THE EFFECT OF INSTRUCTIONAL REMEDIATION ON HANDWRITING LEGIBILITY AMONG PUPILS WITH DYSGRAPHIA IN PRIMARY SCHOOLS IN OGOJA EDUCATION ZONE CROSS RIVER STATE, NIGERIA

BY

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DECLARATION

I **OLOFU, PRECILLA ALU** with registration number **SPE/M.Ed/18/008** hereby declare that this thesis titled "The Effect of Instructional Remediation on Handwriting Legibility among pupils with Dysgraphia in Primary Schools in Ogoja Education Zone, Cross River State, Nigeria." is a product of my research under the supervision of **Dr J. E. OLAYI** and has not been presented anywhere for the award of degree or certificate.

OLOFU, PRECILLA ALU **SIGNATURE _____**

SPE/M.Ed/18/008

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CERTIFICATION

This is to certify that this thesis titled: "The Effect of Instructional Remediation on Handwriting Legibility among pupils with Dysgraphia in Primary Schools in Ogoja Education Zone, Cross River State, Nigeria." carried out by **Olofu, Precilla Alu** with Registration number **Spe/M.Ed./18/008** under our supervision has been examined and found to have met the regulations of the university of Calabar, and worthy of the award of Master's Degree (M.Ed.) in Special Education (Learning Disability).

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ABSTRACT

This study was conducted to investigate the effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools in Ogoja Education Zone, Cross River State, Nigeria. To achieve this, the study was anchored on four theories. The independent variable is instructional remediation which include teacher modeling, use of pencil grip, motor training skills while the moderators' variables was gender. The dependent on handwriting legibility among pupils with dysgraphia. Six research questions and six null hypotheses were formulated to guide the study. The null hypotheses were: A review of related and relevant literature was conducted to seek the views and opinions of authors and researchers concerning all the variables. A quasi-experimental research design was adopted for the study. The population of the study comprised of 74 pupils with dysgraphia selected in 4 primary schools which also formed the sample of the study selected through multiple sampling techniques. A hand writing legibility ability test was designed by the researcher under the guidance of the supervisor and two experts in special Educators as instrument and used for data collection. The data collection instrument was scrutinized and declared valid by experts in research, measurement and evaluation in the Faculty of Education, University of Calabar. The reliability of the instrument was established using the Kuder Richardson 20 formula and yielded a high reliability coefficient ranges from 0.78 to 0.83. Analysis of co-variance (ANCOVA) was used to analyze the collected and prepared data for all hypotheses. The results of the study reveals that there is a significant influence of teacher modeling, use of pencil grip, motor training skills on handwriting legibility among pupils with dysgraphia in primary schools.. The result shows no significant influence of gender on handwriting legibility among pupils with dysgraphia in primary schools when taught handwriting legibility using teacher modeling and motor training skills but significant when using pencil grip. Based on the finding of the study, it was recommended that teacher should be encourage more to apply pencil grip, teacher modeling, motor training skills strategy in teaching handwriting legibility of pupil with dysgraphia in primary schools in order to sustained academic performance in writing.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Education is a right and not a privilege for all children of school age including pupils with dysgraphia. This is in lines with international or global policies in education such as, Education for all (EFA), Inclusive Education (IE) and Sustainable Development Goals (SDGs). The implication of these policies is that all categories of learners are to access quality education in any conducive classroom where individualized attention to pupils is required. However, the major skill for any learner, in any educational setting across the globe is the skills of reading and writing. Writing which has to do with a coordination between the brain, eyes and hands, is a motor skill activity involving the movement of the hands and the eyes transmitting the information interpreted by the brain into a well meaningful, constructed and readable ideas in a written expression or language.

Written language has long been a do without aspect of learning in the education sector, classroom reporting activities, business organization, offices, media houses among other formal and informal settings. Its usefulness is based on the production and legibility. Though, technology had advanced various ways of producing written language such as the use of typewriters, computer keyboards, phones among others but this has not replaced handwriting as a means of producing writers' expression through manual handwriting. Handwriting is a functional life skill and the most useful in the day to day communication. Hulstijn (2019) added that "handwriting is a functional yet complex task in which lower-level, perceptual-motor processes and higher-level cognitive processes interact, allowing for communication of thoughts using a written code". It is a skill that is required for full participation in school activities since children spend up to half of their

classroom time engaged in paper and pencil tasks daily (Kushki, Schwellnus, IIyas & Chau, 2021). Thus, “handwriting difficulties have a profound impact on a child’s academic success and self-esteem”. Handwriting proficiency in the other hand, significantly correlate with academic achievement and is a predictor of general learning abilities.

Hand writing skills is a method of representing language in visual or tactile form which use sets of symbols to represent the sounds of speech and may also have symbols for such things as punctuation and numerals (Danladi, 2018). There are form of communication that allows “pupils to put their feelings and ideas on paper, to organize their knowledge and beliefs into convincing arguments, and to convey meaning through well-constructed text. Spelling, vocabulary, grammar, and organization come together and grow together to help the pupils demonstrate more advanced writing skills each year”. This union of skills, however, is a very complex process, and there are few for whom these skills evolve easily. When mastery of these skills becomes an overwhelming obstacle for children, they are often diagnosed with a learning disability in written expression (Mark, 2020).

Research though not only in Nigeria, has shown that approximately 10-30% of children have difficulty mastering the skill of writing and problems are most common among children with disorders such as Attention deficit hyperactive disorder, learning disabilities, and speech and language difficulties (Graham & Harris, 2015). The term use by professionals and stakeholders to describe the disorder or defect in written expression which incorporates various facets, including spelling and handwriting is called dysgraphia. Dysgraphia is a partial inability to remember how to make certain alphabets or arithmetic symbols in handwriting. Learners’ handwriting problem can arise from their lack of fine-motor coordination, failure to attend to task, and inability to perceive and/or

remember visual images accurately, or from inadequate handwriting instruction in the classroom. Learners with handwriting difficulties may also have difficulty in common spelling, like adding unwanted letters, the omission of needed letter, reversal of vowels, reversal of syllables, and the phonemic spelling of non-phonemic words. Consequently, this has impacted negatively on the learners' academic performance and achievement leading to poor performance, poor completion of class task, delay in class grading and transition, low self-esteem, failures, frustration and total school dropout.

To enhance the writing of pupils with handwriting difficulties (dysgraphia), instructional remedies such as teachers modeling, pencil grips are of immense benefit. Instructional remediation is an instructional intervention, carefully design to correct handwriting difficulties to minimal or in totality. These instructional remedies include; teacher modeling, pencil grip/paper position, motor training, cooperative practice, use of peer feedback and independent practice. Teacher modeling is an instructional strategy in which the teacher demonstrates a new concept or approach to learners and students learn by observing and making learning notes. Modeling can be used in all stages to help learn a new skill, undertake a task more effectively in terms of the success criteria, develop thinking skills, and thought processes. Modeling provides a clear picture in a student's mind as to how to handle the task at hand (Okeke, 2016). Creating a picture in a student's mind will give the student confidence in how to complete the assignment. This type of guidance shows what the teacher expects and gets the students off on the right foot. Task modeling occurs when the teacher demonstrates a task to students and expects the students to do on their own what is demonstrated. Teacher modeling instruction involved the teacher instructing the learners on the forms, types, models and orderly arrangement of letters or a written form and allow the learner to copy or follow the pattern used by the teacher. The teacher demonstrates proper pencil grip, paper position as well as letter

formation to the learners. This gives the learner the opportunity to model after the teacher and follow a pattern of handwriting or become proficient in writing. In a situation where the teacher fails to model the learners, the learners will develop their pattern of writing which might not be appropriate for a proficient handwriting in future. As such, a classroom of a child with any sign of dysgraphia must be individualized to enable the teacher modeled the learner accordingly.

Pencil grips are small impermanent attachments that fit onto a pencil. They help a child or adult have a functional and accurate grasp of a pencil. Used correctly, a Pencil grip can help develop fine motor skills and user control over their handwriting. A correct pencil grip will enable the writer to move the fingers, controlling the pencil or pen with efficient finger movements. According to Adams and Simmons (2019), the ability to hold a pencil correctly can affect a child's attitude to learning and school work, their academic achievement as well as their motor/joint development. Pencil grip helps children build important fine motor and handwriting skills and helps the fingers to be more efficient at controlling the pencil.

Sometime, poor hand coordination in writing is as a result of difficulties in fine motor skills which involve all small muscles within the hand region, more especially those that control precise movements of the hands, wrists, and fingers (Berninger & Fuller, 2018). The small muscles of the hands and fingers are the most important for developing handwriting skills. However, pupils who struggle with speed and legibility issue may need to develop fine motor skills possibly with the combination of tools and activities. Therefore, teachers of pupils with dysgraphia need to inculcate in their teaching motor trainings that will help to develop fine motor skills. For pupils to be proficient in handwriting, there is need for them to be given lots of opportunity to practice and review handwriting. Having the pupils' self-evaluate their writing (i.e circle the best formed

letter that session) is also a very effective strategy. This independent practice is very vital for handwriting instruction because it gives the individual opportunity to evaluate self, rearrange and reformed letters or words that the learner might not have opportunity to attend to in the initial instruction.

Legible handwriting is one of the scholastic skills that children need to acquire to meet the common demands in classroom work at primary school. Thirty percent to sixty percent of the child's time is spent in fine motor activities, with writing as the predominant task (McHale & Cermak, 2019). Proficient handwriting has also been considered a prerequisite for later academic achievement (Graham, Harris & Fink, 2020). Unfortunately, handwriting difficulties are commonly observed in children at primary schools, which its effects have resulted to frustration at early education years, drop out from school, illegibility in writing and general poor academic performance. Researchers attributes these difficulties in handwriting to poor instruction, poor early intervention, family educational background, family structure and parenting style as well as environmental factors, school and instructional facilities.

However, government on through the State Universal Basic Education Board (SUBEB) Cross River State have being organizing training for primary school teachers on English language including handwriting skills but the transmission of these skills to pupils has over the years remain a difficult task for teachers more especially.

Besides the instructional approach employed by teachers, there are other factors that are useful in explaining the differences in handwriting legibility among pupils with dysgraphia in primary schools which include pupil's gender. According to Ibok, Thomas and Nkereuwem (2019), gender is the socially/culturally constructed characteristics and roles which are associated to males and females in any society. Males are assigned such attributes as boldness, aggressiveness, logical reasoning, intelligence, tactfulness, self-

confidence etc, whereas females are assigned the opposite attributes such as fearfulness, tactlessness, talkativeness and submissiveness (Okeke, 2016). Males tend to outperform the females in writing skills, girls tend to dedicate more time in word processing than boys, Boys are prone to skipping of passages, or entire section, and that they frequently choose books that are beneath their reading levels (Ibok, Thomas & Nkereuwem, 2019).

Unarguably, males and females in view of their biological structures are naturally different. Berninger and Fuller (2018) stated that males are physically stronger than their female counterparts and are therefore, likely considered to be physically or intellectually demanding and requires in hand writing legibility. According to Udo (2018), gender stereotyping of learning skills specifically writing skills by some teachers and the society, has been considered to be responsible for scaring females from the learning , making them feel they do not have the wherewithal (just like their male counterparts) to excel in learning skills. It is based on this backdrop that the researcher sought to investigate the effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools in Ogoja Education Zone, Cross River State, Nigeria.

1.2 Statement of problem

Classroom activities require ability to write, where there is difficulty in writing pupils with dysgraphia tend to stay out of class, avoid classroom participation that requires writing, inability to transmit what is heard, seen and memorize into written expression which result to their poor academic performance and frustration. Dysgraphia refers to brain dysfunction, poor find motor coordination, poor pencil grip, poor paper positioning inadequate writing instruction. This problem has affected pupils with dysgraphia academically, poor tasks complexion, frustration, depression, isolation and even school dropout which may be as a result of the teachers' instructional method or poor teaching instruction. However, the government and ministry of education has

organized workshops, seminars and retraining programmes to equip teachers in public primary schools, but the problem of poor handwriting legibility of pupils with the dysgraphia still persist, hence the researcher seek to investigate a suitable instructional remediation to help reduce the problem of poor handwriting legibility among pupils with the dysgraphia in Ogoja Education Zone.

1.3 Purpose of the study

The main purpose of the study was to investigate the "effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools in Ogoja Education Zone, Cross River State, Nigeria". Specifically, the study investigated the effects of;

1. The effect of teachers modeling strategy on handwriting legibility among pupils with dysgraphia.
2. The effect of pencil grips strategy on handwriting legibility among pupils with dysgraphia .
3. The effect of teacher modeling strategy and gender on handwriting legibility among pupils with dysgraphia.
4. The effect of pencil grip strategy and gender on handwriting legibility among pupils with dysgraphia.
5. The interaction effect of teacher modeling and pencil grip strategies and gender on handwriting legibility among pupils with dysgraphia.

1.4 Research questions

1 what is the effect of teachers modeling strategy on handwriting legibility among pupils with dysgraphia.

2 What is the effect of pencil grips strategy on handwriting legibility among pupils with dysgraphia.

3 What is the effect of teacher modeling strategy and gender on handwriting legibility among pupils with dysgraphia.

4 What is the effect of pencil grip strategy and gender on handwriting legibility among pupils with dysgraphia.

5 What is the interaction effect of teacher modeling and pencil grip strategies and gender on handwriting legibility among pupils with dysgraphia.

1.5 Statement of the hypotheses

1. There is no significant main effect of teacher modeling on handwriting legibility among primary school pupils with dysgraphia.
2. There is no significant main effect of pencil grips on handwriting legibility among primary school pupils with dysgraphia
3. There is no significant main effect of teacher modeling and gender on handwriting legibility among primary school pupils with dysgraphia
4. There is no significant effect of pencil grip strategy and gender on handwriting legibility among primary school pupils with dysgraphia .
5. There is no significant interaction effect of teacher modeling, pencil grips and gender on handwriting legibility among primary school pupils with dysgraphia.

1.6 Significance of the study

The finding of the study may be of benefit to pupils with dysgraphia, teachers, parents, curriculum planners, government and other researchers.

Pupils with dysgraphia might find this study beneficial to them through proper identification and description of dysgraphia errors, and the proper implementation of accommodation and remediation strategies that will enhance their handwriting

proficiency and the general academic performance. These pupils will get the findings of this study through the teachers during classroom instructions.

To parents, the findings of the study will assist them s to provide children with the right learning environment and facilities that will help them to acquire the learning skills that are needed for their life functioning. The parents will also ensure that they monitor what the child does in order to learn effectively at that tender stage. Parents can read this when published in learned journals.

To teachers, the findings of this study may help them with information on the hand writing needs of every child with dysgraphia, and equip them with the knowledge to understand how each child will be accommodated and remediated from their handwriting difficulties.

The findings of the study may help the primary school curriculum planners in adopting appropriate approaches to some concepts in primary schools that can motivate and capture the interest of the pupils in the school curriculum. Curriculum planners will find this study useful in such a way that area of need for pupils with handwriting difficulties will be identified and such will be used by the curriculum planners to plan appropriate curriculum for pupil with dysgraphia in all the schools.

Education ministries, school heads and administrators may benefit from the result of the study as it may help in planning and organizing seminars for teachers to sensitize them on the need of using role play teaching method to capture the students' interest and improve their performance.

The study may be useful to the government in the process of provision of needed materials that will ensure accommodation of students with dysgraphia in all schools without discrimination as well as ensuring adequate training of teachers that will handle pupils with dysgraphia in all level of education. The result of this study would be of

benefit to teachers, pupils, parents, school heads and administrators, curriculum planners and ministry of education in the following ways: The clear understanding of the strategy that can capture pupils' interest especially in classroom teaching on the need to readjust his teaching techniques by introducing certain things that can motivate pupils to learn. This could also make teachers develop strategies that could make pupils have better results. This benefit could come to teachers through seminars, in service training and sandwich programmes, based on the fact that the researcher intends to submit the findings to the state ministry of education in Cross River State. Also, the findings of the study may help them appreciate the effectiveness of utilizing role play methods as an instructional strategy that can ease their job as well as help the learners to maximize their performance. It also provides the basis for improving primary teachers' programmes in the area of the use of role play teaching method.

Finally, the study may encourage other researchers to conduct further studies on the same topic which would enrich both local and international literature. The study may contribute to the body of knowledge in the area, as well as serve as a reference for those who would want to carry out further study in the area in future. This could be done through publication of the result of the findings in journals and workshops.

