

OCCUPATIONAL THERAPY EVIDENCE-BASED HANDWRITING HANDBOOK  
FOR CAREGIVERS OF PRIMARY SCHOOL-AGED CHILDREN, AGES FOUR-  
SEVEN

A Thesis submitted to the faculty at Stanbridge University in partial fulfillment of the  
requirements for the degree of Master of Science in Occupational Therapy

by

Gabriela Aguilar, Gabriela Badillo, Karen Dorantes, and Andrea Orozco

Thesis Advisor: Naomi Achondo OTD, OTR/L, SWC

July 15, 2023

© 2023  
Gabriela Aguilar, Gabriela Badillo, Karen Dorantes, and Andrea Orozco  
ALL RIGHTS RESERVED

## Certification of Approval

I certify that I have read the *Occupational Therapy Evidence-based Handwriting Handbook for Caregivers of Primary School-Aged Children, Ages Four to Seven*, by Gabriela Aguilar, Gabriela Badillo, Karen Dorantes, and Andrea Orozco; this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy at Stanbridge University.



---

Naomi Achondo, OTD, OTR/L, SWC

Instructor of Occupational Therapy

ACCEPTED

---

Myka Persson, OTD, OTR/L

Program Director, Master of Science in Occupational Therapy

## **Acknowledgments**

The authors are grateful to our families' everlasting support throughout this process.

## **Abstract**

Children often experience common issues or difficulties in handwriting, and these challenges differ according to different age groups and can vary from grip strength to fine motor skills. Children are taught how to write during their first years of primary school due to the rapid development of in-hand manipulation skills between the ages of three and seven. This project aimed to create a handwriting handbook using previous evidence-based literature for children between the ages of four to seven years old that caregivers could use to help develop and improve handwriting skills in children. A thorough evidence-based literature review was conducted to determine the fundamental skills that affect primary school-aged children's handwriting development. The skills identified for the project were fine motor, visual perceptual, and visual motor skills. Upon developing this handbook, the student researchers utilized the Person-Environment-Occupation (Law et al., 1996) model for understanding better the relationship between a caregiver, the different settings, and the child's occupation of handwriting. The handwriting handbook includes different worksheets to support developing and improving children's fine motor, visual perceptual, and visual motor skills essential for proper handwriting. The validity of the handwriting handbook will not be known at this time as it will not be disseminated or tested on human subjects.

## Table of Contents

Introduction.....	1
Statement of Problem.....	1
Statement of Purpose.....	2
Literature Review.....	3
Teacher and Occupational Therapist Collaboration .....	4
Gaps in Research.....	6
Theoretical Framework.....	7
Methodology.....	7
Design and Formatting.....	8
Strategies.....	8
Worksheet Integrations.....	9
Inclusion of Guidelines and Resources.....	9
Developmental Milestones.....	9
Fine Motor Skills.....	10
Visual Perceptual Skills.....	12
Visual Motor Skills.....	14
Inclusion and Exclusion Criteria.....	15
Possible Limitations of the Project.....	16
Discussion.....	16
Implications for Occupational Therapy.....	16
Ethical and Legal Considerations.....	17
Conclusion.....	17

References.....20

Appendix A: The Scribble to Script Adventure Fun and Creative Handwriting Handbook  
for Kids.....24

Appendix B: Research and Grant Writing Committee Approval.....66

## **Occupational Therapy Evidence-Based Handwriting Handbook for Caregiver of Primary School-Aged Children, Ages Four-Seven**

Challenges in handwriting could have a negative effect on students' academic performance; for that reason, children are often referred to an occupational therapy practitioner (OTP) in school settings (Engel et al., 2018). A study by Weintraub et al. (2009) focused on occupational therapy (OT) school-based interventions and emphasized the importance of preparatory components needed to perform handwriting. One component was fine motor ability. Weintraub et al. observed a common lack of fine motor skills among primary school children who showed deficits in handwriting. Moreover, handwriting impairments have been linked to reduced memory capacity and low reading skills, suggesting that handwriting difficulties early in life can impair learning and school performance (Engel et al., 2018). In addition, many schools do not have a formal handwriting program or handbook that provides structure and follows a developmental progression for skill acquisition (Schlagal, 2014). Proper handwriting skills are necessary for school success, as writing is essential to learning. Therefore, providing evidence-based handwriting programs or handbooks for primary school-aged children, ages four to seven, could be beneficial in increasing their motor skills and cognitive abilities.

### **Statement of Problem**

Research indicates that children often experience issues or difficulties in handwriting. The challenges differ depending on age groups and can vary from grip strength to fine motor skills (Lin et al., 2019). Handwriting impairments in children are due to a lack of fine motor skills, gross motor skills, cognitive and perceptual motor



skills, and visual motor integration (Ohl et al., 2013). These skills enable a child to control writing tools, make controlled or calculated movements for letter formation, spacing, and overall legibility, and help individuals process and interpret visual information. However, a lack of these skills could lead to handwriting impairments. Such impairments were linked to reduced memory capacity, low reading skills, impaired learning, and school performance (Engel et al., 2018). Furthermore, developing and refining these skills through practice, instruction, and targeted interventions can improve handwriting abilities in individuals of different ages.

