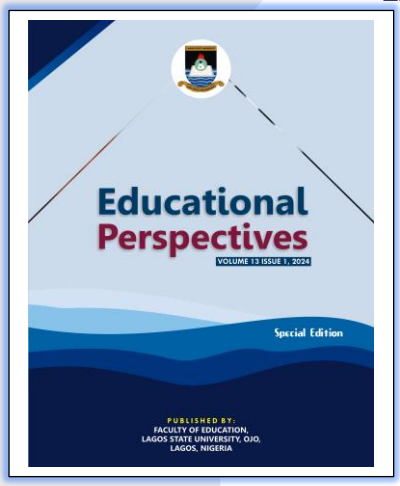

Handwriting for global excellence: Examining the impact of Handwriting Interventions on the academic performance of pupils in the early years

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ABSTRACT

Handwriting is the act of penmanship and it is a skill that requires teaching, training and learning. Even though it is essential in the learning, there appears to be a gradual tilting towards becoming obsolete. The increase in the use of technology including tablets and computers has aggravated this. The present study examines the effect of Handwriting interventions on academic performance of pupils in the early years. A total of 75 pupils from two purposively selected schools in Lagos State education district V participated in the study. A Handwriting Achievement Test (HAT) which had a reliability coefficient of 0.78 was the instrument used to collect the quantitative data. Treatment lasted three weeks after the conduct of the pretest, the experimental group was taught using handwriting intervention and the control group was taught using the traditional lecture method. One-way ANCOVA was used to analyse the data. It was revealed that that there is a statistically significant effect of handwriting interventions on the academic performance of pupils in the early years [$F(1,72) = 6.81$; $p < .05$] and that there is no significant effect of gender on the academic performance of pupils exposed to handwriting interventions [$F(1,37) = .27$; $p > .05$]. Within the limitations of the study, it was concluded that handwriting interventions is capable of improving pupils' performance.

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Introduction

Handwriting is more than just putting pen to paper; it represents a complex interplay of fine motor skills, language processing, memory, and concentration. From early childhood, children learn to coordinate these elements to form letters, words, and sentences that communicate their thoughts and ideas (Dinehart, 2015). Despite the increasing use of digital technology in education, handwriting remains a fundamental skill that shapes cognitive development and academic performance. Research has consistently shown that strong handwriting ability in early years contributes to improved literacy skills, better reading comprehension, and enhanced written expression. However, concerns have arisen over the apparent decline in handwriting instruction, raising questions about its long-term impact on learning.

Handwriting is as old as humanity itself. Since the beginning of civilisation, humans have sought ways to document their emotions, ideas, and thought patterns. The ability to attach symbols to objects through handwriting likely led to the development of written words, enabling communication across generations. The earliest known writing system, the Sumerian pictograph, evolved into cuneiform and later into ideographic scripts, where symbols represented abstract concepts. Around the same period, the Egyptians developed hieroglyphics, which began as pictographs but later transformed into a syllabic script (Fancher et al. 2018). From the Etruscan civilisation, Latin handwriting emerged, and under Charlemagne's reign, efforts to establish a uniform and easily readable script took shape. These historical transitions underscore the significance of handwriting as an evolving medium of communication that has continually adapted to societal needs.

Handwriting development has fascinated researchers for decades, with various terms used to describe its progression. Among the many aspects of handwriting, legibility and speed stand out as the most crucial indicators of quality. Since young children often struggle to write both legibly and quickly, much of the existing research has focused on older children in formal education. However, like other fundamental academic skills such as reading and mathematics, handwriting proficiency does not emerge overnight. It builds upon foundational skills that likely begin developing long before a child enters school.

For most adults, writing legibly at speed feels automatic, but for young children, handwriting presents a significant cognitive and motor challenge. Engel et al. (2018) noted that handwriting requires the coordination of multiple processes, including cognitive, motor, and neuromotor functions. Children typically start exploring writing as early as two years old, using scribbles as their first attempts at written expression. Although these early marks may not resemble conventional writing, but some scribbles display universal writing features such as directionality and linearity. Over time, children begin refining their writing attempts by copying simple geometric shapes, including vertical and horizontal lines, circles, and—perhaps the most critical for handwriting readiness—the oblique cross (Taverna et al. 2020).