1.7 Assumption of the study

The study was based on the following assumptions:

1. The variables of the study can be measured.
2. The attributes measured in the population are normally distributed

1.8 Scope of the study

This study was restricted to all the pupils with dysgraphia in primary schools in Ogoja education Zone of Cross River State. The variables examined include teacher

modeling, pencil grip as remediating strategies for handwriting legibility. The moderator variable used is gender. The study is limited to only primary four pupils with dysgraphia in primary schools.

1.9 Limitation of the study

One of the major challenges faced by the researcher during the course of the study was the frequent disruption of classes due to unplanned school activities such as compound work and games since they was no official time in the school timetable for the research work. Also some pupils inability to write effectively which was reflected in their poor attitude in learning handwriting when using instructional remediation. Also some of the instructional remediation was not yet practicable in any of the schools in the study area and most of the teachers were not aware, neither acquainted on the strategy in teaching in special school. These challenges restricted the researcher to involve the teacher in the study immediately.

1.10 Definition of terms

Instructional remediation: These are interventions, strategies or set of programmed instructions design to correct handwriting disorder.

Handwriting legibility: The extent to which a written sample or product is readable by all users.

Dysgraphia: Is defined as a special need condition that manifested in partial inability to remember how to make certain alphabets or arithmetic symbols in handwriting.

Teacher modeling techniques: This is a technique where the teacher translate learning skills to students through demonstrations.

Pencil grip: The way and manner at which Pupils hold any writing instrument during the process of writing.

CHAPTER TWO

LITERATURE REVIEW

This chapter will review related literatures of the sub-variables based on the following sub-headings:

2.1 Conceptual review

2.1.1 Concept of dysgraphia

Dysgraphia is a disorder of writing ability at any stage, including problems with letter formation/legibility, letter spacing, spelling, fine motor coordination, rate of writing, grammar, and composition. Acquired dysgraphia occurs when existing brain

pathways are disrupted by an event (e.g., brain injury, neurologic disease, or degenerative conditions), resulting in the loss of previously acquired skills (Feder, Majnemer & Synnes, 2020). “Dysgraphia may occur in isolation but is also commonly associated with dyslexia as well as other disorders of learning’’. Depending on the definitions utilized, anywhere from 30% to 47% of children with writing problems also have reading problems. In addition, difficulty in writing can be seen in many other neurodevelopmental disorders, including attention-deficit/hyperactivity disorder, cerebral palsy, and autism spectrum disorder. Research demonstrates that 90–98% of children with these disorders struggle with writing (American Psychiatric Association, 2020).

Dysgraphia may occur in isolation but is also commonly associated with dyslexia as well as other disorders of learning. Depending on the definitions utilized, anywhere from 30% to 47% of children with writing problems also have reading problems. In addition, difficulty in writing can be seen in many other neurodevelopmental disorders, including attention-deficit/hyperactivity disorder, cerebral palsy, and autism spectrum disorder. Research demonstrates that 90–98% of children with these disorders struggle with writing. Developmental coordination disorder (DCD), in which individuals have deficiencies in motor development and motor skill acquisition, often also affects writing development; around half of those with DCD also exhibit impaired writing abilities. With regards to the association between learning disorders and mental health disorders, co-morbidity is the rule, not the exception. Given this high risk of co-morbidity, clinicians should be shriveling patients for possible related conditions; e.g., the patient with autism spectrum disorder should be monitored for problems with reading, writing, and math while the patient with dysgraphia may warrant an investigation of co-morbid attention-deficit/hyperactivity disorder (Zhang, Bennett, Deane & Rijn, 2019). At its broadest definition, dysgraphia is a disorder of writing ability at any stage, including problems

with letter formation/legibility, letter spacing, spelling, fine motor coordination, rate of writing, grammar, and composition. Acquired dysgraphia occurs when existing brain pathways are disrupted by an event (e.g., brain injury, neurologic disease, or degenerative conditions), resulting in the loss of previously acquired skills. In contrast, this review will concentrate on developmental dysgraphia, i.e., the difficulty in acquiring writing skills despite sufficient learning opportunity and cognitive potential. This article will use the terms dysgraphia and specific learning disorder with impairment of written expression in their broadest terms, to encompass any difficulty an individual may have in written communication (Olinghouse, 2018).

Dysgraphia is a problem with the writing process. For these students, there is an underlying reason that their papers are messy or that their speed is excessively fast or extremely slow. It is unfair to label them as poorly motivated, careless, lazy, or impulsive. While these interpretations may be true on the surface, they are not the *root* of what is happening. The root for dysgraphia is actually found within the processing system involved with sequencing, especially the motor movements which should be sequential and very automatic.

Pupil with dysgraphia need to develop both comprehension and remediation strategies. Comprehension are techniques to bypass the problem and reduce the negative impact on learning. This is accomplished by avoiding the difficulty, changing the assignment expectations, or using strategies to aid a particular aspect of the task. Compensations can also be termed bypass strategies or accommodations, the latter term used more frequently in legal situations. Remediation provides additional structured practice or re-teaching of the skill or concept using specialized techniques to match the student's processing style and need.

2.1.2 Concept of handwriting legibility

Writing is a skill that is central to learning and activities of daily living; it begins to develop in early childhood but continues through the school age. Though common in children, dysgraphia and disorders of written expression are often overlooked by the school and family as a character flaw rather than a genuine disorder. A variety of cognitive mechanisms have been proposed regarding the mechanism of dysgraphia and continued research is needed in the field to clarify the definition and etiology of the disorder. Regardless of the presenting symptoms, early diagnosis and intervention has been linked to improved results. Because of typical delay in the diagnosis of dysgraphia, the primary care provider can play an important role in recognizing the condition and initiating the proper work-up and intervention. Screening for co-morbid medical, neurodevelopment, psychiatric and learning disorders is also an important function of the provider. Education and support for the family, coordination of care with the educational system, additional referrals to subspecialists, and follow-up screening for co-morbidities are important tasks for the primary care provider to adopt.

Handwriting is often judged and seen as a reflection of an individual's intelligence or capabilities. Studies show lower marks are assigned to students with poor handwriting and higher marks to those with legible handwriting despite similar content. Children with handwriting problems typically have difficulty keeping up with the volume of written work required during the elementary school years, which may impede academic progress and lead to lowered self-esteem and behavioral problems. In addition, it is common for these children to be wrongly labeled as noncompliant, lazy, or lacking motivation, which causes further frustration and disappointment (Feder & Majnemer, 2017).

Handwriting is a complex perceptual–motor skill encompassing a blend of visual–motor coordination abilities, motor planning, cognitive, and perceptual skills, as well as tactile and kinesthetic sensitivities (Macland, 2020). It is important to identify

handwriting performance components as a means of targeting effective intervention strategies (Amundson & Weil, 2016). The motor and perceptual components related to handwriting performance may include fine motor control (in-hand manipulation, bilateral integration, and motor planning), visual–motor integration, visual perception, kinesthesia, sensory modalities, and sustained attention (Amundson, 2020).Lack of fine motor control is implicated in common writing errors in studies of children in grade one (ages 6–7y) and include incorrect size/placement of letters and relationship of parts (Simmer, 2020). Exner (2019) refers to isolation, grading, and timing of movements as the three aspects of fine motor control that affect handwriting ability. Inadequate pencil grasp may result in children who have difficulty isolating and grading finger/ hand movements. These children often use compensatory strategies (i.e. locking fingers into extension, fisting into flexion to stabilize their pencils). Laboured, slow, jerky writing or rapid, haphazard writing is usually a sign of difficulty with timing of movements affecting the rhythm and flow of handwriting (Exner, 2019). Hamstra-Bletz and Blote (2020) concluded that problems of dysgraphic writers relate to a lack of fine motor control in the execution of motor programmes. Children with developmental coordination disorder (DCD), characterized by motor coordination substantially below that expected for their age, which is unattributed to a medical condition, represent one subgroup likely to exhibit handwriting difficulty (American Psychiatric Association, 2020). Exner (2019) is frequently seen in children with DCD, it has also been documented in children without this diagnosis. In-hand manipulation is included in fine motor control and is the process of adjusting objects within the hand after grasp.30 After grasping a pencil, it must be shifted, which is defined as the linear movement of the tool by the fingers, in order to adjust it for writing. Translation, a type of in-hand manipulation task, is the ability to move an object from the fingers to palm or palm to finger pads, Exner, (2019) as in

pushing the fingers toward or away from the pencil's point during handwriting.33 Rotation, another in-hand manipulation task, involves movement of the pencil around an axis and is essential for turning the pencil from grasp position to placement for writing or erasing (Exner, 2019).

Precursor skills for handwriting according to Newland (2017) include; Good fine motor skills, Good visual-motor skills, Proper pencil grasp, Ability to trace lines/shapes accurately, ability to draw prewriting shapes and lines, Good pencil control-straight lines clear, defined strokes, Multi-directional coloring-good coloring movement shows ability to make different writing strokes for letters, Self-care independence maturity, good fine motor.

The two most important elements in handwriting performance are legibility and speed. Difficulties with letter formation, spacing, size, slant, and/or alignment may affect handwriting legibility (Mather & Robert, 2015; Bonny, 2022).However, Amundson and Weil (2016) maintain that below-standard performance in letter formation, and size in particular, can greatly reduce handwriting readability (Amundson & Weil, 2016).A handwriting sample may be readable even though poor alignment interferes with its appearance. Speed is also an important aspect of handwriting ability if a child is to cope with classroom demands, and speed is variable depending on context, instruction given, and whether the child is copying, taking dictation, or free writing (Bonny, 2022).It is, therefore, important to consider these factors when comparing children's handwriting speeds. Most studies of handwriting remediation provide evidence to support its effectiveness despite varying duration, frequency, and treatment approaches applied. However, it is important that careful evaluation of a child's handwriting performance be carried out before remediation using both formal and informal methods (i.e. classroom observation, teacher consultation) (Benbow, Henft & Marsh, 2020; Amundson and Weil,

2016).The instrument chosen should best match the child's area of handwriting difficulty so as to facilitate the implementation of an effective treatment strategy (Amundson, 2020). A quantitative scoring system is critical in identifying the problem areas to be targeted during remediation, in monitoring a child's progress after intervention, and in communicating the results more clearly (Campbell, 2019).

In a Cross-Canada survey of occupational therapists, formal handwriting assessments were rarely used, possibly reflecting a lack of availability at the time of a valid and reliable handwriting evaluation tool (Feder, Majnemer & Synnes, 2020). More recently, several standardized instruments evaluating different areas of handwriting performance have become available (Feder & Majnemer, 2013). In selecting an evaluation tool, it is important that the clinician is aware of the psychometric properties of the instrument, keeping in mind its strengths and limitations (Chu, 2017).The handwriting treatment approaches documented in the literature include perceptual–motor, visual–motor, motor control, individualized interventions/exercises, and supplementary handwriting instruction. However, there are few controlled studies that have examined specific treatment approaches to handwriting intervention using a large sample size. A survey of Amundson pediatric occupational therapists found 90% favoured an eclectic approach in treating handwriting problems, irrespective of experience or work setting (Feder, Majnemer & Synnes, 2020).An eclectic approach is also advocated in the handwriting literature; Cermak (2020) with greater effectiveness expected when a combination of techniques are used to improve handwriting performance (Amundson, 2020).Some studies have reported that supplementary instruction enhanced both handwriting performance and story writing ability, whereas others reported improvement in component skills (i.e. visual–motor control, in-hand manipulation) after treatment (Graham, Harris & Fink, 2020). Studies that re-evaluated handwriting proficiency 3, 6,

and 9 months' post-treatment found children demonstrated improved compositional fluency and wrote more accurately than controls (Smits-Engelsman, Neimeijer & Van Galen, 2020).The kinesthetic training approach in treating handwriting difficulties was shown to be effective by Harris and Livesey (2020) but disputed by a later study (Sudsawad, Trombly, Henderson, & Tickle-Degnen, 2020). Several studies have investigated the effect of supplementary handwriting instruction using varying types of handwriting practice based on an educational and motor learning model (Graham, Harris & Fink, 2020; Roberts & Samuel, 2020).Most studies of handwriting intervention report an improvement in the legibility of children's handwriting, but no significant changes in speed. The 'readability' of a handwriting sample is considered more important than speed, with a trade-off between speed and legibility noted.

The automatic production of alphabet letters is important in the early stages of learning to write and the child's inability to acquire this automaticity will adversely affect their speed. The achievement of automaticity in alphabet-writing is a lower-order skill that may be affected by three neuropsychological variables: the child's letter retrieval ability from visual memory (Preminger, Weiss & Weintraub, 2020); their visual–motor integration skills; and soft signs seen in imitative finger movements, finger differentiation, or opposition (Preminger, Weiss & Weintraub, 2020). In older children who have mastered lower-order writing, cognitive or linguistic difficulties should be explored as these are important in higher-order writing skills needed in planning revising. Indeed, remediation may need to focus on both lower-order and higher-order skills in some cases. The use of bypass strategies (i.e. keyboarding, decreasing volume of written work required, photocopied worksheets to reduce copying, oral test taking) may be recommended when children cannot keep up with the volume of classroom work (Cermak, 2020). Keyboarding requires specific prerequisite skills (Preminger, Weiss &

Weintraub, 2020) and evaluation/training must be provided before choosing this as a feasible bypass strategy. Individualized evaluation is necessary, taking into account age and cognitive level, to determine whether alternative methods of test taking would be beneficial for the child, such as oral testing or keyboarding. The idea of providing supplementary handwriting instruction as the first line of defense in remediating handwriting difficulties, as suggested by several authors, appears to have merit. However, there will likely be a subset of children in whom handwriting difficulties will persist. More evidence based studies examining which treatment approaches are effective on particular populations would be beneficial. Handwriting difficulties do not disappear without intervention (Preminger, Weiss & Weintraub, 2020; Hamstra-Bletz & Blote, 2017).It is clear that further research is warranted, examining specific and eclectic approaches to treatment.

. Learning skills is viewed as a function of observation, rather than direct experience. Research has showed that modeling is an effective instructional strategy in that it allows students to observe the teacher's thought processes. Using this type of instruction, teachers engage students in imitation of particular behaviors that encourage learning. Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them on what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others, one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action (Bandura, 1986).

2.1.3 Concept of instructional remediation

Instructional remediation is used in an intervention program to targets basic skills such as phonics, reading, writing and number sense with the goal of raising the student's ability to the standard expected of their age (to 'remediate' the problem before it becomes

worse).It is implemented when a teacher identifies that a student requires temporary, additional and specialist support for one or more core skills that cannot be provided by the teacher alone (Zhang, Bennett, Deane & Rijn, 2019) According to Berninger, Fuller and Whitaker (2018), instructional remediation is the central strategy used in the highest level of Response to Intervention programs. Core skills refer to foundation skills such as reading, writing and arithmetic. More specifically, remedial instruction often targets phonetic awareness (identifying, processing, pronouncing, combining and using sounds and words). Other skills such as number sense (identifying and using numbers), handwriting and word recognition may also be targeted. As remedial instruction is used to address core skills, it is most often used with younger students. The basic premise of remedial instruction is to help students to 'catch-up' to their peers and thus prevent ongoing academic issues .The basic premise of remedial instruction is to help students to 'catch-up' to their peers and thus prevent ongoing academic issues. When students fall behind, a gap opens between their abilities and that of their peers. Over time, this gap gathers pace and widens to the point where learning in other areas is affected. Gaps in core skills affect all aspects of a student's education as well as their self-confidence, motivation and interest in learning. Remedial instruction aims to arrest this spiral with targeted, small group or individual lessons delivered by specialist teachers. A typical remedial program involves the student attending daily sessions of 30-40 minutes with the specialist teacher. These sessions are held during class time, so it is not perceived as any type of punishment. Instructional remediation is not intended to be a ''cure'' for issues caused by a person's disability or disorder. However, people with a disability or disorder can still attend a remedial program for the same reasons as their non-disabled peers (Berninger, Fuller & Whitaker, 2018).