Our project aimed to target fine motor skills, visual perceptual skills, and visual motor skills by creating a handwriting handbook for caregivers of primary school-aged children. This handwriting handbook could easily be accessible for caregivers and teachers who will facilitate handwriting interventions for children to improve their handwriting skills. Furthermore, the American Occupational Therapy Association's (2017) "Vision 2025" states, "Occupational therapy maximizes health, well-being, and quality of life for all people, populations, and communities through effective solutions." We attempted to accomplish this vision by offering caregivers and teachers an accessible, concise, evidence-based handwriting handbook that maximizes the child's ability.

### **Statement of Purpose**

We aimed to create a handwriting handbook for four to seven-year-olds to enhance their fine motor, visual motor, and visual perceptual skills. Our primary focus was on those skills that play a crucial role in handwriting development. By creating the handbook, we sought to provide a solid foundation in those skills to promote their overall handwriting abilities and promote academic success. Included in the handbook, we also

created accompanying worksheets for children to complete. The handbook could be a valuable tool for caregivers to support and guide their children toward successful handwriting. The handbook has clear instructions that can be quickly followed and explained to children on how to complete each worksheet.

The handbook was purposefully organized and supported by evidence-based literature. We included information about the developmental milestones of hand grasps and handwriting to help caregivers understand whether a child's skills are developing at an appropriate pace. Evidence-based literature allowed us to identify effective strategies, underlying issues, and developmentally appropriate content for the creation of the handwriting handbook.

### **Literature Review**

Studies identified hand grip and pinch strength as essential components in developing pencil control, handwriting legibility, and independence concerning functional fine motor tasks. According to Schneck and Amundson (2010), the primary reasons for referring a student to a school-based OTP are typically related to fine motor skills and handwriting difficulties. Handwriting involves a complex integration of cognitive and perceptual motor abilities, which requires a combination of fine motor skills (Ohl et al., 2013). Handwriting legibility is considered a handwriting skills deficit due to visual-motor integration. Fine motor and visual-motor integration skills are essential for kindergarten performance and predict later achievement. A study by Hwang et al. (2020) further supports this idea, the study found that participants who scored lower on their fine motor, visual-perceptual, and visual-motor integration tests had an increased risk of having poor handwriting later in life.

Another study researched the correlation between handwriting legibility and visual-motor skills, and the findings showed no significant effects between the two (Howe et al., 2013). Klein et al. (2011) researched the relationship between fine-motor, visual-motor, visual perceptions, and handwriting legibility. They suggested that a top-down framework should be used to examine the occupation of handwriting to consider additional factors that can impact students' handwriting. This framework would consider the potential interactions between the child, the task, and the environment. After making these assessments, the framework can help determine interventions by providing appropriate handwriting strategies to accommodate motor and perceptual skills difficulties.

### **Teacher and Occupational Therapy Practitioner Collaboration**

The importance of ongoing OTP and teacher collaboration when developing appropriate educational goals and handwriting teaching methods for children with complex individual needs is another critical area to be addressed. In 2015, Patton et al. reported that OTP involvement during the beginning stages of teacher education and continuing professional development is recommended to increase collaboration and understanding between the professions, along with pre/post-qualification education opportunities. Their research demonstrated how beneficial it is for teachers and OTPs to collaborate in applying a new handwriting teaching method. In the classroom OTPs serve as a support system for teachers to further enhance student performance, particularly in handwriting intervention. Nye and Sood (2018) further elaborate on the importance of teacher and OTP relationships by interviewing kindergarten teachers. The study found that teachers emphasized the need for formal training by OTPs in handwriting instruction

and the development of a handwriting curriculum to support the needs of their students better. The participants felt the positive impacts of OTPs in the classroom in improving the development of fine motor skills.

There are various approaches OTPs use when it comes to treating fine motor and handwriting difficulties in children. A study conducted by Case-Smith et al. (2014) investigated the effectiveness of a handwriting and writing program, Write Start, taught together by teachers and OTPs for first-grade children. The intervention included a first-grade teacher and an OTP working on the same group of children for two weekly sessions for twelve weeks. The OTP and teacher worked closely to implement letter formation, using modeling techniques and consistent verbal and visual cues. Frequent feedback from both instructors was consistently given to the students, and collaboration on changes was made according to both the teacher and OTP's observations. The findings reflected that students who completed the Write Start program taught by both professionals improved their handwriting legibility and speed more than those in the group that received standard instruction. Another study by Piller and Torrez (2019) examined OTP's role in treating fine motor skills in children with handwriting difficulties. In this study, a multisensory and a motor approach were the two most commonly used treatment methods for handwriting difficulties in school-aged children.

Based on our review of the literature, we can conclude that there is a moderate amount of evidence that suggests fine motor and visual-motor integration skills are essential for increasing handwriting legibility in primary-aged students (Ohl et al., 2013; Patton et al., 2015; Case-Smith et al., 2014). However, studies are uncertain on the overall correlation between visual-motor skills and handwriting legibility, but do support

the intervention of fine motor integration (Howe et al., 2013). Strong evidence exists for teacher and OTP collaboration when increasing handwriting speed and legibility in primary-aged students. The literature supports fine motor integration interventions with the collaboration of teachers and OTPs but does not support using visual-motor integration skills as a predictor of handwriting.