The ability to copy an oblique cross appears to be a significant milestone in handwriting development. Malpique et al. (2020) found that children who successfully reproduced this shape, along with other simpler symbols from the Developmental Test of Visual-Motor Integration were able to copy significantly more letters than those who struggled with it. As children's fine motor skills develop, they gain better control over objects in their hands, which enhances their ability to form letters accurately. Fine motor control plays a crucial role in handwriting, as first graders commonly make writing errors linked to immature motor skills. Preschoolers, unsurprisingly, display less refined

grasping techniques compared to older children, which can make it difficult for them to produce letters with precision.

The journey to proficient handwriting is complex, beginning with rudimentary scribbles and progressing through structured letter formation. While technology has reshaped many aspects of education, handwriting remains an essential skill that supports literacy, cognitive development, and academic success. Understanding how children acquire this skill can inform effective teaching strategies, ensuring that handwriting instruction meets their developmental needs. Despite its historical importance, handwriting has faced challenges in the modern era. McCarroll and Fletcher (2017) observed that handwriting instruction has declined due to technological advancements. Digital devices have become central to education, leading some to question whether traditional handwriting still holds value. However, substantial evidence suggests that handwriting plays a crucial role in cognitive and academic development. Wollscheid et al. (2016) posited that handwriting enhances literacy skills by strengthening the connection between thought and written expression. Similarly, McCarroll and Fletcher (2017) highlighted the importance of early handwriting skills, linking them to later academic success.

Beyond its cognitive benefits, handwriting impacts how children engage with learning. Young learners who struggle with handwriting often find writing tasks laborious, leading to frustration and reduced confidence. Poor handwriting can hinder written expression, making it difficult for pupils to organise their thoughts coherently. When children devote excessive cognitive resources to letter formation, they may struggle to focus on composing meaningful content. As a result, their performance in written assessments may not accurately reflect their knowledge or understanding of a subject. Handwriting interventions have emerged as an effective response to these challenges, providing structured support to improve fluency, legibility, and writing speed.

Handwriting interventions take various forms, ranging from multisensory techniques that integrate movement, auditory feedback, and visual cues to structured handwriting programmes that emphasise proper letter formation and spacing. These interventions do more than refine handwriting mechanics; they also reduce the cognitive load associated with writing, allowing pupils to focus on higher-order thinking and creative expression. Studies suggest that effective handwriting instruction fosters motivation and self-efficacy, equipping pupils with the skills needed to engage confidently in academic tasks.

Despite the wealth of research supporting handwriting interventions, gaps remain in understanding their long-term effects on academic performance. While many studies have documented improvements in handwriting fluency and quality, there is still a need to explore how these interventions influence broader learning outcomes, including literacy development, problem-solving skills, and overall academic performance. This study aims to examine the impact of handwriting interventions on the academic performance of pupils in the early years.

Research questions

1. What is the effect of handwriting interventions on the academic performance of pupils in the early years?
2. What is the effect of gender on the academic performance of pupils exposed to handwriting interventions?

Hypotheses

1. There is no significant effect of handwriting interventions on the academic performance of pupils in the early years
2. There is no significant effect of gender on the academic performance of pupils exposed to handwriting interventions

Methodology

The study employed a quasi-experimental research design. This is due to the inability to assign participants to the experimental and control groups at random during data collection. A total number of seventy-five pupils comprising of 42 males and 33 females selected from two sampled schools in Education District V of Lagos state formed the sample of the study. Intact classes were used for the study because the school authority wouldn't allow the disorganization of the classes. Forty students in one school were used as experimental group, while thirty-five pupils in another school stood for the control group. The experimental group was taught using the Handwriting intervention, while the control group was taught using lecture method. Handwriting Achievement Test (HAT) was used to collect quantitative data. The reliability of the HAT using split-half reliability coefficient was 0.80. Face and content validity of the instruments was ensured by test experts and early years teachers. Permission was sought from the authorities of the participating schools and pupils consent to voluntarily participate in the study with an understanding that they are free to withdraw their interest at any point during the study. A pre-test was conducted for both groups using HAT to determine the prior knowledge of the pupils. The performance pre-test was marked and each correct answer was awarded 1mark and the maximum obtainable mark is 20 marks. The treatment lasted for four weeks. At the end of the treatment, a post test was conducted to determine the difference in performance of the pupils. The test administration was carefully done with no observable difference in the process for the two groups particularly concerning time allotted, supervisors and willingness to take the test by the pupils.