Instructional remediation fail to produce an outcome that is any better than if the student stayed in class. One reason for this might be that remedial classes sometimes repeat activities that have already failed the student in the past. Another common reason is a vague or incorrect diagnosis. When this happens, learning activities cannot target the specific issue. A common example of this is the false belief that a student has a problem with reading. In actual fact, the problem could be a mild and undiagnosed processing disorder, an eyesight issue, trouble with several sounds, or a lack of practice with whole-word recognition. No matter how many reading sessions the student attends, if the learning activities are not correctly targeted, the underlying issue will not be resolved. No matter how many reading sessions the student attends, if the learning activities are not correctly targeted, the underlying issue will not be resolved (Zhang, Bennett, Deane & Rijn, 2019).

Second, remedial instruction is not a substitute for poor or lazy teaching. Inexperienced teachers may need to seek further advice, training and support if a student has not progressed throughout the year but seemed to have no issues the year before. Third, remedial instruction can lead to negative labels and potential bullying: for example, ‘you’re in the dumb classes. Finally, remedial classes are expensive, time consuming, and they may require specialist staff who have specialist training (particularly for diagnosis and planning). The student also needs to be sufficiently motivated to engage in the process. Having buy-in from parents is also beneficial as research has shown that parental support has a positive effect on student achievement.

There is no consensus on the best way to organize and structure a remedial program. Often students follow a program similar to their original class but with a specialist teacher one-on-one or in small groups. Some strategies (such as direct instruction and direct explicit instruction which follow tight structures and scripts) save

the teacher time on planning and developing resources, as well as providing easy lessons for parents to implement. The terms remedial program and special education are two different terms and things. Special education is intended to address the ongoing needs of students with disabilities in order to assist them in making academic progress.

Remedial services are intended to bridge the difference between what a student already knows and what he should know. They also focus on reading and math skills. In certain cases, students are taken out of their normal classroom and taught in a different environment.

Many students need the additional assistance that remedial programs may provide. The reading proficiency gap, for example, is causing a lot of concern. All children need instruction, but some children need substantial amounts of truly high quality teaching to learn to read and write alongside their peers. What all children need, and some need more of, is models, explanations, and demonstrations of how reading is accomplished. What most do not need are more assignments without teacher-directed instruction, yet much of the work children do in school is not accompanied by any sort of instructional interaction or demonstration. Children are routinely asked questions after reading but are infrequently provided with demonstrations of the comprehension strategies needed to answer the questions posed. In short, too often assigning and asking are confused with teaching. When the teacher-directed instructional component is left out of the lesson, it enormously reduces the potential of many activities (e.g., maps, webs, summary writing, and response journals) for supporting the acquisition of complex comprehension strategies (Fielding & Pearson, 2018; Pressley, 2018).

With no clear instruction, children are left to discover the strategies and processes so important to skillful readers and writers. Some children puzzle through the activities assigned but never discover the thinking patterns that proficient readers use. Modeling,

explaining, and demonstrating are essential teaching activities if all children are to learn to read and write. Teachers model the reading and writing processes by engaging in them while children observe. Reading aloud to children, for instance, provides a model of how reading sounds and how stories go. Composing a list of things needed for a project provides a model of one function of writing. Talking about how a newspaper story made us worry provides a model of response to text. Models are essential, but models do not give children much in the way of information about how proficient readers actually accomplish such feats. Reading aloud to children is one way to model fluent reading and thoughtful talk about books, stories, and responses. While read-aloud have become increasingly popular, research indicates that nearly one-third of classroom teachers rarely read children's books aloud to their students (Hoffman, Roser, & Battle, 2020).

The teacher provides a model of the writing process and, ultimately, a model of a written summary. The teacher might work from a map or a web following an explanation of the essential summary elements. A demonstration would occur as the teacher thinks aloud during the composing, making visible the thinking that assembles the information for the summary, puts it into words, and finally creates a readable summary of the information presented. Similarly, the teacher demonstrates the complex mental processes that readers engage in while reading when she talks children through a strategy for puzzling out an unfamiliar word while reading a story. For example, ‘‘I can try a couple of things: Read to the end of the sentence; look at the word and see if I know any other words that might help me figure it out; ask myself, what makes sense here; double-check what word makes sense against word structure; read the sentence using the word that makes sense and has the right letters. Demonstrating such thinking and how thinking shifts from incident to incident (Here I can look at the picture to get a clue; I think the word will rhyme with name because it is spelled the same way; and so on) gives children

the chance to see that skillful strategy use is flexible and always requires thinking, not rote memory of rules.

The way pupils relate to one another in class can be a motivation to learning especially during class activity. When the activity is complex and requires problem solving skills, the weaker pupils get support from the able peers and this promotes cooperation amongst them. This interaction is likely to encourage the learning process and makes pupils feel that they belong to one family and it motivates them to work with each other (Strickland et al, 2020; Anita, Hughes & Walkup, 2018; Isaacs, 2012). According to researchers (O'Donnell, 2020; Anita et al, 2018), peer tutoring should be encouraged by teachers because it enhances personal interdependence, individual accountability and cooperative skills. It also enables pupils to respect each other's ideas/opinions and practice turn taking in the group. In the process of solving problems, they ask questions and seek explanations from each other, learn to organize their knowledge or answers by exchanging ideas. This interaction among peers can also cause cognitive conflict which encourages them to question their understanding critically and try out new ways of solving the problem (O'Connor and Vadasy, 2021). Some children also enjoy as they learn from their friends due to freedom of expression as they interact. In the process of this interaction, peers build social relationships among themselves and emotional well-being. This makes them learn to show empathy and get concerned with one another as they share knowledge (Anita, Heiskari, Van-luit & Vuorio, 2019).

As much as peer support is encouraged by many scholars because it promotes learning, it has some disadvantages, for example, some pupils may fail to participate because the able peers will do the task on their behalf, they may use the opportunity to socialize instead of learning, they may fail to tackle the question because they are rushing to finish ahead of others, instead of challenging misconceptions, they may support the

misunderstanding and finally, they may consider their able peers as experts than teachers whether they are wrong (Anita et al, 2019). According to the authors, objectives of instructional remediation strategies are academic expectations, classroom learning, learning capacity, and academic success for every student. The objective of the Remedial Teaching Program is to offer to learn support to students who are not doing well compared to their peers.

Using the school curriculum and teaching methods, a teacher delivers learning exercises and practical experiences to students based on their skills and needs. A teacher also creates individualized instructional programs with intense remedial assistance to assist students in consolidating their fundamental knowledge in various subjects, mastering learning processes, and their trust, and improving their learning effectiveness.

Teachers should have formal instruction to help students improve generic skills such as interpersonal relationships, communication, problem-solving, self-management, self-learning, critical thought, imagination, and information technology use. Remedial education lays the groundwork for students' lifelong learning, assisting them in the development of healthy attitudes and values, and preparing them for future studies and careers.

2.1.4 Teacher modeling and handwriting legibility among pupils with dysgraphia

Modeling is one of the most efficient modes of learning of any new skill or knowledge. According to Bandura (1986), it is difficult to imagine any society that has not relied on models in one form or another to transmit the most important and basic cultural values, customs and beliefs from one generation to the next. According to Salisu and Ransom, (2014), if all of human learning had occurred at the level of direct experience or trial-and-error efforts, human progress would have occurred at a much slower rate. From childhood through adulthood, modeling plays a key role in the

acquisition and development of cognitive and meta-cognitive skills, fine motor skills, interpersonal skills, and later professional skills. Each of these is gained primarily through the process of observation (Salisu & Ransom, 2014). Motor skill acquisition and development occur as children observe parents, siblings, and peers interact with their worlds. From the simplest act of learning how to pick up and use a fork to the complex and multifaceted process of driving a car, all of these skills are acquired through the observation of models. Which skills are learned and repeated by the observer will ultimately depend upon the types of reinforcement received, as well as how capable or motivated the observer is to repeat those behaviors.

Complex cognitive skills, such as critical thinking or problem solving, are facilitated when models verbalize their own thought processes as they engage in these activities. Thoughts are thus made observable, and potentially modeled, through overt verbal representation of the model's actions. Modeling both thoughts and actions has several helpful features that contribute to its effectiveness in producing lasting improvements in cognitive skills. Nonverbal modeling gains and holds attention, which is often difficult to sustain by talk alone. It also provides an informative semantic context within which to imbed verbalized rules. Behavioral referents confer meaning on cognitive abstractions. Moreover, verbalized rules and strategies can be reiterated in variant forms as often as needed to impart a cognitive skill without taxing observers' interest by using different exemplars. In addition, the more and varied application can deepen understanding of generative rules. According to the social cognitive model of learning, the acquisition of meta-cognitive and self-regulatory skills and competence first develops through social interaction, otherwise known as observational learning (Schunk & Zimmerman, 2016). Schunk and Zimmerman suggest that in developing what they call self-regulatory competence, students need to be given opportunities to practice the

various strategies associated with self-regulated learning in order to fully develop and master this set of skills. Mastering these skills is made easier when models provide ‘‘guidance, feedback, and social reinforcement during practice.’’

Children only infrequently encounter such demonstrations in most classrooms. Children who find learning to read difficult often see the teacher and other children reading and writing, serving as models, but they wonder, ‘‘How do they do it?’’ All children benefit from instruction, but some children need incredible amounts of careful, personal instruction, with clear and repeated demonstrations of how readers and writers go about reading and writing (Duffy, 2020; Harvey & Goudvis, 2020). Left without adequate demonstrations, struggling readers are likely to continue trying to make sense out of lessons, but rarely will they accomplish this feat. Some of these children learn to score better on tests but never really learn to read and write.

The use of models as learning aides has two primary benefits. First, models provide accurate and useful representations of knowledge that is needed when solving problems in some particular domain. Second, a model makes the process of understanding a domain of knowledge easier because it is a visual expression of the topic. Gage and Berliner found that students who study models before a lecture may recall as much as 57% more on questions concerning conceptual information than students who receive instruction without the advantage of seeing and discussing models. Alesandrini (2021) came to similar conclusions when he studied different pictorial-verbal strategies for learning (Salisu & Ransom, 2014). Another of the modeling process’s dynamic aspects rests on the relationship established among the class participants, understood as a form of social practical (Resnick, Salmon, Zeitz, Wathen & Holowchak, 2020). Of the many aspects involved in this kind of practical, diversity of participant viewpoints is a fundamental condition in order for the modeling process to be produced, to an extent that,

if these differences did not exist, it would be a required condition to provoke them (Duschl, 2020). In the experience analyzed in this article, the diversity of viewpoints was provoked by encouraging each group of students to manipulate a different material and to communicate the way these manipulations were understood by way of an interrelated set of linguistic and nonlinguistic representations drawings, physical models, and gestures. These external representations were compared and discussed, therefore used as instruments (Hymes, 2022) with which to reduce the diversity of viewpoints and to construct explanations that have common ideas in tune with the scientific consensus model.

In this sense, the function of the teacher was crucial, since his or her interventions had a fundamental influence in two aspects: they assisted in ‘‘seeing’’ the aspects in common, which were in line with the ideas selected from the scientific consensus model, and helped the students to proceed with the adjusting of their model to the results of the manipulations they were performing. Because of their relevance in the modeling process, the highlights of the interactions among members of the classroom that are encouraged are listed as follows: the communication of a variety of viewpoints expressed during a particular manipulation, and the group identification of common aspects among these viewpoints; the collective search for use of the ideas agreed by consensus in a first stage in order to deal with the interpretations of the new manipulations performed; the metacognitive moments of reflection on what is being learned, on what has changed each pupil’s way of thinking, etc.; the use of different linguistic and nonlinguistic expressions to encourage richness of perspectives and to encourage each child to discover the expressive form which best helps him or her share their viewpoints; and the intervention of the teacher, by selecting, from among all the ideas expressed, those that are the best for constructing the model, putting them in order of importance or helping to redefine

them. Modeling is an instructional strategy in which the teacher demonstrates a new concept or approach to learning and students learn by observing. Modeling describes the process of learning or acquiring new information, skills, or behavior through observation, rather than through direct experience or trial-and-error efforts. Modeling can be used across disciplines and in all grade and ability level classrooms (Salisu & Ransom, 2014).

Modeling is an instructional strategy in which the teacher demonstrates a new concept or approach to learning and students learn by observing and making learning notes. Modeling can be used in all stages to help learn a new skill, undertake a task more effectively in terms of the success criteria, develop thinking skills, and thought processes. Task modeling occurs when the teacher demonstrates a task to students and expected the students to do on their own what is demonstrated. This type of modeling would precede activities such as science experiments, foreign language communication, physical education tasks, and solving mathematical equations. This strategy is used so that students can first observe what is expected of them, and so that they feel more comfortable in engaging in a new task or activity. Metacognitive modeling demonstrates how to think in lessons that focus on interpreting information and data, analyzing statements, and making conclusions about what has been learned. This type of modeling would be particularly useful in a math class when teachers go through multiple steps to solve a problem. Teachers would talk through their own thought process while they do the problem on a board.

This thinking-out-loud approach, in which the teacher plans and then explicitly articulates the underlying thinking process, should be the focus of teacher talk. This type of modeling can also be done in a writing lesson while the teacher asks rhetorical questions or makes comments about how to anticipate what is coming next in a story. Modeling as a scaffolding technique teachers must consider students' position in the

learning process. Teachers first model the task for students, and then students begin the task and work through the task at their own pace. In order to provide a supportive learning environment for students who have additional needs or English as an additional language, teachers will probably need to model the task multiple times. Student-centre modeling often the most effective type of modeling in terms of student engagement, teachers asks students to model a performance, task or a thought processes. In student-centre modeling, teachers engage students who have mastered specific concepts or learning outcomes in the task of modeling for their peers. This type of modeling makes the class less teacher-centre, which, in some cases, provides a more supportive learning environment for students.

Some basic skills needed for modeling include; Modeling processes with pupils involves establishing clear aims, providing an example, exploring thinking yours and the pupils, demonstrating the process, working together through the example, providing prompts (or scaffolds) as appropriate, providing an opportunity for pupils to work themselves (alone or in pairs) and drawing out the key learning.

2.1.5 Pencil grip and handwriting legibility among pupils with dysgraphia

Handwriting is an essential part of the school experience as the majority of classroom assignments require handwriting. In addition, ‘‘handwriting involves cognitive, kinesthetic and perceptual-motor components’’ (Hanover Report, 2012) and thus, ‘‘handwriting instruction benefits students’ cognitive development as well as their motor functioning’’ (Zubrzycki, 2012). Furthermore, handwriting is the foundational skill necessary for literacy success, as writing helps students to become fluent in recognizing letter formations (Berninger, 2012). Moreover, it has been shown that the act of writing newly learned words results in a significant strengthening of word recognition (Adams, 2020). The nice thing is good hand writing is the practical use of learned skills

to improve handwriting (Graham & Santangelo, 2012). It has been found that school work written with good writing receives higher scores than work with poor handwriting (Chase, 2016). But more importantly, writing instruction improves ‘‘not just the legibility of writing, but its quantity and quality’’ (Graham & Santangelo, 2012). However, it is estimated that 25%-33% of elementary students don’t gain the necessary handwriting skills needed to write legibly and fluently putting them at a disadvantage (Summit, 2012). Therefore, it is important that teachers plan numerous writing tasks, as that is the ‘‘most effective method for facilitating handwriting fluency’’ (Graham & Santangelo, 2012).

There are a variety of reasons why some people have handwriting problems. One of these reasons is the internal factor found within the child, which consists of such ideas as fine motor skill development and attitude toward writing (Marr, Windsor, & Cermak, 2020). The second reason concerns external factors which consist of such ideas as pencil size, time to write and teacher instructional approach toward writing (Marr, Windsor, & Cermak, 2020). Lack of motor skills is one reason for poor handwriting. This is important to note, as ‘‘research has shown that fine motor skills are the strongest predictor of special education referrals and the second strongest predictor of kindergarten retention’’ (Cameron, Brock, Murrah, Bell, Worzalla, Grissmer, & Morrison, 2012).Another reason for handwriting problems is the pencil size. However, recommendations regarding the best pencil size are conflicting (Marr, Windsor, & Cermak, 2020). Some research has shown pencil size does not make a difference (Ochler et al, 2020) while other research shows large diameter pencils should be used as they encourage correct finger positioning and may prevent hand cramps (Carlson & Cunningham, 2020).