### **Gaps in the Research**

Upon completion of the literature review, we found a gap with the collaborative teaching strategies that are currently available for caregivers to help in the development of their school-aged children's handwriting. The study conducted by Case-Smith et al. (2014) examined the effectiveness of a handwriting program co-taught by teachers and OTPs. However, this study had limitations due to the method that was used. Participants in the study were not assigned to a randomized group and have affected the overall results. The drawback of a nonrandomized design is the limited ability to guarantee comparability of the intervention and control group. The validity of the study does not take into account potential biases and effectiveness of the handwriting program with a larger population of children not in the first grade. The study also does not offer any teaching guides or strategies for a parent to be able to utilize within the home. Patton et al. (2015) also noted the importance of teacher and OTP collaboration when applying new handwriting teaching methods. While teachers did report finding the collaborative relationship with OTPs useful, they found difficulty with how to use the curriculum to meet each student's complex needs. A lack of research remains on how current handwriting teaching strategies utilized in the classroom can be used by caregivers in the home setting to better assist with the development of their child's handwriting skills.

### **Theoretical Framework**

The theoretical model for this handwriting handbook project was the Person-Environment-Occupation (PEO) model (Law et al., 1996). The PEO model highlights the relationship between the environment, a person or group, and occupation and how they impact occupational performance over time (Bray & Capilouto, 2021). By adopting the PEO framework, we considered the child as the person, the home setting as the environment, and handwriting as the occupation in creating our handbook. The handbook was designed with careful attention for children in that age group who experience deficits in handwriting skills. The accompanying worksheets were age appropriate, could all be completed in a home setting, and targeted to improve fine motor, visual perceptual, and visual motor skills. Environmental factors were addressed in the handbook by providing detailed instructions on how to set up the environment for the child for each section. The PEO framework emphasizes how the person and environment together impact the development of handwriting skills. Overall, the integration of the PEO framework into the creation of the handwriting handbook ensured a holistic approach that considered the child, home setting, and handwriting as an occupation to promote the development of handwriting skills among primary school-aged children four to seven years old.

### **Methodology**

Creating the handwriting handbook involved several steps to ensure accuracy based on evidence-based literature. An extensive review of evidence-based literature was conducted to identify critical areas supporting handwriting skills development, including mechanics of handwriting, pre-handwriting, fine motor skills utilization, and other

foundational aspects. Relevant studies and research findings were gathered to form the handbook's content.

### **Design and Formatting**

We used Canva (<https://www.canva.com>), a web-based design tool as the platform for creating the handbook. Its versatile design features facilitated the development of visually appealing and engaging materials. Canva allowed us to use different colors, shapes, figures, and fonts when designing our worksheets. Additionally, using this website helped us upload our own hand-drawn drawings/figures when necessary. The layout and formatting were carefully crafted to enhance readability and accessibility for the target audience. The pages designed for caregivers were created to be easy for anyone to follow without any required training. The activity worksheets were created with the child in mind, with each worksheet being colorful and fun. Our handwriting handbook was organized by first a table of contents, followed by three sections targeting three main handwriting skills that were further down broken into red flags to look out for, a page with the materials necessary and instructions for the activity, followed by the worksheets necessary to complete the activity. We found this organization of our handwriting handbook to be straightforward and easy to follow.

### **Strategies**

The handbook incorporates intervention strategies derived from evidence-based literature. These strategies were designed to improve fine motor, visual perceptual, and visual motor skills, all crucial for handwriting proficiency. By incorporating evidence-based interventions, we ensured the handbook's efficacy in promoting skill acquisition and improvement.

### **Worksheet Integration**

The handbook includes a range of interactive worksheets targeting various aspects of handwriting. These worksheets include letter tracing, word recreation, cut-and-paste exercises, and coloring by number. Each activity aims to reinforce the foundation skills necessary for developing, improving, or strengthening handwriting abilities.

### **Inclusion of Guidelines and Resources**

The handbook provides comprehensive guidelines on its usage, offering insights into teaching-learning moments, grasp and handwriting development milestones, red flags to be mindful of, and activities/worksheets for each foundational skill. These guidelines and resources could assist educators and caregivers in correctly using the handbook for handwriting instruction. The handwriting handbook was thoughtfully crafted, drawing from evidence-based literature and incorporating intervention strategies supported by research. We included a variety of worksheets, guidelines, and resources to provide a comprehensive resource to promote handwriting skills development in primary school-aged children ages four to seven years old.

### **Developmental Milestones**

Children typically begin to develop a pincer grasp at about ten months old as they begin to use a thumb-finger grasp to hold small objects. This grasp requires the tips of the pointer finger and thumb to hold onto an object (Greutman, 2023). At age four, the child should develop a three-fingered grasp, known as a tripod grasp (Schwellnus et al., 2012). This type of grasp pattern is critical for a child to develop, as it is used daily for feeding, dressing, and writing tasks. A tripod grasp is demonstrated as holding the pencil between the thumb and index finger pads, and the middle finger supports and stabilizes the pencil.