Results

Research questions one: What is the effect of handwriting interventions on the academic performance of pupils in the early years?

Table 1 Mean and standard Deviation showing the difference in the performance of pupils in the Handwriting intervention Group and control group.

Group	Mean	Std. Deviation	N
Control Group	8.71	3.02	35
Handwriting Intervention Group	11.28	1.93	40

The table above reveals that the pupils in the control group had the mean and standard Deviation values of 8.71 and 3.02 while pupils taught with Handwriting Intervention Group had the mean and standard Deviation values of 11.28 and 1.93 respectively. To determine if this difference is statistically significant, hypothesis 1 was tested using ANCOVA.

Hypothesis 1: There is no significant effect of handwriting interventions on the academic performance of pupils in the early years

Table 2: ANCOVA Summary table showing the effect of handwriting interventions on the academic performance of pupils in the early years

Source	Type III sum of squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	211.234[a]	2	105.716	15.47	.000	.235
Intercept						
PRE_TEST	533.476	1	533.476	78.094	.000	.436
GROUP	57.393	1	57.393	8.402	.005	.077
Error	46.494	1	46.494	6.806	.010	.063
Total	689.953	72	6.831			
Corrected Total	10440.000	75				
	901.385	74				

a. R Squared = .235 (Adjusted R Squared = .219

The table above reveals that there is a statistically significant effect of handwriting interventions on the academic performance of pupils in the early years [$F(1,72) = 6.81$; $p < .05$]. Therefore, the null hypothesis was rejected.

Research question 2: What is the effect of gender on the academic performance of pupils exposed to handwriting interventions?

Table 3 Mean and standard Deviation showing the difference between the academic performance of male and female pupils exposed to handwriting intervention

Group	Mean	Std. Deviation
Male	11.58	2.40
Female	11.01	1.22

The table above reveals that male pupils had a mean and standard Deviation values of 11.58 and 2.40 while female pupils had the mean and standard Deviation values of 11.01 and 1.22 respectively. To determine if this difference is statistically significant, hypothesis 2 was tested using ANCOVA.

Hypothesis 2: There is no significant effect of gender on the academic performance of pupils exposed to handwriting interventions

Table 4 ANCOVA Summary table showing the effect of gender on the academic performance of pupils exposed to handwriting interventions

Source	Type III sum of squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	27.015[a]	2	13.507	1.503	.230	.004
Intercept	306.152	1	306.152	34.063	.000	.340
Pretest	20.690	1	20.690	2.302	.134	.034
GENDER	2.465	1	2.465	.274	.602	.004
Error	593.188	37	8.988			
Total	5855.000	40				
Corrected Total	620.203	39				

a. R Squared = .044 (Adjusted R Squared = .015)

The table above reveals that there is no significant effect of gender on the academic performance of pupils exposed to handwriting interventions [$F(1,37) = .27$; $p > .05$]. Therefore, the null hypothesis was not rejected.

Discussion

The first research question examined effect of handwriting interventions on the academic performance of pupils in the early years. Findings revealed that that there was a statistically significant effect of handwriting interventions on the academic performance of pupils in the early years. Several studies have demonstrated that explicit and structured handwriting instruction not only improves the physical act of writing—enhancing legibility and fluency—but also bolsters broader literacy skills which underpin academic success. McCarroll & Fletcher (2017) revealed a significant positive correlation exists between academic success in writing and reading and the quality of handwriting. In addition, Shaturaev (2019) has suggested that early handwriting proficiency lays a critical foundation for later academic performance, as it enables children to develop a more effective internal representation of letter forms, which in turn facilitates reading and writing.