To ascertain the appropriate pencil size that will best improve pencil grip, Sinclair and Szabo (2018) make used of four different pencils during the intervention. The first pencil was a short skinny pencil, 3 ½ inches in length and ¾ centimeters in diameter. An

example of this is a golf pencil. The second pencil was a short oversized pencil. It was 4 inches long by 1 centimeter in diameter. This was created by buying a jumbo pencil and sharpening it down to 4 inches. The third pencil was a long skinny pencil, 7 ¼ inches long with a ¾ centimeter diameter. This is a standard pencil. The fourth pencil was a long oversized pencil, 7 ½ inches long and 1 centimeter in diameter. This is a regular jumbo pencil. The result of the investigation shows that third category of the pencil (i.e. the standard pencil) help normal pencil grip as the improved proper fingers positioning.

One particular pencil grip is frequently seen and typically recommended. It has come to be known as the 'dynamic tripod'. The term refers to the use of the thumb, index and middle fingers so that they function together and perform well co-ordinated movements (Ziviani & Watson-Will, 2018). Rosenbloom and Horton (2020) have described the dynamic tripod as the posture in which shoulder, elbow, and wrist stabilization allow the interphalangeal joints to perform very fine and intricate movements. Further, the flexed ring and little fingers provide stability by resting on the surface, forming an arch (Wynn-Parry, 2016). The tripod opposition of thumb and two fingers is precise and at the distal end of the pencil (Erhardt, 2020). The dynamic tripod grip is considered by many teachers and therapists to be ideal (Schneck & Henderson, 2020). However, the basis for recommending the dynamic tripod pencil grip and for excluding other grips is subjective and lacks scientific underpinning. For example, little is known about the possible detrimental effects on writing caused by deviation from this recommended grip.

Poor pencil grasp has commonly been the target of intervention by both teachers and occupational therapists, who attempt to alter the child's pencil grasp from anything different from the traditional dynamic tripod grasp (Feder & Majnemer, 2017; Graham, 2019). Schneck and Henderson (2020) found that poor writers had less mature pencil

grasps, although later research failed to replicate these results (Tseng & Cermak, 2013). A dynamic or mature pencil grasp, specifically the dynamic tripod grasp, has been suggested as the best grasp for writing because it allows for efficient distal movements of the pen or pencil (Elliott & Connolly, 1984) and purportedly minimises muscle tension that can lead to fatigue (Tseng & Cermak, 2013). In contrast, a static or immature pencil grasp is one in which the pencil is held by the fingers, but the movement of the pencil is controlled by the extrinsic muscles of the hand and arm, while the fingers remain static (Elliott & Connolly, 2020). There are at least four pencil grasp patterns that are mature and therefore functional for handwriting: the traditional dynamic tripod grasp and three other grasps, including the lateral tripod grasp; the dynamic quadrupod grasp and the lateral quadrupod grasp (Tseng & Cermak, 2013; Ziviani, 1983). These grasps are described in detail below. Although the name of the lateral grasps does not imply dynamic movement, in these mature grasps, the fingers are dynamic and supply movement while the thumb is static (Elliott & Connolly, 2020). 1. Dynamic tripod (DT): This grasp is most commonly recommended (Schneck & Henderson, 2020). Fingers involved include the thumb opposed to the index and middle fingers, with all three fingers positioned in a tripod (Benbow, 2017). The ring and little finger stabilise against the writing surface. 2. Lateral (thumb) tripod (LT): Also a common grasp described in the literature (Schneck & Henderson, 2020). The thumb is adducted to the lateral border of the index finger or crosses over top of the pencil. The index and middle fingers are predominantly the source of pencil movements without the thumb because its position restricts participation. 3. Dynamic quadrupod (DQ): Identified by Benbow (2017), this grasp is similar to the dynamic tripod; however, it involves the addition of the ring finger on the barrel of the pencil. Similar distal manipulation of the pencil occurs, as with the tripod; however, surface stabilisation may be less due to the inclusion of the ring finger in the pencil grasp.

4. Lateral (thumb) quadrupod (LQ): Dennis and Swinth (2019) identified this grasp involving four fingers. The thumb is in an adducted position and the index, middle and ring fingers are in contact with the barrel of the pencil, and therefore initiate the pencil movement. Performance was similar for these grasps for short duration copy tasks, where the speed and legibility of the written output was not significantly different (Schwellnus et al., 2012). The three other grasps may require excessive effort to maintain over longer periods of writing. With the dynamic tripod grasp, the distal control of the movement allows the muscles to have consistent pressure on the pencil and therefore minimises muscle tension, which can lead to muscle fatigue (Soechting & Flanders, 2018). Although writing is a low force activity, fatigue has been reported in the muscle groups involved in grasping a pen during writing for 10 minutes (Rosenblum, Parush & Weiss, 2020). This is due to the isometric muscle effort expended to control the many joints involved in maintaining the grasp of the pencil during writing, and this effort can lead to fatigue over time (Udo, 2020).

Stability, which in the normal hand can be achieved by a precision grip or a power grip, is a pre-requisite for all refinements of hand function. In the precision grip the object, e.g. the pencil, is pinched between the flexor aspects of the finger and the opposition of the thumb (Napier 2020). In the power grip the fingers and the palm, and the thumb lying more or less in the plain of the palm, hold the pencil. Napier's method of classifying prehensile movements is based on the anatomical and functional distinction between these two discrete patterns. Landsmeer (2020) added to Napier's classification a distinction between gripping and handling objects. The power grip immobilizes the object and thus the verb gripping is accurate. However, Landsmeer considered the term precision handling to be more accurate than Napier's precision grip as the fingers and the opposed thumb hold and handle the object, the pencil. Elliott and Connolly (2020) agree

with Landsmeer, but argue that there is a strong case for anatomical and functional descriptions to be regarded as separate, so that the functional distinction between digital prehensile patterns and palmer grips is brought forth. They also offer a classification of the patterns of hand movement and object manipulation, suggesting that an object such as the pencil may be held in either a power grip or in a precision grip with equal security. The immobility of the power grip gives fewer degrees of freedom of movement, but adds to stability and power. The facility of movement gained by precision grip, or precision handling, allows for a variety of movement, convenience and economy of action rather than merely precision or delicacy. Complex hand activity involves stereo Gnostic and tactile feedback, muscle, joint, and visual input, and the co-ordination of some 40 muscles (Hyldgaard, 2020). Motor control of the hand must begin with sensory input and optimal muscle tension (Erhardt, 2020). The movements of the fingers require further refinement and must be differentiated from the movements of the wrist and arm while the body learns to keep still in order facilitating complex distal movements (Ajuriaguerra & Auzias, 2020).

The role of the thumb in both gripping and in prehensile movements is indisputable. The thumb provides stability to the grip ((Elliott & Connolly, 2020; Napier, 2016). The thumb also enhances the utilization of the tactile cells of the fingertips. Hyldgaard (2020) claims that when the opposition of the thumb against the finger(s) is absent, the hand function is impaired, and thus for example a cross thumb grip can reflect tactile impairment of the hand. On the other hand, Hyldgaard (2020) admits that a functional pencil grip does not have to look like the dynamic tripod. It is enough for it not to hinder the fine motor movements of the writing hand. Functional use of the hand is more dependent on joint stability than on joint mobility (Benbow, 2017).

An example of alternative pencil grips is the combined pencil grip named and discussed in Callewaert (2020), and referred to as the modified grip in Otto, Rarick, Armstrong and Koepke (2016), and as the adapted tripod in Benbow (2017). This alternative pencil grip is rarely adopted spontaneously (Sassoon et al., 2016). The grip is, however, a recurrently recommended non-modal grip as it decreases tension without the grip losing stability. An explanation for the existence of non-normative pencil grips, which differ from the observed developmental patterns, could be that the hand is seeking the stability, which is lacking as a result of premature writing. When the hand is not mature enough to adopt the dynamic tripod grip, it spontaneously deals with the situation by finding other functional grips. As the hand seeks stability, positions like instability in the metacarpophalangeal joint of the thumb and a collapsed web in an immature hand will cause the hand to seek spontaneous adaptations such as a thumb wrap or thumb tuck grip (Benbow, 2017). Another adaptation described in Benbow (2017) is a narrowed space between the index and the third finger, which also increases the stability of the grip. These interpretations support the conclusions that stability is a prerequisite for the functional pencil grip and that stability can be gained either by positioning the fingers in different pencil grip configurations, or by force.

The type of pencil grip consisted of four different grips. First, the tripod grip has the pencil positioned so that there is equal pressure between the thumb, the side of the middle finger, and the tip of the index finger with all fingers being bent slightly. Second, the quadruped grip has the pencil positioned by the four fingers and the thumb opposing. Third, the thumb wrap grip had the pencil held against the index finger with the thumb crossed over the pencil. Fourth, the palmer pencil grip had the pencil being held fisted in the palm with the thumb up or down (Sinclair & Szabo, 2018).The pressure on pencil grip according to Sinclair and Szabo (2018) is defined as firm, shaky firm, wispy, and

shaky wispy. Firm pressure was characterized as a straight, steady line, while the shaky firm pressure was characterized as a wavy, dark colored line. Wispy pressure was characterized as a very light colored line and shaky wispy pressure was characterized as a wavy, light colored line.

2.1.6 Gender and handwriting legibility among pupils with dysgraphia

Gender is a socio-economic variable for analyzing roles, responsibilities, constraints, and needs of men and women in a given context. Mahmood and Bokhari (2022) stated that it refers to the social and cultural constructs that each society assigns to behaviors, characteristics and values attributed to men and women. The basis of the construct lies behind the idea that they are natural or intrinsic, and therefore, unalterable. These gender constructs are shaped by ideological, historical, religious, ethnic, economic and cultural determinants. These are usually translated into social, economic and political inequalities, where men's activities and their gender attributes are perceived as essentially superior to women's. Buttressing this notion, Aman, Broege and Steinmetz (2016) opined that gender relations in Nigeria are characterized by a lot of imbalance, to the disadvantage of women, by keeping women in subordinate positions to their men counterparts. The larger society and the male subculture still see women and their aspirations as subordinate, resulting in a situation in which the marginalization, trivialization and the stereotyping of women becoming glaring aspects of Nigerian life. According to Boserup (2017), gender could be described as a system of roles and relationships between men and women that are determined not biologically but by social, political and economic context. Gender also involves the process by which individuals who are born into social categories of male and female become the social categories of men and women through the acquisition of locally defined attributes of masculinity and femininity which is beyond biological differences, all other

differences between men and women are socially constructed and have no logical relationships with their biological composition (Burgos-Bebray, 2020).

Research has shown that there are differences between how males and females use language with regard to certain feature. There are also folk linguistic believes about gender differences. For example, males are thought to use taboo language to a larger extent than females, who are supposed to use what is generally considered a more polite language. Also, females are thought to talk much more than men do, which is visible in the traditional proverb: ‘‘A woman’s tongue wags like a lamb’s tail’’ (Coates, 2019), even though there is no evidence of this. In a similar way, a broad potential of differences in gender has been identified in writing (Beard & Burrell, 2017; Berninger & Fuller, 2018; Olinghouse, 2018; Troia, Harbaugh, Shankland, Wolbers & Lawrence, 2013). These differences have been attributed to different aspects such as motivation and language proficiency. Gender differences have been associated with differences in writing performance; however, the processes by which these differences have their effects have been given relatively little discussion. It is important therefore to examine the factors which mediate the effects of such variable on the written product. For example, the relationships that have been observed between gender and text quality have not been linked directly to writing performance such as writing fluency.

Different accounts have been offered to explain gender differences in writing. Beside the transcription skills, as explained above, aspects of individual motivation have been also identified in explaining gender disparities in writing. Among these is self-efficacy individuals’ confidence in their own writing skills which has been recognized as an important predictor of writing performance (Abdel & Latif, 2019; Castro & Limpo, 2018).

Motivation has been recognized as an important factor that explains differences of individual performance in writing. Hayes (2012) argued that motivation is intimately involved in a number of aspects of the writing process, including individuals' willingness to write, how long they can engage in writing and editing, and how much they are concerned about the quality of their writing. Furthermore, most of the gender difference research in writing has been exclusively limited to L1 writing with school students, mostly in America and the UK. Gender difference has been rarely studied in English as a foreign language (EFL) writing context with adult writers. The case might be different in EFL adult learners since their linguistic skills in English are less good. One potential difference between genders is language abilities as girls have been found to be linguistically better than boys (Huttenlocher, Haight, Bryk, Seltzer & Lyons 2017; Hyde & Linn, 2019; Özçalişkan & Goldin-Meadow, 2019). However, research on writing typically has not explicitly dealt with this (language ability and gender differences) as a major issue. Little discussion has been given to how gender differences in cognitive writing might be mediated by linguistic factor.

Furthermore, using computer-based tracking methods to observe gender differences in writing processes should be considered, given that most of the previous studies used paper-based tasks and methods. Employing computer-based tools to track writing processes, such as keystrokes, might probe the debate about gender difference further (Zhang et al., 2019). This might contribute to our understanding of what underlies gender differences in writing in general and, in turn, advance theory with respect to gender differences in writing processes. According to Trudgill (2019), it is difficult to explain why these kinds of gender differences exist. He comes to the conclusion that it is ‘‘closely related to social attitudes’’ (Trudgill, 2019).

As far as learning skills is concerned, there is the belief that boys perform better than girls. It was positioned that boys are superior to girls in school achievement (Ochor, 2017). The researcher attributes such behaviour to difference in traditional sex role expectations in Nigerian society, which does not give females the opportunity to exercise mental capacities in certain areas of learning. This position may depend on circumstances and the samples involved, besides other psychological disposition. Gender refers to the roles of men and women that are socially or culturally base. Sex on the other hand, refers to the biological differences of men and women .Therefore, most people agree that learning differences are gender based and are related to the individuals socialization and culturalization rather than based on biological differences (Feldstein & Jiggins, 2014). Also Okeke (2016) explained that gender is socially or culturally constructed characteristic, qualities behaviours and roles which different societies ascribe to females and males. Unlike sex which is biological, gender expectations, roles and characteristics of member of a society are made evident in the approved process of socialization dictated by the society. Studies have shown that gender as a variable relates to performance (Ezeugo & Agwagah, 2019).

The child is an essential element of the society; in a child are great abilities and potentials that can help in the development of the society. The child has the potentials to enhance the continuity of the society by acquiring the skills, values, norms, tradition that are cherished by the society. The child thus must be taught how to internalize values, skills and techniques that can aid him or her sustain the norms of the society. That is, the child must be helped to acquire learning skills that are necessary for his/her survival in the modern society. Learning skills are skills that help the child to assimilate what is taught and read from textual and non-textual materials. They are a combination of different skills that helps a learner to acquire knowledge, values and techniques that can

aid him or her in effective and efficient functionality in the society. The relevance of learning skills cannot be overemphasized in that it helps a child to follow what is done in the class, relate well with others, and understand other happenings around him or her other than the classroom instructional interaction.

According to Hanba (2016), learning skills is a term that describes the task involved in learning that includes time management, note taking, reading effectively, study skills and writing skills. Hence, the basic objective of primary education as reflected in the Nigerian Policy on Education is ‘‘inculcation of permanent literacy and ability to communicate effectively’’ (Federal Republic of Nigeria, 2014, p. 12). Learning skills is not just an important tool for learning but it is the basis for all aspects of learning. There are different learning skills that every child is supposed to acquire such as communication skills, reading skills, studying skills scientific skills, literacy skills and numeracy skill among others. Additional research is needed to explore the appropriate balance of play, academic enrichment, and organized activities for children with different temperaments and social, emotional, intellectual, and environmental needs.

Men and women have traditionally acquired different social roles, which creates a certain way of talking and behaving. There is proof, however, that these roles are in a state of change, maybe due to a more equal society (Trudgill, 2019). Interaction for female has been found to be based on solidarity and support, where girls acknowledge and build on other’s utterances. Girls are perceived as more expressive and concerned with others. Girls are more cooperative in their conversations, work harder to establish equality between people, and are often tentative, using more hedges and qualifiers than boys.’’ (Yale, 2019) The quote above suggests that girls make use of a more cooperative language, with certain types of questions and hedges. Many studies have also shown that girls use a type of language and grammar which is closer to that of the standard variety

than boys do. These forms are culturally considered more prestigious, formal and hypercorrect (Coates, 2018). However, it has also been shown that women often overestimate their use of correct grammar, while men underestimate their use of it, as it is prestigious in itself to use, or not use these varieties depending on gender.