The tripod grasp enables enhanced control and precision when participating in writing activities (Schwellnus et al., 2012). Frequent opportunities to handle small or thin objects with control can help a child improve their tripod grasp. As a child's dexterity and fine motor skills develop, their ability to use a tripod grasp strengthens. The dynamic tripod grasp is typically developed from ages four to six (Schwellnus et al., 2012). It is considered a more refined version of the tripod grasp. The child uses their fingers to move their writing tool while the thumb provides stability. That grasp type is vital for precise control and fluid movement during writing tasks. A lateral pinch grasp is usually developed from 5 to 6 years old. The lateral pinch grasp is demonstrated as using the thumb and the lateral side of the index finger to hold and manipulate objects. It is used for holding thin objects, such as pencils or chopsticks.

Handwriting development milestones provide a general guideline for the expected progression of skills during early childhood. It is important to note that the ages at which each child will achieve these milestones may vary. At ages three to four, the child should be able to cut a piece of paper in half and imitate bilateral movements of limbs. The child should be able to copy prewriting lines of different shapes, including vertical, horizontal, and circle. At four to five years old, the child should perform copying and shaping patterns with blocks or beads, imitating a square shape and left/right diagonal lines, and cutting shapes with scissors (Centers for Disease Control and Prevention, n.d). From ages five to six, the child should have developed an efficient grasp of controlling a pencil and writing using various patterns. Children aged six to seven begin to write sentences and paragraphs using correct punctuation and capitalization (Haberfehlner et al., 2023).

### **Fine Motor Skills**

Fine motor deficiencies in primary school-aged children can lead to issues in daily life, including play, self-esteem, and academic performance, such as handwriting. Handwriting and fine motor control involve "the coordination of muscles, bones, and nerves to produce small, exact movements" (Lelong et al., 2021, p. 2). Fine motor skills development is needed for a child to learn how to use the dynamic tripod grasp required for writing. In contrast, poor development of a child's fine motor skills may present as an immature grasp. An immature grasp tends to appear more fist-like and tighter with limited finger movement when writing on paper (Banumathe et al., 2016). As such, the Fine Motor Skills section of the handwriting handbook utilizes activities that properly support a child's hand grip progression.

The Fine Motor Skills portion consists of five worksheets that address the development of primary school-aged children's pencil grip and control, along with step-by-step instructions for a caregiver to instruct the child. The first activity is the "ABCs Chart". It involves having the caregiver model how to draw a letter in the air before subsequently asking the child to copy the same movement with their index finger. It follows a developmental transition into tracing worksheets focusing on following the dotted lines of capital and lowercase letters, respectively. A study by Pfeiffer et al. (2015) specified the importance of utilizing starting points and teaching children how letters must touch the top and bottom lines. This prevents the letter from appearing as though it is floating in between both lines. As such, the next two worksheets incorporate thick, bolded, appropriate-sized boxes, which are visually meant to make the process of letter formation easier for the child.

The following worksheet in the Fine Motor Skills section involves continuing to trace the letters of the alphabet on lined paper. This activity focuses on their force grade when moving a pencil to write. The last activity in this section includes the “Do it Yourself” worksheet, a blank lined paper with faint dots to trace, which serves as a light visual guide. The last activity aims to have a child practice the fine motor skills previously learned without using a prominent model. The objective of implementing a variety of tracing worksheets is to progressively strengthen children's fine motor skills, which are required for handwriting.

The handwriting handbook includes red flags for caregivers. The child may demonstrate difficulty holding a writing utensil with a proper grasp. The handbook will include a section demonstrating the child's appropriate grasp based on age to be used as a guide. They may also show an uncontrolled dynamic of finger movements. A child holding a writing utensil could have excessive or lack of pressure. The child may be unable to guide pencil movements and correct movement errors accurately (Lelong et al., 2021; Vries et al., 2015).

### **Visual Perceptual Skills**

The significance of visual perceptual skills in handwriting development for primary-aged children has been extensively explored within occupational therapy. These skills are crucial in children's interaction with and interpretation of visual stimuli, consequently influencing their capacity to produce legible written work. According to Supawadee (2022), there exists a positive correlation between visual perceptual skills and handwriting abilities, indicating that improvements in visual perceptual skills correspond to enhanced handwriting proficiency. For this section, we included an activity that

requires the use of clay to engage the child's visual perception of the shape and form of the word while simultaneously coordinating their hand movements to replicate it accurately. The activity provides a detailed description of the required materials and caregiver-friendly, step-by-step instructions to guide the child through the process.

In addition, an activity focusing on building blocks with a template is also included in the handwriting handbook. Block activities can contribute to the development of visual perceptual skills in children in several ways. Block activities require children to manipulate and arrange blocks in space, which helps develop their spatial awareness. This skill helps children understand the placement of letters, words, and sentences on a page. It aids them in maintaining appropriate letter size, spacing, and alignment while writing (Chanu et al., 2018). Block activities require children to manipulate and position blocks precisely, enhancing hand-eye coordination. This skill is transferable to handwriting, as it helps children control their hand movements while forming letters and shapes on paper. In addition, block activities require the coordination of visual perceptual with motor skills to manipulate and position blocks accurately. This integration of visual and motor skills is crucial for fluent and efficient handwriting. By honing this coordination through block activities, children can transfer the skill to writing, enabling smoother letter formation and control (Cornhill & Case-Smith, 1996).

