intervention, they already had foundational skills in recognizing and naming letters and struggled with connecting letters to their corresponding sounds.

2. The participants achieved an outstanding level in their post-test scores for letter recognition, letter sound, and letter naming. This means using Boom Cards as an intervention improved their letter recognition, sound, and naming skills.

3. A significant difference was observed between the pre-test and post-test scores of the participants, indicating notable improvement in their letter recognition, letter sound, and letter naming abilities. Therefore, using Boom cards as an intervention significantly affected the participants' overall performance in the mentioned areas of evaluation.

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