2.2 Theoretical framework

This study was guided by the following theories:

2.2.1 Constructivist Learning Theory by Jerome Bruner (1966)

2.2.2 Connection theory by Edward Thorndike (1922)

2.2.3 Motor learning theory by Richard Allen Schmidt (1975)

2.2.4 Model of self-regulated learning by Pintrich (2000)

2.2.1 Constructivist Learning Theory by Jerome Bruner (1966)

Constructivist learning theory was propounded sin 1996 by Jerome Brunner. The constructivist learning theory argues that people produce knowledge and form meaning based upon their experiences. This theory also argues that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. Constructivism proposes that learners' conception of knowledge is derived from a meaning-making search in which learners engage in a process of constructing individual interpretations of their experiences.

The constructions that result from the examination, questioning and analysis of tasks and experiences yields knowledge whose correspondence to external reality may have little verisimilitude. For the learner to construct meaning, he must actively strive to make sense of new experiences and in so doing must relate it to what is already known or believed about a topic. Students develop knowledge through an active construction process, not through the passive reception of information. In other words, learners must build their own understanding.

Constructivists claim that learning is not passing knowledge from teachers to students but students' constructing their knowledge. Learners are not passive information receivers but those who actively construct meaning from information. Therefore, the meaning of an article lies in learners' construction based on the existing information, knowledge, emotion, experience and culture rather than article itself. In fact, reading is a communication between readers and writers but not face to face. This theory emphasized that students do not come into the classroom with empty head. They have formed rich experiences in daily life and the previous study or concluded the explanation of the problem through sensible reasoning. The theory believes that pupils need as many choices as possible to work with and choose those elements of information that they can digest in each moment and that teachers should be facilitators who help students construct their own understandings by carrying out challenging tasks.

The relevance of this theory to the present study is that it will enable the pupils write and construct meaning by themselves and not wait for the teacher’s input. By so doing, they become actively involved in what they writing. This theory will enable the pupils choose from what they have; the type of technique or text they are most comfortable with which will aid in their understanding. The Stages of individual can make learning become more active, effortful and interactive which results from the combination of what the already knows and what he is writing..

2.2.2 Motor learning theory by Richard Allen Schmidt (1975)

Motor learning theory emphasizes that skills are acquired using specific strategies and are refined through a great deal of repetition and the transfer of skills to other tasks. The motor learning theory in relation to this study states that for pupils to improve their handwriting, fine motor skills need to be developed and this can only occur through practice.

Schmidt, in his efforts to determining what factors most greatly influenced the achievement of motor learning, realized that attention and motivation on the part of the learner, feedback from the instructor greatly influenced motor learning. More specifically, extrinsic feedback regarding errors is one of the more important sources of information. In terms of motor learning theory, as defined by Schmidt, feedback refers to information received by the learner before, during, and after a task has been attempted. This feedback can be divided into feedback that is received from either intrinsic or extrinsic sources. Feedback from intrinsic sources would include sensory information that arises as a natural consequence of attempting to perform a task. Extrinsic feedback, on the other hand, consists of information, other than sensory, provided to the learner from any source outside of the learner's own body, such as a mechanical device or an instructor. Ideally, this feedback should provide information that the learner cannot receive on his/her own without the aid of the outside information source, and should supplement the intrinsic feedback that the learner has already received.

This theory implies that for handwriting to be proficient and developed in pupils with dysgraphia there is need for repeated practice in the development of fine motor muscle of the hands to enable the child master pencil grips and continue to practice handwriting. It provide a guide to the dependent variable, handwriting proficiency among pupils with dysgraphia in this study.

2.3 Empirical review

2.3.1 Teacher modeling and handwriting legibility among pupils with dysgraphia

Rahim and Jamaludin (2019) addressed problems and difficulties in mastering the process of writing among dysgraphic children. The most suitable method to overcome these problems was to provide activities and exercises that can help children with dysgraphia improve visual-motor integration that was correlated with writing skills. The

study was an attempt in designing and evaluating the Write-Rite application that provides a stimulating and interactive experience for dysgraphic children to practice writing at different levels of difficulty to facilitate the learning process. The study was conducted in two primary schools in Kedah, with five participants (aged seven to 12) who were observed and evaluated for five weeks. Data was compiled through observations, recorded handwriting performances and a self-generated rubric to track the following: formation of letters, slant, size and proportion, alignment, spacing and line quality. The results of a preliminary evaluation and assessment of ‘‘Write-Rite’’ found that this application fulfilled its role in terms of optimising writing proficiency among children with dysgraphia. The study recommended among others that other remedial instruction like teachers' modeling can be utilized to improve writing proficiency among dysgraphic children. The purpose of the study of Rahim and Jamaludin's differs from the present study as the authors addressed problems and difficulties in mastering the process of writing among dysgraphic children.

Fogel, Rosenblum and Anna (2022) carried out study on handwriting legibility across different writing tasks in school-aged children. The aim of the study was to examine handwriting legibility across different writing tasks and to explore which components might predict overall handwriting legibility. The study used a secondary analysis of data from 148 school-aged children across writing scripts obtained from the Detailed Assessment of Speed of Handwriting: copying-best, copying-quickly and free-writing. Results showed that letter formation and teacher modeling was the major predictors of the total Handwriting Legibility Scale (HLS) score, and significant differences in handwriting legibility were found across the three tasks. The study concluded that teacher modeling, as well as the HLS are practical tools that can benefit occupational therapists who work in schools by assessing handwriting legibility across

different handwriting tasks. In as much as the above study relates to the present study, it differs from the source of its data, as it used secondary data while the present study used primary data.

Amos and Antibia (2019) carried out a research into writing difficulties faced by basic pupils at St. Peter's R/C Primary School in Ghana. The study was carried out to assist pupils in St. Peter's R/C Primary School to improve upon their handwriting. The study was an action research. Thirty-three pupils were purposively selected for the study. Interviews and their responses were analysed. Observation and test was also conducted to collect data from pupils. Interventions which were put in place were. Firstly, weekly activities in teaching handwriting were put in place which was supervised by the researcher. The work was marked and scored. Again, test items were administered and those who performed below average were given the needed attention. Moreover, it was recommended that, in teaching handwriting, teachers should employ different approaches, techniques and use of varied models, such as teacher's modelling in teaching and learning of handwriting especially at the primary level. Amos and Antibia's study differs from the present study as it researched the writing difficulties faced by basic pupils. The present study ascertained the effect of teachers model on handwriting legibility among pupils with dysgraphia in primary schools.

Crouch and Jakubecy (2017) carried out a study on dysgraphia: How it affects a student's performance and what can be done about it. The purpose of the study was to apply two techniques, drill activities and fine motor activities, to find whether they help improve the handwriting of a student with dysgraphia. This action research used an ABAB single subject design to find which technique worked better over an eight-week period. The results were inconclusive on which technique worked better. However, the combination of both improved the subject's handwriting and increased students' score by 50%.

Therefore, the study suggested that using both techniques can help improve the problems associated with dysgraphia, especially in the area of handwriting. The study recommended that other remedial instructions such as teachers' model should also utilized by to assist students with dysgraphia, to meet their educational needs. Crouch and Jakubecy's study was on dysgraphia, which relates with the present study. However, the authors ascertained how dysgraphia affects students' performance.

Thompson, McLaughlin, Derby and Conley (2022) carried out a study on 'using tracing and modeling with a handwriting without tears® worksheet to increase handwriting legibility for two preschool students with developmental delays: A brief report'. The purpose of the study was to increase the legibility of letter writing using tracing and copying procedures derived from the Handwriting Without Tears® (Olsen, 1998) program. Two preschool students with developmental delays served as participants. Both participants were enrolled in an integrated preschool and expected to continue on to kindergarten in the Fall. To promote success in kindergarten the letters in each participants name were chosen as the target letters. Both participants showed low rates of legible handwriting during Baseline. Using the tracing and copying procedure from the Handwriting without Tears® program produced improved handwriting legibility. Overall, both participants showed an increase in their ability to write the letters in their name legibly. The Handwriting Without Tears® program and its effects were discussed. The study recommended among others that non-digital methods such as teachers' model could be used by teachers to improve their students' handwriting legibility. The present study and Thompson, McLaughlin, Derby and Conley's study are similar, as they both focused on handwriting legibility. However, Thompson et al. adopted tracing and copying procedures derived from the Handwriting Without Tears

program while the present study focused on teachers' model and how it affects handwriting legibility.

Yıldız, Yıldırım and Ateş (2019) undertook a study on pupil modeling of the legibility of class teachers' board writing. The main aim of the study was to examine the pupil modeling of the legibility of class teachers' writing on the classroom board. A stylistic quality of writing, legibility was evaluated by criteria such as letter slope, spacing, size, shape and line straightness. The study group included 70 class teachers from 13 primary schools at the city center of Kırşehir. The study was a descriptive situation analysis and data were gathered by the document analysis method. Writing samples were gathered by photographing classroom boards, and then analyzed and evaluated by using legibility criteria. The results showed that while the majority of teachers used cursive and many used manuscript, some teachers used the two types of writing together. Among those who wrote cursive handwriting, almost half had inadequate slope but moderately adequate spacing, size, shape and line straightness. It was also found that writing on a blackboard produced better legible writing than that on a white board. The study recommended among others that teachers should employ other models such as teachers' model and pencil grips to enhance their students' writing legibility also. Yıldız, Yıldırım and Ateş's study focused on pupil modeling while the present study focused on teachers' modeling.

2.3.2 Pencil grip and handwriting legibility among pupils with dysgraphia

Dennis and Swinth (2021) examined the influence of pencil grasp and gender on handwriting legibility during both short and long writing tasks in 46fourth-grade students who were typically developing. Matched samples were used to control for variability. Regular classroom writing assignments were scored for word and letter legibility, and scores were compared using a mixed repeated-measures analysis of variance design. The

two independent variables were pencil grasp (dynamic tripod grasp vs. atypical grasp) and task length (short vs. long). A significant difference was found between the letter legibility scores on the short task and the letter legibility scores on the long task. Students' legibility was greater on the short task than on the long task across both grasp conditions. No significant difference was found in scores between students who used dynamic tripod grasps and those who used atypical grasps, nor was there a significant interaction between grasp and task length. No significant differences were found between word legibility scores. Also, gender do not impact significantly on handwriting legibility during both short and long writing tasks in 46fourth-grade students. The results indicated that although the students in the study wrote more legibly on the short task than on the long task, the type of grasp they used did not affect their legibility. The above study is similar to the present study as it examined the influence of pencil grasp and gender on handwriting legibility. However, was not limited to students with dysgraphia.

Koziatek and Powell (2022) carried out a study on pencil grips, legibility, and speed of fourth-graders' writing in cursive. The purpose of the research was to study how the speed and legibility of fourth-grader's handwriting was affected by type of pencil grip on the Evaluation Tool of Children's Handwriting-Cursive and the role gender plays. Ninety-five typically developing students and 6 students receiving special education services completed the Evaluation Tool of Children's Handwriting-Cursive (ETCH-C). Photographs were taken of their pencil grips while they wrote the alphabet. One-way ANOVAs were calculated to compare legibility rates and writing speeds by type of pencil grip. The study revealed that ninety-nine of the students used one of four pencil grips including the dynamic tripod (38 students), the dynamic quadrupod (18), the lateral tripod (22), and the lateral quadrupod (21). One student used the four-finger pencil grip and one used the inter-digital pencil grip. Mean cursive writing speeds were similar for all pencil

grips except for the inter-digital grasp. Speeds obtained were slower than recently published fourth-grade speeds ranging from a mean of 29.45 to 34.75 letters per minute. The study found that gender do not impact on legibility, and speed of fourth-graders' writing in cursive. The study concluded that the lateral quadrupod and four-finger pencil grips to be as functional as the dynamic tripod, lateral tripod, and dynamic quadrupod pencil grips. The study provides average handwriting speeds for fourth-grade students on the ETCH-C. the statistical tool (ANOVA) used by Koziatek and Powell differed from those used in the present study.

Malecki and Jewell (2013) research and apply the instructional technique to encourage pupils to developed learning skills in Kano State. Experimental design was used. The sample of 110 pupils with dysgraphia were selected from a population of 415 pupils and were used for the study. The researcher adopted remediation technique in teaching. The results of the study showed that the experimental group performed better in learning skills than those that use traditional method. The study concluded that the pencil grip influenced writing skills. The study recommended among others that teachers should frequently use pencil grips to develop the learning skills of their students. The design of Malecki and Jewell's study differed from the present study design, as the latter used quasi-experimental.

Pajares and Valiante (2019) in their study applied remediation strategy to enhance learner skills in English in Ogun State. The researchers adopted pre-test and post-test experimental design. A sample of 200 pupils was selected via stratified sampling technique, simple sampling technique, having 75 males and 75 females. The major instrument used was oral test and achievement test. The researcher adopted remediation technique in teaching. The study revealed that the experimental group performed better in learning skill than those that use traditional method. The study concluded that pencil

grip as a teaching method influenced students' learning skills. It was recommended among others that refresher courses should be undertaken by some teachers to acquaint them with the use of pencil grips in improving their students' writing legibility. In as much as Pajares and Valiante study and the present study were carried out in Nigeria, the former covered Ogun State while the present covered Ogoja in Cross River State.

Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau (2013) determined writing forces associated with four pencil grasp patterns in Grade 4 children. The study investigated differences in handwriting kinetics, speed, and legibility among four pencil grasps after a 10-min copy task. One hundred twenty Grade 4 students were recruited as a volunteer sample from four schools within a metropolitan school board. However, seventy-four Grade 4 students completed a handwriting assessment before and after a copy task. Grip and axial forces were measured with an instrumented stylus and force-sensitive tablet. Data collection was conducted in the spring for most of the students; however, to achieve the desired sample size of 120 students, an additional 16 students were recruited in the subsequent school year. These new recruits were derived from a new cohort of Grade 4 students and were assessed in the fall (thus, they were younger and less experienced writers than the spring cohort at the time of testing). To evaluate the grip and the axial forces, the students wrote with an instrumented pen on an electronically inking and digitizing tablet (Waco m Cintiq 12WX, Wacom, Vancouver, WA). The researchers used multiple linear regression to analyze the relationship between grasp pattern and grip and axial forces. The study found no kinetic differences among grasps, whether considered individually or grouped by the number of fingers on the barrel. They also found that gender is not a writing force associated with four pencil grasp patterns in Grade 4 children. However, when grasps were grouped according to the thumb position, the

adducted grasps exhibited higher mean grip and axial forces. The study concluded that (i) Grip forces were generally similar across the different grasps. (ii) Kinetic differences resulting from thumb position seemed to have no bearing on speed and legibility. (iii) Interventions for handwriting difficulties should focus more on speed and letter formation than on grasp pattern. The purpose of Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau's study differs from the present study, as they determined writing forces associated with four pencil grasp patterns in Grade 4 children. While the present study investigated the effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools in Ogoja Education Zone, Cross River State, Nigeria.

2.1.3 Gender and handwriting legibility among pupils with dysgraphia

Udo (2018) conducted an experimental design based on gender differences to prove the usefulness of instructional methods in students learning skills in Ogun state. The objective was to investigate whether there the difference exit between male and female students in learning skills when remediation strategies to develop learning skills of pupils with dysgraphia in the classroom learning. The population of the study were 120 students with pupils with dysgraphia. The study sampled 58 pupils using purposive and simple random sampling techniques. The instrument for data collection was interview and observation. Independent was the statistical tool used to test the hypotheses. The result of the finding showed a significant gender difference of remediation methods on learning skills. Udo's for data collection was interview and observation while the present study used three (3) instruments to collect data, namely: hand writing legibility ability test, school academic record and teacher nomination checklist.

Corneliussen (2018) research and applied the instructional technique to encourage pupils to developed learning skills in Zamfara State. Experimental design was

used. The sample of 110 pupils with dysgraphia were selected and used for the study. The researcher adopted remediation technique in teaching. The study revealed that the experimental group performed better in learning skill than those that use traditional method. The also findings showed significant difference in male and female pupils in learning skills based on instructional remediation teaching methods. The above study used experimental design while the present study used quasi-experimental design.

Yebe (2013) carried out a study on remediation strategy to enhance learner skill in English in Yobe State. A researcher adopted pre-test and post-test experimental design. The sample of 100 pupils was selected via stratified sampling technique, simple sampling technique, 50 males and 50 female were used. The major instrument used was oral and achievement test. The researcher adopted remediation technique in teaching. After the hypotheses were tested, the study found that the experimental group performed better in learning skill than those that use traditional method. The finding of the study also revealed that teaching method significantly influence students' learning skills based on gender. The finding was in favour of boy pupils. The sampling techniques used by Yebe, which were stratified and simple sampling techniques differed from that used in the present study.