By enhancing visual perceptual abilities, children between the ages of four and seven could effectively analyze and interpret visual stimuli, resulting in improved handwriting and academic performance throughout their educational journey. This underscores the importance of integrating activities targeting visual perceptual skills into early childhood interventions to foster optimal handwriting development and subsequent

academic success. Without proper visual perceptual abilities, the child may present with inaccurate formation of letters or numbers and problems with legibility and speed.

Difficulties with paper accuracy may be demonstrated, such as upside-down, uneven, or bumpy writing. Lastly, the child could present unevenness between characters or letter-like differences in size between capital letters (Hong et al., 2020).

### **Visual Motor Skills**

Visual motor skills are one of the skills that play a critical role in the development of handwriting skills in primary-aged children. They provide coordination and integration of visual perception with motor skills. According to Ohl et al. (2013), visual motor skills strongly predict handwriting legibility and relate to academic performance in primary school-aged children. Due to the importance of these skills in later achievement, it is essential to gain the skills and include them in early intervention. In the study by Ohl et al. (2013), primary-aged students were given worksheet-based interventions to improve visual motor skills. The worksheets involved hand-eye coordination, and the results demonstrated effectiveness among improvements in visual motor skills and motor coordination.

The handbook we created incorporated an activity with the focus of enhancing visual motor skills. A copy-and-paste activity was created to involve the integration of visual information with motor responses. The activity requires hand-eye coordination, which is crucial for accurate and controlled movements in handwriting (Ohl et al., 2013). The worksheet provides a list of required materials and a list of red flags to look out for to ensure the child performs the activity correctly. By engaging in a copy-and-paste activity, the child can strengthen their visual perception, fine motor control, hand-eye

coordination, spatial awareness, and visual memory, which all account for developing visual motor skills (Klein et al., 2011).

The next section provides three “color-by-number” worksheets. The worksheets consist of different objects and numbers listed in different areas. There is a key provided with colors selected for specific numbers. The activity enhances visual motor skills, hand-eye coordination, fine motor control, and spatial awareness (Klein et al., 2011). The activity allows primary-aged children to gain the necessary skills and apply them to the precise movements required in handwriting.

The handbook we created provides information about what red flags the caregivers should look out for when performing the worksheets. The first red flag to look out for is that the child may struggle to use their hands or manipulate objects in response to visual stimuli (Cantin et al., 2014). The second red flag is that the child may struggle with tasks that involve precision and control, such as coloring within the lines and writing between the lines on the paper. The third red flag is if the child may struggle with accurately reproducing written material from a board or given text. It is vital to provide a list of red flags to ensure the child will receive the support and guidance to gain the skills.

### **Inclusion and Exclusion Criteria**

Inclusion data for this project included evidence-based OT literature that provided strategies and tools for helping develop and strengthen fine motor and visual perceptual skills, such as hand grip and letter and sentence formation, in primary-aged children. Research that includes teachers, caregivers, and teaching handwriting strategies to primary school-aged children in different settings will also be included. The exclusion

criteria for our project are evidence-based literature that includes research on students under the age of four and over the age of seven.

### **Possible Limitations for the Project**

Despite its strengths, this project also has some limitations. One of them is that since the handbook will not be disseminated at this moment, there will be no way to determine its effectiveness. Due to limited time, we focused solely on creating the evidence-based handwriting handbook. An upcoming thesis group will be responsible for testing the handwriting handbook on subjects. Additionally, the handwriting handbook is only intended for a limited age range. We purposely targeted the age range of 4-7 years due to the importance of acquiring and improving basic handwriting skills, and all our evidence-based research was conducted based on this specific age range. Future research should also focus on implementing the strategies and tools in the handbook on a larger population. There is also limited research on caregivers attempting any of the previously mentioned strategies to assist with improving and developing handwriting skills.

## **Discussion**

### **Implications for Occupational Therapy**

OTPs, as educator partners for teachers and caregivers, may utilize the handwriting handbook according to the client's needs. This handwriting handbook could reinforce the collaboration between OTPs, teachers, and caregivers and its positive effect on children ages four- seven handwriting skills within various settings. A primary school-aged child's caregiver, teacher, or OTP may utilize the handwriting handbook in places like the home, school, or clinical site. OTPs should continue to advocate for their involvement in handwriting curriculums. It is essential for developing handwriting skills

in children that OTPs are made accessible inside and outside the schools for additional practice with the skills involved.

### **Ethical and Legal Considerations**

The ethical considerations for our project include beneficence, fidelity, and veracity. Beneficence is utilized by providing a handwriting handbook to positively impact children's handwriting skills from kindergarten to third grade. Fidelity is highlighted in this project by reviewing and utilizing substantial evidence-based literature articles about the topic. We will include information from the most recent evidence-based research in order to ensure the handwriting handbook's veracity.

### **Conclusion**

This handwriting handbook could effectively target a child's fine motor, visual-perceptual, and visual-motor skills, leading to improved handwriting, which can positively impact academic proficiency by improving school performance (Engel et al., 2018). The collaborative effort between occupational therapists and teachers is crucial in providing comprehensive support to children, ensuring the delivery of evidence-based handouts and techniques that specifically address individual needs. There could be potential for an even more significant impact when the handwriting handbook is implemented in the home by the caregiver as the child could integrate the learned methods into their daily writing practice. Reinforcing these strategies at home could facilitate better retention of the skills and techniques taught at school.