Other researchers have underscored the importance of handwriting in the context of modern educational challenges. Adeniyi et al. (2017) observed that despite a decline in traditional handwriting instruction due to technological advancements, the evidence remains strong that handwriting is integral to the development of literacy skills. Stewart (2022) further argued that the act of writing by hand engages neural circuits in a way that promotes deeper cognitive processing—a benefit that cannot be fully replicated by typing. Fears and Lockman (2019) have also noted that, although digital devices are increasingly prevalent, they do not replace the developmental benefits associated with handwriting; rather, handwriting remains the bedrock of early educational development. Likewise, Dahlstrom and Bostrum (2019) emphasised that handwriting plays a crucial role in fostering verbal expression and overall communication skills, which are directly linked to academic performance.

The statistically significant improvement in academic performance following handwriting interventions suggests that early education curricula should reinstate or bolster structured handwriting programmes. Educational policymakers should consider allocating dedicated time for handwriting practice, recognising that

even modest daily investments (for example, ten to fifteen minutes) can yield meaningful improvements in both motor proficiency and literacy outcomes. Secondly, occupational therapists and teachers ought to collaborate closely to ensure that interventions are tailored to address both the motor and cognitive dimensions of writing. Such collaboration would help in identifying children who are at risk of falling behind due to poor handwriting skills, thereby enabling timely, targeted support. Finally, in an era increasingly dominated by digital technology, these findings advocate for a balanced approach. While it is essential for pupils to develop digital literacy skills, maintaining traditional handwriting instruction remains critical. This balance ensures that children develop the neural, cognitive, and motor foundations necessary for both academic success and lifelong learning.

Research question two examined the difference in the academic performance of male and female pupils exposed to the handwriting intervention. It was revealed that there was no significant effect of gender on the academic performance of pupils exposed to handwriting interventions. This finding corroborates that of Maurer et al. (2023) explored early handwriting skills and their motor and cognitive correlates in first-grade children. Although girls outperformed boys in fine motor skills, visuomotor integration, and handwriting legibility, the study did not find a direct link between these differences and overall academic performance. This indicates that while there are gender-based differences in specific handwriting-related skills, these do not necessarily impact broader academic outcomes.

The absence of a significant gender effect on academic performance following handwriting interventions suggests that such programs are equally beneficial across genders. Educators can implement handwriting interventions without concern for gender-specific efficacy, promoting equitable learning opportunities. Despite similar academic outcomes, underlying differences in handwriting proficiency between genders may still exist. Educators should remain attentive to individual needs, providing targeted support to pupils who may struggle with handwriting, regardless of gender, to ensure all pupils can benefit fully from handwriting instruction.

Conclusions

The findings from this study provide strong evidence that handwriting interventions play a significant role in enhancing the academic performance of pupils in the early years. This reinforces the argument that handwriting is more than a mere motor skill—it is a crucial cognitive process that contributes to literacy, comprehension, and overall academic performance. The ability to write legibly and fluently fosters cognitive organisation, aids memory retention, and supports the development of reading and writing skills, which are fundamental to early learning.

Furthermore, the study found no statistically significant effect of gender on academic performance following handwriting interventions. This suggests that both boys and girls benefit equally from handwriting instruction, despite potential variations in fine motor skill development and handwriting fluency. These findings align with previous research indicating that while gender-based differences in handwriting proficiency may exist, they do not translate into disparities in broader academic performance when appropriate interventions are in place. The universality of handwriting's impact highlights its role as an inclusive instructional tool that supports learning across all demographic groups.

Recommendations

Based on the findings, the following recommendations are proposed to enhance early years education and maximise the benefits of handwriting interventions**:**

1. Schools and educational policymakers should ensure that handwriting instruction is

embedded into the curriculum for early years education. This should involve structured, research-based handwriting programmes that focus on letter formation, fluency, and writing endurance to enhance pupils' academic success.

2. Teachers play a crucial role in implementing effective handwriting interventions. Therefore, teacher education programmes should provide specialised training on evidence-based handwriting instruction. Continuous professional development workshops should also be organised to equip teachers with innovative strategies for supporting handwriting development in young learners.
3. Parents and caregivers should be encouraged to support handwriting practice at home. Schools can organise workshops or provide resources that guide parents on effective ways to reinforce handwriting skills through playful and engaging activities.
4. Future studies should explore the long-term effects of handwriting interventions on academic performance beyond the early years. Research should also investigate how handwriting fluency influences other cognitive and motoric skills, including creativity, problem-solving, and memory retention.

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