Gender differences in severity of writing and reading disabilities was carried out by Berninger, Nielsen, Abbott and Wijsman (2018). Gender differences in mean level of reading and writing skills were examined in 122 children (80 boys and 42 girls) and 200 adults (115 fathers and 85 mothers) who showed behavioral markers of dyslexia in a family genetics study. Gender differences were found in writing and replicated prior results for typically developing children: Boys and men were more impaired in handwriting and composing than were girls and women, but men, who were more impaired in those writing skills, were also more impaired in spelling than women. Men

were more impaired than women in accuracy and rate of reading passages orally, but boys were not more impaired than girls on any of the reading measures. Males were consistently more impaired than females in orthographic skills, which may be the source of gender differences in writing, but not motor skills. The above study differs from the present study as it looked at the gender differences in reading and writing abilities. The present study just focused on handwriting legibility.

Lahav, Maeir and Weintraub (2014) investigated gender differences in students' self-awareness of their handwriting performance. The purpose of the study was to compare the handwriting self-awareness (that is, self-knowledge and on-line awareness) and performance of girls and boys, and to examine the relationship between self-awareness and handwriting performance. Participants included 86 middle-school students (aged 12–14) enrolled in general education in Israel. A handwriting evaluation assessment was administered along with self-knowledge and on-line awareness questionnaires. The study revealed that gender differences were found in relation to students' self-awareness of their handwriting performance. In comparison with girls, boys perceived their handwriting to be faster, even though their actual handwriting performance was slower. Regarding legibility, only boys showed a significant correlation between self-knowledge and performance, while both genders demonstrated significant correlations between on-line awareness and performance. The study concluded that students aged 12–14 are only moderately aware of their handwriting performance, yet there are gender differences in relation to this awareness. The above study was carried in Isreal which differs from the present study that was carried out in Nigeria.

2.3.5 Pencil grip and gender on handwriting legibility among pupils with dysgraphia

Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau (2012) investigated the impact of common pencil grasp patterns and gender on the speed and legibility of

handwriting after a 10-minute copy task, intended to induce muscle fatigue, in typically developing children and in those non-proficient in handwriting. A total of 120 Grade 4 students completed a standardised handwriting assessment before and after a 10-minute copy task. The students indicated the perceived difficulty of the handwriting task at baseline and after 10 minutes. The students also completed a self-report questionnaire regarding their handwriting proficiency upon completion. Results from the study showed that the majority of the students rated higher effort after the 10-minute copy task than at baseline (rank sum: P = 0.00001). The effort ratings were similar for the different grasp patterns (multiple linear regression: F = 0.37, P = 0.895). For both typically developing children and those with handwriting issues, the legibility of the writing samples decreased after the 10-minute copy task but the speed of writing increased. With respect to gender, the study revealed that female performed better than males in speed and legibility of handwriting after a 10-minute copy task. The study concluded that the quality of the handwriting decreased after the 10-minute copy task; however, there was no difference in the quality or speed scores among the different pencil grasps before and after the copy task. The dynamic tripod pencil grasp did not offer any advantage over the lateral tripod or the dynamic or lateral quadrupod pencil grasps in terms of quality of handwriting after a 10-minute copy task. These four pencil grasp patterns performed equivalently. The statistical tool used in testing the hypotheses in Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau's study, which was multiple regression differed from the present study's statistical tool.

Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau (2012) determined effect of pencil grasp and gender on the speed and legibility of handwriting in children. The study examined the impact of grasp on handwriting speed and legibility. The researchers videotaped 120 typically developing fourth-grade students while they

performed a writing task. They categorized the grasps they used and evaluated their writing for speed and legibility using a hand-writing assessment. The study documented six categories of pencil grasp: four mature grasp patterns, one immature grasp pattern, and one alternating grasp pattern. Using linear regression analysis, they examined the relationship between grasp and handwriting. Multiple linear regression results revealed no significant effect formature grasp on either legibility or speed. The study also revealed that gender do not affect the speed and legibility of handwriting in children. The study then concluded that pencil grasp patterns did not influence handwriting speed or legibility in this sample of typically developing children. This finding adds to the mounting body of evidence that alternative grasps maybe acceptable for fast and legible handwriting. Schwellnus, Carnahan, Kushki, Polatajko, Missiuna and Chau's study differs from the present study as the authors determined effect of pencil grasp and gender on the speed and legibility of handwriting in children. While the present study determined the interaction effect of pencil grips and gender on handwriting legibility among pupils with dysgraphia in primary schools.

Another study was conducted by Ann-Sofie (2015) on pencil grip: A descriptive model. The study was descriptive in nature. The study distinguished between preferred writing hand among boys and girls showed that the preferred writing hand had a similar distribution in both boys and girls. Using descriptive statistics of chi-square, a hypertext ended index finger joint (descriptor 2) was observed in 35 per cent of both right- and left-handed pupils. Handedness was not associated with the two dimensions of the model, ease ($Chi2 = 0.01$, $df = 1$, $p = .920$) and grip configuration ($Chi2 = 0.93$, $df = 1$, $p = .335$). With regards to gender, hyperextension of the index finger was observed in more girls than boys ($Chi2 = 4.44$, $df = 1$, $p = .035$). Gender was also related to the distribution of

the precision grips vs. power grips (Chi2 = 4.92, df = 1, p = 0.027) with boys applying more precision grips than girls. Also, an association was noted between gender and the distribution of pencil grips on the two dimensions of ease (Chi2 = 4.38, df = 1, p = .036) and grip configuration (Chi2 = 4.92, df = 1, p = .027). Consequently, more boys than girls were found in the upper right quadrant of the model applying a precision grip with ease, whereas girls were in the majority in the other three quadrants (Chi2 = 11.17, df = 3, p = .011).

In a cross-sectional study of pencil grips of Finnish pupils in grades one through six, the case-by-case analysis reveals four times as much variation as the cross sectional analysis does. The follow-up data revealed changes in 31 individuals' pencil grips from grade 1 to 5, equivalent to 26 per cent of the 117 instead of merely 8 (7 per cent of the 117) as might be suggested by the cross-sectional data. Changes were observed in 22 per cent of the boys' pencil grips (14 of 64) vs. 32 per cent in the girls' grips (17 of 53) (Chi2 = 1.07, df = 1, p = .301). The author also revealed on the investigation of stability vs. change: in pencil grip development from grade one to five, that in grade 1, a nearly significant gender-related difference was observed in the hypertext ended index finger joints of the girls, 53 per cent, vs. the boys, 34 per cent (Chi2 = 3.32, df = 1, p = .068). By grade 5, hyperextension of the index finger was significantly higher (Chi2 = 8.97, df = 1, p = .003) in girls than in boys. Ann-Sofie's study is similar to the present study as it considered gender as a moderating variable. However, the purpose of the study differs from the present study's purpose.

2.3.4 Teachers' model and gender on handwriting legibility among pupils with dysgraphia

Ukwueze (2023) carried out a study on effect of dysgraphia on students' performance in examinations: Implications for counseling. Three hundred and twelve secondary school students randomly selected from fifteen secondary schools in three

Local Government Areas of Lagos State participated in the study through survey and ex-post facto research designs. An instrument titled Students' Dysgraphia Inventory (SDI) was constructed and validated for data collection. Three research questions and two hypotheses guided the study. The study discovered that students who always hold pen or pencil tightly while writing, have difficulty in drawing, make excessive erasures or cancellations, write different shapes and sizes of words, and other forms of dysgraphia usually perform below average in examinations. The study also revealed that gender does not impact significantly on writing legibility of these students. The study recommended cognitive restructuring technique of counseling, critical evaluation of students' handwriting, teachers' model, drilling and use of ruled exercise books in blue and red lines for treatment of dysgraphia in order to improve students' performance in examinations. Ukwueze's linked effects of dysgraphia to students' performance in examinations which differs from the present study that determined the interaction effect of teachers' model and gender on handwriting legibility among pupils with dysgraphia.

Caravolas, Downing, Hadden and Wynne (2020) undertook a study on handwriting legibility and its relationship to spelling ability, age and gender: Evidence from Monolingual and Bilingual children. Studies of the relationship between spelling and handwriting concur that spelling skills influence the dynamic processes of handwriting. However, it remains unclear whether variations in spelling ability are related to variations in the legibility of handwriting, how important spelling skills are relative to the amount of handwriting experience afforded by an individual's age and number of years of schooling, or to what extent this relationship may be task and orthography-specific. The study investigated these questions in a study comparing spelling and handwriting legibility in a group of N = 127 Welsh-English bilingual children matched in age and number of years of schooling to a group of N = 127 English-monolingual

children, gender as well as to a group of N = 127 younger, English monolingual children matched to the bilingual group in spelling ability. All groups completed the Spelling and Handwriting Legibility Test (SaHLT) and a broader battery of literacy measures. The bilingual children were found to have poorer handwriting legibility than same age peers, and in some cases, than their younger, spelling-ability peers, suggesting that spelling ability, more so than amount of handwriting experience and years of schooling impacts handwriting legibility. This was corroborated in a series of multi-group path models, where all children's handwriting was predicted by spelling ability more strongly than by age, and, the effect of spelling generalized across two different spelling tasks in all groups. Finally, bilingual children seemed to draw on general (Welsh) as well as on orthography-specific (English) knowledge when handwriting in English. With respect to gender, students do not differ significantly in their writing legibility. Hence, gender was not considered a factor that impacts on handwriting legibility among monolingual and bilingual children. The above study is similar to the present study as it covered handwriting legibility. However, it also considered its relationship to spelling ability, age and gender, which makes it different from the present study

Bayat and Küçükayar (2016) identified third-grade students' performance levels for written expression and handwriting and to find the relationship between these performances. The study also investigated if gender impacts on handwriting legibility among these students. The study was based on relational screening model. With regard to data collection technique, the study was based on observation. Texts written by students were evaluated by making use of observation forms. For choosing the study group, maximum diversity method was employed among the purposeful sampling methods. It was carried out with 110 third grade students. The study employs measurement tools for evaluation of ‘‘legible handwriting’’ and ‘‘written expression’’.

Cronbach Alpha reliability was measured at 83 for legible handwriting and .81. for written expression. For the purpose of the study, standard deviation and arithmetic average calculations were made and the existence of a meaningful relationship between the legibility of handwriting and the level of success in written expression was tested with Pearson Product Movement Correlation Technique. Students' levels of success in handwriting and in written expression are evaluated with observation forms developed by researchers. The results of the study revealed that third grade students' success in handwriting was good, while their success in written expression was moderate. The relationship between their success level of handwriting and that of written expression was found to be moderate as well. The study also found no significant difference in the handwriting legibility of male and female Third Grade Students in Written Expression. The above study differs from the present study as it focused on students' performance levels for written expression and handwriting while the present study focused effect of instructional remediation on handwriting legibility among pupils with dysgraphia.

With respect to gender differences, Dada, Adeleke, Aderibigbe, Adefemi and Apie (2021) investigated the effectiveness of music therapy in enhancing attention among children with intellectual disability. A pretest-posttest control experimental research design was adopted. The experiment was carried out for six weeks using Music Therapy Treatment Package on 24 children with intellectual disability that were randomly selected Modupe Cole Momerial Childcare and Treatment Home/School, Akoka, Yaba, Lagos. A validated Attention Observation Rating Scale (AORS) with a reliability coefficient of 0.88 was used for the study. Three hypotheses were tested in the study, and Analysis of Covariance (ANCOVA) was used for data analysis. The study revealed that music therapy was effective in enhancing attention among children with intellectual disabilities. Sex and level of severity of the disability were also tested as moderator variables, but

they have no significant main or interaction effect with music therapy in enhancing attention for children with intellectual disability. The finding was that music therapy was significantly effective in enhancing attention for children with intellectual disability regardless of their sex or level of severity. It was concluded that attention deficit could be improved for children with intellectual disability. Therefore, Music therapy was recommended for use in the school with adequate teacher training. The above study relates to the present study as it also considered gender as a moderating variable. However, the context to which gender was used differs from the present study.

Gargot, Asselborn, Pellerin, Zammouri, Anzalone and Casteran (2020) carried out a study on acquisition of handwriting in children with and without dysgraphia: A computational approach. 280 children were recruited in schools and specialized clinics to perform the Concise Evaluation Scale for Children's Handwriting (BHK) on digital tablets. Within this dataset, the study identified children with dysgraphia. Twelve digital features describing handwriting through different aspects (static, kinematic, pressure and tilt) were extracted and used to create linear models to investigate handwriting acquisition throughout education. K-means clustering was performed to define a new classification of dysgraphia. Linear models showed that three features only (two kinematic and one static) showed a significant association to predict change of handwriting quality in control children. Most kinematic and statics features interacted with age and gender. Results suggested that children with dysgraphia do not simply differ from ones without dysgraphia by quantitative differences on the BHK scale but present a different development in terms of static, kinematic, pressure and tilt features. The K-means clustering yielded 3 clusters (C1). Children in C1 presented mild dysgraphia usually not detected in schools whereas children in C2 and C3 exhibited severe dysgraphia. Notably, C2 contained individuals displaying abnormalities in term of kinematics and pressure

whilst C3 regrouped children showing mainly tilt problems. The study recommended among others that remedial instruction such as teacher model, if employed can boost writing legibility of students with or without dysgraphia. The study population of Gargot, Asselborn, Pellerin, Zammouri, Anzalone and Casteran's study differs from the present study as it considered children with and without dysgraphia. While the present study used pupils with handwriting difficulties.

2.4 Summary of literature review

The literature reviewed had defined dysgraphia as a disorder of writing ability at any stage, including problems with letter formation or legibility, letter spacing, spelling, fine motor coordination, rate of writing, grammar, and composition. The study reviewed literature on six main variables namely teacher modeling techniques, pencil grip, motor training skills and gender difference among instructional remediation strategies and how they enhanced writing ability of pupils with dysgraphia. Based on the literatures reviewed, authors found that some of the intervention strategies have the capacity to influence writing ability of pupils with dysgraphia, while order authors argued that writing problems are not associated with teachers' classroom instruction.

However, some research evidence had foreign cultural backgrounds, the literature reviewed so far showed no result in Ogoja Education Zone Nigeria on the effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools. Hence the need for the study.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is concerned with the method that was used in the study. It focussed on the following sub-headings;

3.1 Research design

The design used for this study was pre-test post-test, control group quasi experimental design. Quasi-experimental research involves an empirical study used to estimate the causal impact of an intervention on a target population. This design is commonly employed in the evaluation of educational programmes where random assignment is not practicable or possible (Ikwen, 2015). Thus, the design was selected because intact groups were desire, in order to avoid disruption of the school system.

Specifically, the study used the pre-test, post-test variation of the quasi-experimental design. In this variation, three intact groups were used, two were assigned

to experimental and one to control group. The three intact groups were primary four pupils in the three selected schools, teacher modeling and pencil grip strategies was applied to primary four in two schools which was the experimental groups, while no handwriting legibility strategy was applied to the control group. Pre-tests were administered to both the experimental and control groups. The pre-test scores were used to assess their competence in the skills before the strategies, while the post-test scores were used to compare the effects of the strategies. The structure of the design is represented as followed

Group 1	R	O_1	X	O_2
Group 2	R	O_3	X	O_4
Group 3	R	O_5	X	O_6

Where:

01 Pre-test for experimental group 1

02 Post-test for experimental group 1

03 Pre-test for Experimental group2

04 Post-test for Experimental group 2

05 Pretest for control group

06 Post-test for control group

X Treatment for the experimental group

3.2 Area of the study

This study was carried out in the Ogoja Education Zone of Cross River State, which cuts across the five local government areas (Obanlikwu, Obudu, Bekwarra, Ogoja and Yala) that make up the northern senatorial district of the state. The prominent ethnic groups, within each of these local government areas (LGAs), are; Obanliku - Bendi, Obanliku, Utanga and Bechere; Obudu - Bette, Utugwang, Alege, Ukpe and Ubang;

Bekwarra - Bekwarra, Afrike; Ogoja - Mbube, Ishibori and Ekajuk; and Yala - Yala, Ukelle, Yache and Igede.