There are still areas that warrant further investigation. Studies in the future could explore the dynamics of collaboration between OTPs and teachers and identify optimal strategies for achieving success. Additionally, investigating the impact of regular at-home



practice with evidence-based handouts on handwriting skills in primary school-based children would provide valuable insights into the long-term effectiveness and sustainability of the intervention. It further supports the Vision 2025 (American Occupational Therapy Association, 2017) as the creation of the handwriting handbook aims to make strategies and tools available for caregivers to maximize primary school-age children handwriting abilities.

In conclusion, the findings of this project support the integration of a handwriting handbook in a home setting to enhance handwriting skills in school-aged children. The collaborative efforts of occupational therapists, teachers, and caregivers and the implementation of evidence-based handouts hold great potential for improving handwriting proficiency. Further exploration and research in this area will contribute to the ongoing development and refinement of interventions to optimize handwriting skills in primary school-based children.

## References

- American Occupational Therapy Association. (2017). Vision 2025. *The American Journal of Occupational Therapy*, 71(3), 7103420010p1.  
<https://doi.org/10.5014/ajot.2017.713002>
- Banumathe, K., Sharma, P., & Binu, V. S. (2016). Methods of handwriting assessment in occupational therapy: A quick reference. *Indian Journal of Physiotherapy and Occupational Therapy - An International Journal*, 10(1), 19-21.  
<https://doi.org/10.5958/0973-5674.2016.00005.8>
- Bray, L. M. P., & Capilouto, G. (2021). Self-determined occupational performance model for children from economically disadvantaged backgrounds. *Canadian Journal of Occupational Therapy. Revue Canadienne D'ergotherapie*, 88(4), 285–293.  
<https://doi.org/10.1177/00084174211035627>
- Cantin, N., Ryan, J., & Polatajko, H. J. (2014). Impact of task difficulty and motor ability on visual-motor task performance of children with and without developmental coordination disorder. *Human Movement Science*, 34, 217–232.  
<https://doi.org/10.1016/j.humov.2014.02.006>
- Case-Smith, J., Weaver, L., & Holland, T. (2014). Effects of a classroom-embedded occupational therapist–teacher handwriting program for first-grade students. *The American Journal of Occupational Therapy*, 68(6), 690–698.  
<https://doi.org/10.5014/ajot.2014.011585>
- Centers for Disease Control and Prevention. (n.d). *CDC's developmental milestones*. U.S. Department of Health & Human Services.  
<https://www.cdc.gov/ncbddd/actearly/milestones/index.html>

- Chanu, H. L., Vig, D., & Saini, S. (2018). Impact of intervention in remediating visual perception skills of urban school children with poor handwriting. *Indian Journal of Health and Well-being*, 9(7), 953-959.  
<https://www.proquest.com/openview/05daab4485ea3b864d404c368de93045/1?pq-origsite=gscholar&cbl=2032134>
- Cornhill, H. & Case-Smith, J. (1996). Factors that relate to good and poor handwriting. *The American Journal of Occupational Therapy*, 50, 732-739.  
<https://doi.org/10.5014/ajot.50.9.732>
- Engel, C., Lillie, K., Zurawski, S., & Travers, B. G. (2018). Curriculum-based handwriting programs: A systematic review with effect sizes. *The American Journal of Occupational Therapy*, 72(3), 7203205010p1–7203205010p8.  
<https://doi.org/10.5014/ajot.2018.027110>
- Greutman, H. (2023, July 30). *Typical pencil grasp development for writing*. Growing Hands-On Kids. <https://www.growinghandsonkids.com/pencil-grasp-development-for-writing.html>
- Haberfehlner, H., de Vries, L., Cup, E. H. C., de Groot, I. J. M., Nijhuis-van der Sanden, M. W. G., & van Hartingsveldt, M. J. (2023). Ready for handwriting? A reference data study on handwriting readiness assessments. *PloS One*, 18(3), Article e0282497. <https://doi.org/10.1371/journal.pone.0282497>
- Hong, Q., Jiang, B., Xu, Q., Zhang, L., Ou, J., Zhang, Q., Li, N., Wang, J., Xie, Y., Hua, J., Guo, X., Tong, M., & Chi, X. (2020). Reliability and validity of handwriting test for preschool children (HT-PRE): A new tool to assess the handwriting ability of

preschool children aged 5–6 years old in mainland China. *PloS One*, *15*(3), 1–18.

<https://doi.org/10.1371/journal.pone.0229786>

Howe, T.-H., Roston, K. L., Sheu, C.-F., & Hinojosa, J. (2013). Assessing handwriting intervention effectiveness in elementary school students: A two-group controlled study. *The American Journal of Occupational Therapy*, *67*(1), 19–26.

<https://doi.org/10.5014/ajot.2013.005470>

Hwang, Y.-S., Su, P.-F., Hsiao, Y.-L., Tsai, W.-H., & Hung, J.-Y. (2020). Developing a nomogram model to predict the risk of poor Chinese handwriting in first grade. *The American Journal of Occupational Therapy*, *74*(5), 1–8.