This zone lies between latitudes 6^{o} 39' and 6^{o} 41' north of the equator, and longitudes 8^{o} 47' and 8^{o} 58' east of the Greenwich meridian. It is bounded by Benue State to the north, Cameroon to the west, Boki and Ikom local government areas to the south, and Ebonyi State to the east. It occupies a total area of 4527km^2, has a population estimated to be 1,015,300 as at 2016, and its inhabitants are predominantly Christians. There is no common dialect used for communication across this zone. In fact, only Obudu local government area has at least four different dialects, while Bekwarra has two.

The zone has a total of eighty-five (85) government-approved secondary schools, unevenly distributed across its five (5) local government areas (Obanlikwu - thirteen, Obudu – twenty-seven, Bekwarra - six, Ogoja - sixteen and Yala – twenty-three). Also, present in this zone is a Federal College of Education, Obudu, which will benefit from the findings of this study. The people of the Ogoja Education Zone have a very rich history, artifacts and cultural heritage that in turn, interact with Mathematics to bring about ethno-mathematics instructional materials such as the traditional thatch house that could be used to reduce abstraction in the teaching of Mathematics, thereby simplifying concepts.

The inhabitants of this zone are generally industrious and daring. A larger proportion of them are engaged in para-professional occupations (small scale farming and petty trading), while the rest are civil servants. Major crops and fruits grown in substantial quantity within this zone are groundnut, yam, cassava, rice, maize, potato, oil palm, cashew, beniseed, mango, pear and orange.

The ‘‘new yam’’ festival is one of the most important celebrations in this zone. Every tribe has its own day within the months of August and September each year for

this celebration. Another very important celebration that unites these people, attracts tourists from within and outside the country, promotes agriculture and rewards best harvesters, is the ‘‘North fest’’ introduced by the Executive Governor of Cross River State, His Excellency, Senator Benedict Ayade. Unlike the ‘‘new yam’’ festival which has different celebration dates across the zone, ‘‘North fest’’ has a single day and location for its celebration. Dances like igbili, ikpatemana, udeng, ayila, abakpa, iwala, igeli, ikpatuma, gana, ijor, otsippi, wohi, and masquerades like ikwom ishor and akata exist in this zone. Some of these dance groups perform during the festival celebrations.

It is interesting to note at this point, that there is no place in the world, other than Ubang (in Obudu LGA of the Ogoja Education Zone), where you can find a community with men, naturally speaking a different language from women, yet understand each other. This LGA is also home to one of the longest serving monarch in Nigeria, His Royal Majesty, Uti J. D. Agba.

The foremost internationally known tourist attraction site in Nigeria, the Obudu cattle ranch, is located within this zone (precisely, in Obanlikwu local government area). When it comes to hospitality, the people of the Ogoja education zone come top. They are very peaceful, friendly and accommodating to visitors/strangers. It is also important to add, that these people have very rich cultural heritage and mouth-watering delicacies such as; groundnut soup, beniseed soup, melon soup, bitter leaf soup with pounded yam, ground-beans moi-moi with fresh palm wine, etc. The aforementioned should make anyone in love with adventures or looking for a place to spend vacation to consider visiting the Ogoja Education Zone. The researcher used Ogoja Education Zone because from the knowledge of the researcher, no literature shows effects of handwriting legibility on academic performance of pupils with dysgraphia, hence the reason for choice of the zone.

3.3 Population of the study

The population of the study comprised of all the primary four pupils with handwriting difficulties in the selected schools, which comprised 11 pupils form school (A), 9 from school (B) and 10 from school (C) , making a total population of 30 pupils. This population was as a result of the information from their school records and informal identification test which was carried out by the researcher. The researcher gave the pupils a short note to copy and those whose handwriting was not legible were placed on the other side of the class and they made up the population of the study.

3.4 Sampling technique

The sampling technique used for this study was purposive sampling technique. Purposive sampling techniques also known as judgmental, selective or subjective sampling technique is a type of non-probability sampling technique. It is a sampling technique where the units under investigation are based on the judgment of the researcher. The main goal of purposive sampling is to focus on particular characteristics of a population that are of interest to the researcher, and enable the researcher to answer the research questions.

Hence, three schools with a sample of 30 pupils in primary four were purposively selected; the schools were selected because they met the criteria for the study and had B.ed holders as their English teacher which was one of the conditions for the selection and primary four is a class where handwriting legibility is developed. With this, the researcher took primary four pupils of each the schools for the study.

Based on the information gotten from the class teachers on the pupils' performance in handwriting legibility and through indirect observation of their characteristics, the researcher was able to identify pupils with dysgraphia from the intact classes used.

3.5 Sample

The sample for the study consisted of thirty (30) pupils with handwriting difficulties selected from three schools in public primary schools in Ogoja Education Zone, which comprised 30 pupils in all. The experimental group one (school A) consisted of 11pupils, while the experimental group two (school B) 9 pupils and the control group (school C) 10 pupils, making the total number to be 30 pupils in all. This sample is based on the number of pupils per selected class for the study and the source of this information was based on their overall class performance and also an informal test result conducted by the researcher, on their handwriting ability, characteristics and signs of dysgraphia, which include pupils that write below the expected age, problems with processing and understanding what he or she have written , difficulty forming right sentences, difficulty spelling, difficulty seeing and hearing similarities and differences in letters and words, avoiding activities that involve writing. The distribution is shown in Table 1.

TABLE 1

Sample distribution of pupils

S/N	Name of school	Number of pupils

1	School A	11
2	School B	9
3	School C	10
	Total	30

3.6 Instrumentation

The handwriting legibility ability test was developed by the researcher which consisted of two sections A and B. Section A. sought information of pupil's demographic

variables such as gender while session B contained Comprehensive Passages. To test pupils' ability in writing, the research assistant copied the comprehension test on the board and asked the pupils to copy the text. The researcher with the help of the research assistants graded the pupils' writing ability on the following area line spaces, letter clearly written, punctuations maintenance, dots of i's and cross of t's and speed. Each sentence written correctly with the above grading criteria was assigned five (5) marks while each not written correctly was assigned one (1) Mark.

3.6.1 Validation of Instruments

The handwriting legibility ability test instrument was developed by the researcher with the help of the supervisor. Copy of the instrument was submitted to the two lecturers in special education and an expert in measurement and evaluation to comfirm their face validity. A criteri for the assessment of the learners were sent to the evaluators with a copy of the puprose of the study, research questions and statement of hypoitghesis in order to provide first hand information of what the study seeks to achieve. All ambiguous and irrelevant items were spotted and removed. Suggestions made by the supervisor, lecturers and the expert were used to review and improve the instrument.

3.6.2 Reliability of the Instrument

The reliability of handwriting legibility ability test was determined using the Kuder-Richardson formula 20 (KR – 20) after subjecting the instruments to a trial test of 40 pupils with dysgraphia in primary schools who were not part of the sample that were used in this study but had relevant qualities as those in the study. Reliability coefficients of the handwriting legibility ability test instrument was 0.79.

TABLE 2

Reliability of pupil writing legibility Test items using Kuder Richardson formular K-R-20.(40)

Variables	No. of items	$\sum pq$	S_x^2	r_{xy}

hand writimng legibility test	1	14. 23	30.54

3.6 Procedure for data collection

A letter of introduction was presented by the researcher signed by the supervisor to the head teacher of the schools, for permission and co-operation to carry out the study. Thereafter, three research assistants were trained and used for the treatment

groups and the control group. Then, they were administered pre-test and post-test on both groups.

The control group was taught using conventional teaching methods. While the experimental groups were receiving treatment from the research assistants. The post-test was a repetition of the pre-test that was administered before the treatment, in order to determine the skill competence of the pupils. The repetition was done in order to access the effect of the treatment on the pupils in the relation to two strategies. It is better explain in stages:

Stage 1: experimental stage: the experimental stage was done by the researcher. It involved the training of the research assistants on the use of teacher modeling technique and pencil grip technique and pre-test assessment of the pupils in the experimental groups and the control group. Teacher modeling technique and pencil grip technique in teaching handwriting was introduced. And the two teaching strategies were explained to the research assistants, and how the methods are applied in each of the lessons was also demonstrated. And questions were taken for clarification.

Stage 2: Experimental procedures: This was done by the trained research assistants under the supervision of the researcher. The duration of the sessions was 30 minutes a day, three times a week for a period of six weeks except the first week that was five days because it was training of research assistants and administration of the pre-test. For control group, there was no treatment package design for them, but was taught using the conventional teaching strategy during that period.

TABLE 3

Experimental procedures

Week	Treatment period		Activities
1	Days	Minutes	
	Mon	30mins	Research assisting training

	Tues	10mins	Distribution of participants in experimental and control groups
	Wed	60mins	Pre-test of the participants in control
	Thurs	30mins	Pre-test of participants in experimental group
	Fri.	30mins	Assessment of the research assistant
2-5	Mon.	30mins	Nouns, types, examples
	Tues.	30mins.	Common nouns, examples and reading passage
	Wed.	30mins.	Proper noun, examples, collective nouns , examples and reading passage
	Thurs.	30mins.	Pronoun, examples and reading passage
6	Mon.	60mins.	Post-test for the participants in control group
	Tues.	60mins.	Post-test for the participants in experimental group

3.8 Procedure for data processing and scoring

A coding schedule was designed to code the responses of the respondents accordingly.

3.9 Procedure for data analysis

The five hypotheses were analyzed and each was tested at .05 level of significance

3.9.1 Hypothesis one:

There is no significant effect of teacher modeling technique on hand writing legibility of pupils with dysgraphia.

Independent variables: teacher modeling technique

Dependent variables: handwriting legibility

Statistical tool: Analysis of covariance (ANCOVA)

3.9.2 Hypothesis two:

There is no significant effect of pencil grip technique on handwriting legibility of pupils with Dysgraphia.

Independent variables: pencil grip technique

Dependent variables: handwriting legibility

Statistical tool: Analysis of covariance (ANCOVA)

3.9.3 Hypothesis three

There is no significant effect of teacher modeling technique and gender on handwriting legibility of pupils with dysgraphia.

Independent variables: teacher modeling and gender

Dependent variables: handwriting legibility

Statistical tool: Analysis of Variance (ANCOVA)

3.9.4 Hypothesis four

There is no significant effect of pencil grip technique and gender on handwriting legibility of pupils with dysgraphia.

Independent variables: pencil grip and gender

Dependent variables: handwriting legibility

Statistical tool: Analysis of covariance (ANCOVA)

3.10 Operational Definition of research variables

Teacher modeling is an instructional technique in which the teacher demonstrates a new concept or approach to learners and students learn by observing and making learning notes.

Pencil grips technique: are small impermanent attachments that fit onto a pencil. It helps a child or an adult have a functional and accurate grasp of a pencil. It also helps pupils develop fine motor skills and user control over their handwriting.

CHAPTER FOUR

RESULT AND DISCUSSIONS

This chapter is concerned with the presentation of the result and further discussion of findings according to the sub heading below.

4.1. General description of variables

4.2. Presentation of results

4.3. Discussion of findings

4.1. General description of variables

This study focused on examining the effect of instructional remediation on handwriting legibility among pupils with dysgraphia in primary schools in Ogoja Education Zone of Cross River State, Nigeria. The study adopted a quasi - experimental design. The independent variable was teacher modeling strategy and pencil grip which was manipulated by the researcher to compare it mean differences with the control group which were not exposed to this teacher modeling and pencil grip strategy. Two treatment packages were prepared for the study titled 'Teacher Modelling Strategy Package (TMSP) and Pencil Grips Strategy package (TTSSP)''. The result is presented in Table 4.

Table 4

Summary of descriptive statistics of the variables

Group	N	Mean	Std. Deviation
Control group	10	1.7000	.47016

Teacher modeling	11	4.6087	.49901
Pencil grip	9	4.1053	.65784

4.2. Presentation of the result

Hypotheses One

There is no significant effect of teacher modeling strategy on handwriting legibility of pupils with dysgraphia. The independent variable is teacher modeling strategy while the dependent variable is handwriting legibility. To test this hypothesis, the descriptive statistics were first assessed and the result as presented in Table 5 showed that the mean

value of control group (X=1.70) is less than (X=4.60) of those who are exposed to teaching using teacher modeling strategy (experimental group 1). This implies that students who are taught using teacher modeling strategy perform better in handwriting legibility than those who are not taught using teacher modeling strategy (control group). Furthermore, when these mean differences were compared using Analysis of covariance (ANCOVA) the result showed that ($F=373.67$, $p<.05$). Since p (.000) is less than p (.05), this implies that there is a significant effect of teacher modeling strategy on handwriting of pupils with dysgraphia. Hence, the null hypothesis is rejected. Hence, it was concluded that the high significant difference between the groups may probably be due to the treatment main effect rather than the effect of random fluctuations.

Table 5

Analysis of Covariance (ANCOVA) result on the effect of teacher modeling strategy on handwriting legibility of pupils with dysgraphia

Variable	N	Mean	Std. Deviation
Control group	10	1.7000	.47016
Teacher modeling	11	4.6087	.49901
Total	20	3.2558	1.54447

Source		Type III Sum of Squares	df	Mean Square	F-ratio	P value
Intercept	Hypothesis	55.735	1	55.735	5.082	.258
	Error	11.401	1.039	10.968[a]		
Pretest	Hypothesis	.123	1	.123	.514	.477
	Error	9.555	19	.239[b]		
Group	Hypothesis	89.264	1	89.264	373.672	.000
	Error	9.555	19	.239[b]		

Hypotheses Two

There is no significant effect of pencil grip strategy on handwriting legibility of pupils with dysgraphia. The independent variable is pencil grip strategy while the dependent variable is handwriting. To test this hypothesis, the descriptive statistics were first assessed and the result as presented in Table 6 showed that the mean value of control group (X=1.70) is less than (X=4.10) of those who were exposed to teaching using pencil grip (experimental group 2). This implies that students who were taught using pencil grip

perform better in handwriting legibility than those who were not taught using pencil grip strategy (control group). Furthermore, when these mean differences were compared using Analysis of covariance (ANCOVA) the result showed that ($F=149.827$, $p<.05$). Since p (.000) is less than p (.05), this implies that there is a significant effect of pencil grip on handwriting legibility of pupils with dysgraphia. Hence, the null hypothesis is rejected. Hence, it was concluded that the high significant difference between the groups may probably be due to the treatment main effect rather than the effect of random fluctuations.

Table 6

Analysis of Covariance (ANCOVA) result on the effect of pencil grip strategy on handwriting legibility of pupils with dysgraphia

Group	Mean	Std. Deviation	N			
Control group	1.7000	.47016	20			
Pencil	4.1053	.65784	19			
Total	2.8718	1.34124	39			
Source	Type III Sum of Squares	Df	Mean Square	F- ratio	p-value	

Intercept	Hypothesis	41.041	1	41.041	7.475	.203
	Error	6.102	1.111	5.491[a]		
Pretest	Hypothesis	.561	1	.561	1.768	.192
	Error	11.428	19	.317[b]		
Group	Hypothesis	47.563	1	47.563	149.827	.000
	Error	11.428	19	.317[b]		

Hypotheses Three

There is no significant effect of teacher modeling strategy and gender on handwriting legibility of pupils with dysgraphia. The independent variable is gender categorizes as male and female and teacher modeling strategy while the dependent variable is handwriting legibility. To test this hypothesis, the descriptive statistics were first assessed, and the result as presented in Table 7. The result in Table 7 showed that the mean value of female students score (X=4.50) is relatively equal with the mean value

of male students score(X=4.64) on teacher modeling strategy. A close look at these means showed that there are no mean differences. When these means were further compared using Analysis of Covariance (ANCOVA), the result showed that for group effect the F-ratio obtained (F=244.97 p <.05), for gender effect on handwriting legibility (F=2.807, p<.05) and for interactive effect of gender and teacher modeling strategy (F=1.361, p<.05) Since p-value (..251) is greater than .p(05), this implies that, there is no significant main effect of student's gender and teacher modeling strategy on handwriting legibility. Hence, the null hypothesis is retained.