<https://doi.org/10.5014/ajot.2020.038711>

Klein, S., Guiltner, V., Sollereeder, P., & Cui, Y. (2011). Relationships between fine-motor, visual-motor, and visual perception scores and handwriting legibility and speed. *Physical & Occupational Therapy in Pediatrics*, *31*(1), 103–114.

<https://doi.org/10.3109/01942638.2010.541753>

Law, M., Cooper, B. A., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The person-environment-occupation model: A transactive approach to occupational performance. *Canadian Journal of Occupational Therapy*, *63*(1), 9-23.

<https://doi.org/10.1177/000841749606300103>

Lelong, M., Zysset, A., Nievergelt, M., Luder, R., Götz, U., Schulze, C., & Wieber, F. (2021). How effective is fine motor training in children with ADHD? A scoping review. *BMC Pediatrics*, *21*(1), Article 490. [https://doi.org/10.1186/s12887-021-](https://doi.org/10.1186/s12887-021-02916-5)

[02916-5](https://doi.org/10.1186/s12887-021-02916-5)

- Lin, Y.-C., Chao, Y.-L., Hsu, C.-H., Hsu, H.-M., Chen, P.-T., & Kuo, L.-C. (2019). The effect of task complexity on handwriting kinetics. *Canadian Journal of Occupational Therapy /Revue Canadienne D'Ergothérapie*, 86(2), 158–168.  
<https://doi.org/10.1177/0008417419832327>
- Nye, J. A., & Sood, D. (2018). Teachers' perceptions of needs and supports for handwriting instruction in kindergarten. *The Open Journal of Occupational Therapy*, 6(2). <https://doi.org/10.15453/2168-6408.1411>
- Ohl, A. M., Graze, H., Weber, K., Kenny, S., Salvatore, C., & Wagreich, S. (2013). Effectiveness of a 10-week tier-1 response to intervention program in improving fine motor and visual-motor skills in general education kindergarten students. *The American Journal of Occupational Therapy*, 67(5), 507–514.  
<https://doi.org/10.5014/ajot.2013.008110>
- Patton, S., Hutton, E., & MacCobb, S. (2015). Curriculum differentiation for handwriting and occupational therapy/teacher partnership: Collaboration or conflict? *Irish Educational Studies*, 34(2), 107-124.  
<https://doi.org/10.1080/03323315.2015.1032994>
- Pfeiffer, B., Rai, G., Murray, T., & Brusilovskiy, E. (2015). Effectiveness of the size matters handwriting program. *OTJR: Occupation, Participation and Health*, 35(2), 110–119. <https://doi.org/10.1177/1539449215573004>
- Piller, A., & Torrez, E. (2019). Defining occupational therapy interventions for children with fine motor and handwriting difficulties. *Journal of Occupational Therapy, Schools & Early Intervention*, 12(2), 210–224.  
<https://doi.org/10.1080/19411243.2019.1592053>

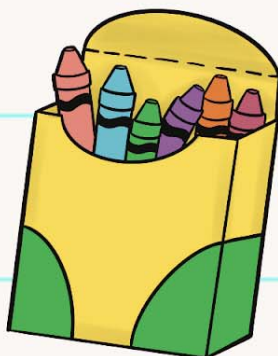
- Schlagal, B. (2014). Best practices in spelling and handwriting. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best Practices in Writing Instruction* (2nd ed., pp. 257-283). Guilford Press.
- Schneck, C. M., & Amundson, S. J. (2010). Prewriting and handwriting skills. In J. Case-Smith & J. C. O'Brien (Eds.), *Occupational therapy for children* (6th ed., pp. 555–580). Mosby Elsevier.
- Schwellnus, H., Carnahan, H., Kushki, A., Polatajko, H., Missiuna, C., & Chau, T. (2012). Effect of pencil grasp on the speed and legibility of handwriting in children. *American Journal of Occupational Therapy*, 66(6), 718–726.  
<https://doi.org/10.5014/ajot.2012.004515>
- Supawadee C. L. (2022). Visual perceptual skills as predictors of handwriting skills of children grades 1-3. *Journal of Occupational Therapy, Schools, & Early Intervention*, 15(3), 265-273, <https://doi.org/10.1080/19411243.2021.1959484>
- Weintraub, N., Yinon, M., Hirsch, I. B.-E., & Parush, S. (2009). Effectiveness of sensorimotor and task-oriented handwriting intervention in elementary school-aged students with handwriting difficulties. *OTJR: Occupation, Participation and Health*, 29(3), 125–134. <https://doi.org/10.3928/15394492-20090611-05>
- Vries, L., Hartingsveldt, M. J., Cup, E. H. C., Nijhuis-van der Sanden, M. W. G., & Groot, I. J. M. (2015). Evaluating fine motor coordination in children who are not ready for handwriting: Which test should we take? *Occupational Therapy International*, 22(2), 61–70. <https://doi.org/10.1002/oti.1385>

Appendix A

The Scribble to Script Adventure: Fun & Creative Handwriting Handbook for Kids



The Scribble to  
Script Adventure:  
Fun & Creative  
Handwriting  
Handbook for Kids