Table 7

Analysis of Covariance (ANCOVA) result on the effect of teacher modeling strategy and gender on handwriting legibility of pupils with dysgraphia

Group	Gender	Mean	Std. Deviation	N
	Male	1.5000	.52223	5
Control group	Female	2.0000	.10000	5
	Total	1.7000	.47016	10
Teacher modeling	Male	4.5000	.54772	6

	Female	4.6471	.49259	4
	Total	4.6087	.49901	10
	Male	2.5000	1.54349	10
Total	Female	3.8000	1.32288	10
	Total	3.2558	1.54447	40

Source		Type III Sum of Squares	df	Mean Square	F-ratio	p-value
Intercept	Hypothesis	46.580	1	46.580	5.068	.255
	Error	9.738	1.060	9.191[a]		
Pretest	Hypothesis	.021	1	.021	.095	.759
	Error	8.361	19	.220[b]		
Group	Hypothesis	73.526	1	73.526	244.972	.042
	Error	.296	.987	.300[c]		
Gender	Hypothesis	.827	1	.827	2.807	.326
	Error	.323	1.098	.295[d]		
Group * gender	Hypothesis	.299	1	.299	1.361	.251
	Error	8.361	19	.220[b]		

Hypotheses Four

There is no significant effect of pencil grip strategy and gender on handwriting legibility of pupils with dysgraphia. The independent variable is gender categorizes as male and female and pencil grip strategy while the dependent variable is handwriting legibility. To test this hypothesis, the descriptive statistics were first assessed, and the result as presented in Table 8. The result in Table 8 showed that the mean value of female students score (X=4.12) is relatively equal with the mean value of male students score(X=4.09)

on pencil grip strategy. A close look at these means showed that there are no mean differences. When these means were further compared using Analysis of Covariance (ANCOVA), the result showed that for group effect the F-ratio obtained (F=86.23 p >.05), for gender effect on pencil grip (F=.797, p>.05) and for interactive effect of gender and pencil grip (F=1.772, p>.05) Since p-value (..192) is greater than .p(05), this implies that, there is no significant main effect of student's gender and pencil grip on handwriting. Hence, the null hypothesis is retained.

Table 8

Analysis of Covariance (ANCOVA) result on the effect of pencil grip strategy and gender on handwriting legibility of pupil with dysgraphia

Group	Gender	Mean	Std. Deviation	N
Control group	Male	1.5000	.52223	5
	Female	2.0000	.00000	5
	Total	1.7000	.47016	10

	Male	4.1250	.64087	5
Pencil grip	Female	4.0909	.70065	5
	Total	4.1053	.65784	10
	Male	2.5500	1.43178	10
Total	Female	3.2105	1.18223	10
	Total	2.8718	1.34124	20

Source		Type III Sum of Squares	df	Mean Square	F-ratio	p-value
Intercept	Hypothesis	39.323	1	39.323	7.427	.204
	Error	5.858	1.106	5.295[a]		
Pretest	Hypothesis	.342	1	.342	1.114	.299
	Error	10.442	19	.307[b]		
Group	Hypothesis	45.483	1	45.483	86.232	.057
	Error	.575	1.089	.527[c]		
Gender	Hypothesis	.436	1	.436	.797	.537
	Error	.541	.990	.547[d]		
Group * gender	Hypothesis	.545	1	.545	1.773	.192
	Error	10.442	19	.307[b]		

Hypothesis Five

There is no significant interaction effect of treatment strategies and gender on handwriting legibility of pupils with dysgraphia. The independent variable is gender categorizes as male and female, teacher modeling strategy and pencil grip strategy while the dependent variable is handwriting legibility. To test this hypothesis, Analysis of Covariance (ANCOVA) was used, the result as presented in Table 9 showed that for interactive effect of teacher modeling strategy and pencil grip strategy on handwriting

legibility (F=125.448 p <.05), for gender effect on treatment package (F=1.536, p>.05) and for interaction effect of gender and treatment package (F=1.159 p>.05) Since p-value (..321) is greater than .p(05), this implies that, there is no significant main effect of student's gender and treatment effect on handwriting legibility. Hence, the null hypothesis is retained.

Table 9

Analysis of Covariance (ANCOVA) result on the interaction effect of treatment strategies and gender on handwriting legibility of pupils with dysgraphia

Group	Gender	Mean	Std. Deviation	N
Control group	Male	1.5000	.52223	5
	Female	2.0000	.00000	5
	Total	1.7000	.47016	10

	Male	4.5000	.54772	6
Teacher modeling	Female	4.6471	.49259	4
	Total	4.6087	.49901	10
	Male	4.1250	.64087	5
Pencil grip	Female	4.0909	.70065	5
	Total	4.1053	.65784	10
	Male	3.0000	1.52315	14
Total	Female	3.8889	1.16565	16
	Total	3.5161	1.38779	30

Source		Type III Sum of Squares	df	Mean Square	F- ratio	p-value
Intercept	Hypothesis	80.667	1	80.667	14.853	.052
	Error	12.070	2.222	5.431[a]		
Pretest	Hypothesis	.019	1	.019	.065	.799
	Error	16.147	29	.294[b]		
Group	Hypothesis	85.136	2	42.568	125.448	.007
	Error	.702	2.068	.339[c]		
Gender	Hypothesis	.521	1	.521	1.536	.337
	Error	.702	2.070	.339[d]		
Group * gender	Hypothesis	.680	2	.340	1.159	.321
	Error	16.147	29	.294[b]		

4.3 Discussion of findings

The discussion of findings is based on the formulated and tested hypotheses and the result of findings. The discussion will be done hypothesis-by-hypothesis.

4.3.1 Teacher modeling and handwriting legibility of pupils with dysgraphia in primary schools

The result of the first hypothesis revealed that there is a significant effect of teacher modeling on handwriting legibility among pupils with dysgraphia in primary schools. This could be because when the pupils see what they teacher does on the board, the method of positioning his/her hand in writing as well as the lines observation that are carried out, there is every tendency that they follow same especially where the teacher follows closely how the pupils are modeling what he or she does in the class. The finding is in line with Bandura, (1986) who stated that modeling is one of the most efficient modes of learning of any new skill or knowledge. The finding is in agreement with Salisu and Ransom, (2014) who stated modeling process's dynamic aspects rests on the relationship established among the class participants, understood as a form of social practice.

The finding also agrees with Salisu, and Ransom (2014) who sees Modeling as an instructional strategy in which the teacher demonstrates a new concept or approach to learning and students learn by observing. Modeling describes the process of learning or acquiring new information, skills, or behavior through observation, rather than through direct experience or trial-and-error efforts. Modeling can be used across disciplines and in all grade and ability level classrooms. According to Johnson, and Johnson (2014), modeling is an instructional strategy in which the teacher demonstrates a new concept or approach to learning and students learn by observing and making learning notes. The finding is in line with Yebe (2013) who stated that modeling can be used in all stages to help learn a new skill, undertake a task more effectively in terms of the success criteria, develop thinking skills, and thought processes Task modeling occurs when the teacher demonstrates a task to students and expected the students to do on their own what is demonstrated.

4.3.2 Pencil grips and handwriting legibility of pupils with dysgraphia in primary schools

The result of the second hypothesis revealed that there is a significant effect of pencil grips on handwriting legibility among pupils with dysgraphia in primary schools. Effective handwriting depends on proper development of necessary prewriting skills by the children. If readiness skills are not developed, handwriting of such child may be illegible. One of the associated problems to this is the age at which handwriting is introduced to early age children, because of higher expectation of the parents and unnecessary demand for children to write and read at the same time. Many children will not develop proper pencil-holding skills before they are asked to write in volumes. Most of the pupils hold the pencil very lightly and it becomes slippery in their hands. This does not afford them the opportunity to write very well as presented on the board or any other material that they are copying from. Most times, the lack of grips of the pencil, see them write above or below the lines and in most cases, write letters wrongly that may become very ineligible to others to read.

The findings collaborated with that of Sassoon et al. (2016) that found that a non-modal grip as it decreases tension without the grip losing stability. An explanation for the existence of non-normative pencil grips, which differ from the observed developmental patterns, could be that the hand is seeking the stability, which is lacking because of premature writing. When the hand is not mature enough to adopt the dynamic tripod grip, it spontaneously deals with the situation by finding other functional grips. Ann-Sofie (2015) that carried out a study on pencil grip: a in distinguishing between preferred writing hand among boys and girls shows that the preferred writing hand had a similar distribution in both boys and girls. The findings further showed that no ambi- or bidextrals were noted in the present study. A hypertext ended index finger joint was observed in 35 per cent of both right- and left-handed pupils. Handedness was not associated with the two dimensions of the model, ease, and grip configuration.

4.3.3 Gender and teacher modeling on handwriting legibility

The result of the second hypothesis revealed that, there is no significant effect of gender on handwriting legibility of pupils with dysgraphia in primary schools who were taught handwriting legibility with teachers' modeling. That is, the hypothesis was retained. This could be because students when observing the teacher do what is done in the board may be doing the same thing to improve in their handwriting. the male pupils may not differ from the female pupils as the entombment they are operate ion may encourage both to write very well.

The result of this study supports the finding in the study conducted by Dada, Adeleke, Aderibigbe et al, (2021) on music therapy and attention reduction among children with intellectual disability. The finding of the study revealed that female and male children who have intellectual disability have the same manner of response to music as an intervention strategy. The study is also in line with, Diana (2019), in a study have established that sex does not play any role in the effectiveness a therapy for children who have developmental disability. Her premise of argument is that individualized approach should be used in determining the outcome of intervention programme for children with such disabilities, and that there is no need for unnecessary comparism.

The finding disagreed with the finding of Zhang et al. (2019) compared the L1 (English) writing processes and text quality of 2,619 middle-school students (grades 6 to 9) using keystroke logging and found females consistently obtained higher essay scores, composed more fluently, edited their texts more and paused less compared to males. The finding disagrees with the research conducted by Adams and Simmons, (2019); Berninger and Fuller, (2018); Malecki and Jewell, (2013); Pajares and Valiante, (2019) Zhang et al., (2019) has provided some evidence that females perform better than males in many aspects of writing, particularly in the UK and America.

Gender differences have been associated with differences in writing performance; however, the processes by which these differences have their effects have been given relatively little discussion. The finding is in line with Verhoeven and Van Hell (2018) who reported that girls, whose age was 10 years, wrote the longer text and used a variety of lexical items as opposed to boys, in the similar age.

Similarly, Beard and Burrell (2017), who investigated writing attainment of year 5 children (9–10 years old) in narrative and persuasive tasks using a standardized test (including rating criteria such as spelling, vocabulary, grammar, purpose and organisation), also reported a significant advantage for girls. Babayiğit (2015) studied English speaking L1 and FL children (about 9 years old) writing and found that girls outperformed boys in text length, spelling, written vocabulary and text quality in both languages. The finding agreed with Udo (2018) who conducted an experimental design based on gender differences to proving the usefulness instructional methods in students learning skills in Ogun state and found a significant gender difference of remediation methods on learning skills. The finding also agreed with Corneliussen (2018) who research and found a significant difference in male and female pupils in learning skills based on instructional remediation teaching methods. The study conducted by Ann-Sofie, (2015) on pencil grip: a descriptive model and four empirical studies distinguishing between preferred writing hand among boys and girls shows that the preferred writing hand had a similar distribution in both boys and girls.

4.3.4 Pencil grips and gender on handwriting legibility of pupils with dysgraphia

The finding on the hypothesis five revealed that there is a significant interactive effect of pencil grips and gender on handwriting legibility among pupils with dysgraphia in primary schools. There is assertion that there is always disparity in the learning rate between male and female children because of gender difference factor, and this study

tries to support that assertion. The implication of this finding is that when both gender and pencil grip (intervention strategy) are combined during the treatment, the handwriting of the study participants improves. This suggests that gender of the study participants affected the efficacy of the treatment. The level of the efficacy of the treatment is different to the level of the efficacy in the male participants.

The finding disagreed with the result of a quasi-experimental study conducted by Dada, Adeleke, Aderibigbe et al, (2021) on the use of music as a therapy in reducing hyperactivity among children with intellectual disability. The study involved 24 children with intellectual disability who also exhibit hyperactivity. Finding of the study revealed that the interaction effect of music therapy and gender does not have a significant effect but highly account for the variance of children's attention with intellectual disability. Other studies also have found that the pattern of grasp does not have a significant effect on handwriting legibility (Dennis & Swinth, 2019; Roston, Hinojosa, & Kaplan, 2018; Ziviani & Wilkins, 2016). However, this finding is in line with Bandura (1986; Salisu and Ransom, (2014) who found a significant effect of teaching method on writing legibility.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents a summary of the study, conclusion, recommendations and suggestions for further studies. It is presented under the following subheadings:

5.1 Summary of the study

5.2 Conclusion of the study

5.3 Recommendations

5.4 Suggestions for further studies

5.1 Summary of the study

This study investigated the effect of instructional remediation (teacher modeling and pencil grip strategies) on handwriting legibility of pupils with dysgraphia in primary schools in Ogoja Education Zone, Cross River State, Nigeria. To achieve this, the study anchored on four theories. The independent variable is instructional remediation which include, teacher modeling and pencil grip strategies while the moderator variable was gender. The dependent variable is handwriting legibility of pupils with dysgraphia. To give the study direction, five research questions were formulated and transform to hypotheses. These were as follows:

i) What is the effect of teacher modeling strategy on handwriting legibility of pupils with dysgraphia?
ii) What effect has pencil grip strategy on handwriting legibility of pupils with dysgraphia?
iii) What is the effect of teacher modeling and gender on handwriting legibility of pupils with dysgraphia?
iv) What effect has pencil grip strategy and gender on handwriting legibility of pupils with dysgraphia?
v) What is the interaction effect of treatment strategy on gender and handwriting legibility of pupils with dysgraphia.

A review of related and relevant literature was carried out to seek the views and opinions of other authors and researchers concerning all the variables. A pre-test post-test control quasi-experimental research design was adopted for the study. The sample of 30 pupils with dysgraphia was selected purposively from 3 different primary schools and all were primary four pupils from three intact classes. The main instrument used for data collection was handwriting legibility ability test, which was designed by the researcher under the guidance of the supervisor and two experts in special Education. The reliability of the instrument was established using the Kuder Richardson 20 formula which yielded a high reliability coefficient of 0.79. Analysis of covariance (ANCOVA) was used to analyze the data collected for all the hypotheses.

The finding of the study revealed that;

1. There was a significant effect of teacher modeling strategy on handwriting legibility of pupils with dysgraphia.
2. There was a significant effect of pencil grip on handwriting legibility of pupils with dysgraphia.
3. The result further showed that gender on handwriting legibility of pupils with dysgraphia was not significant as well as gender and teacher modeling strategy on handwriting of pupils with dysgraphia.
4. The result further showed that gender on handwriting legibility of pupils with dysgraphia was not significant as well as gender and pencil grip on handwriting legibility of pupils with dysgraphia.

5 There is no significant main effect of student's gender and treatment effect on handwriting legibility of pupils with dysgraphia.

5.2 Conclusion

Handwriting is the most important tool for learning, and it is very difficult to achieve academic success without being able to write. Thus, teachers should ensure that all pupils are able to develop their writing skills to the best of their abilities that will prepare them for life. Instructional remediation is one of the important techniques use in improving handwriting legibility of pupils with dysgraphia. Based on the findings, it was concluded that the results of the finding revealed that, there was a significant effect of teacher modeling, use of pencil grip, and motor training skills on handwriting legibility of pupils with dysgraphia in primary schools. The result shows no significant effect of gender on handwriting legibility of pupils with dysgraphia in primary schools when taught handwriting legibility using teacher modeling and motor training skills but significant when using pencil grip.

5.3 Recommendations

The following recommendations have been made based on the conclusion of the study.

1. Teacher modeling skill should be adopted in teaching pupils with dysgraphia in primary schools to improve handwriting legibility.

2. Teacher should be encourage to apply pencil grip strategy in teaching handwriting legibility with pupils' with dysgraphia in primary schools in order to improve academic performance in writing ,

3 Teachers should properly plan and organize writing technique to ensure expected result of high achievement without minding the challenges associated with the use of the writing techniques.

4. School administrators should provide in-service training for their teachers; especially, English language teachers in identifying and making use of the different reading techniques. This should be done because most teachers do not have knowledge of these techniques and therefore cannot teach pupils with dysgraphia adequately, this will help curb handwriting deficiencies, and improve academic performance.

5.4 Suggestions for further research

The following suggestions are made for further studies.

1 This research should be carried out to cover more than one state in order to increase the sample size, so that a wider generalization can be drawn.

2 A replication of the study with either same or different population to compared with the present findings before generalizing the finding.

3 A further study should be carried out on the same issue but this time using different variables from those used in the present study.

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