Achondo, Aguilar, Badillo,  
Dorantes & Orozco 2023






## *Table of Contents*




<b>Page 1</b>	Purpose
<b>Page 2</b>	Instructions
<b>Page 3-4</b>	Developmental Milestones of Handwriting
<b>Page 5-6</b>	Developmental Milestones of Grasps
<b>Page 7</b>	Red flags: Fine Motor Skills
<b>Page 8</b>	Tracing Worksheets Instructions
<b>Page 9</b>	ABC chart
<b>Page 10-11</b>	Capital Letters
<b>Page 12-13</b>	Lowercase Letters
<b>Page 14</b>	Trace Your Letters
<b>Page 15</b>	Try it your own worksheet







## *Table of Contents*




<b>Page 16</b>	Red Flags: Visual Perceptual Skills
<b>Page 17</b>	Play-Dough Activity Instructions
<b>Page 18-20</b>	Play-Dough Word Play
<b>Page 21</b>	Blocks Activities Instructions
<b>Page 22</b>	Blocks Activity
<b>Page 23-24</b>	I Can Build an "Hh" Worksheet
<b>Page 25</b>	Red flags: Visual Motor Skills
<b>Page 26</b>	Cut and Paste Activity Instructions
<b>Page 27</b>	Shape Matching Adventure Activity
<b>Page 28</b>	My Fish Bowl Activitiy
<b>Page 29</b>	Color By Number Instructions
<b>Page 30</b>	Cruising Colors Activitiy



## ***Table of Contents***



<b>Page 31</b>	Soaring the Sky Activity
<b>Page 32</b>	Wheels on the Bus Activity
<b>Page 33-37</b>	Adaptation and Modifications
<b>Page 38</b>	Resources



# *Purpose*

This handbook provides guidance, instructions, practice worksheets, and activities for parents and caregivers to help children develop the necessary skills to write legibly and efficiently.

The handbook includes worksheets and activities that can help improve fine motor, eye-hand coordination, manual dexterity and visual motor integration.

# Instructions

## **Step 1: Get Familiar with the Handbook**

Read through the entire handbook before starting any activities. Step by step Instructions are provided to ensure effective use of the handbook.

## **Step 2: Before Starting Worksheets**

Read the red flags for each section and read the worksheets instructions.

## **Step 3: Create a Comfortable Environment**

Set up a comfortable environment where the child can focus.

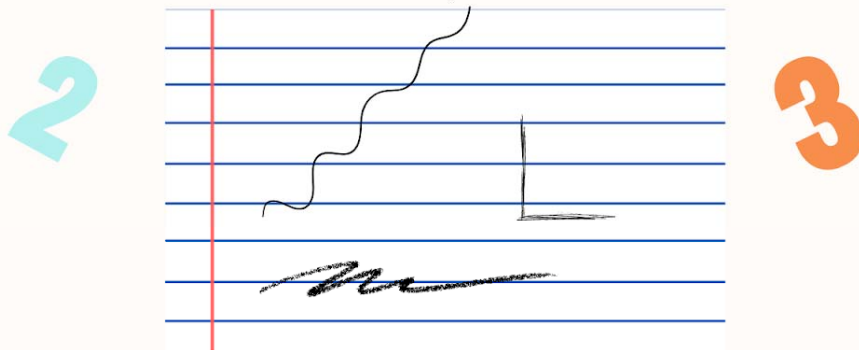
*Example:* Have the child sit in a quiet room with a table to write on and a chair to sit on with their feet firmly planted on the ground.

## **Step 4: Establish a Routine**

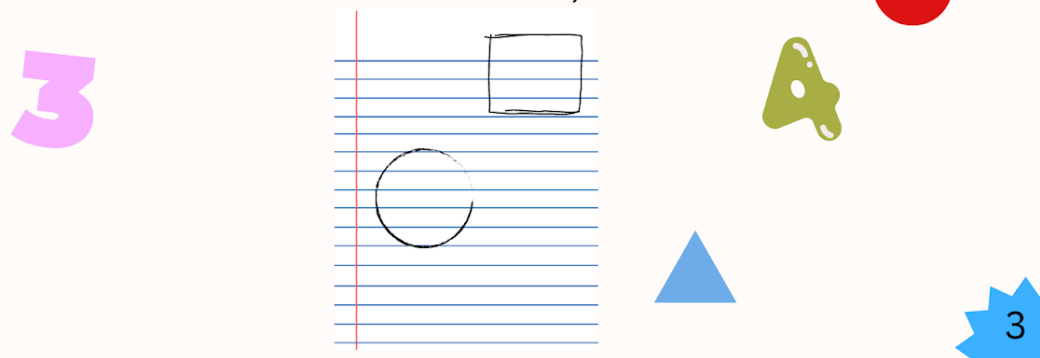
Have the child work on worksheets of choice for 30 minutes a day, 3-5 days a week.

## Developmental Milestones of Handwriting

**Ages 2.5 - 3 years old:** Controlled scribbling normally emerges at this age. At this stage, children start to develop more intentional and controlled scribbles, using different shapes and lines (CDC, n.d.).



**Ages 3 - 4 years old:** Children start to develop the ability to copy shapes and letters, such as circles and lines, and may start to recognize and name some letters (CDC, n.d.).



## Developmental Milestones of Handwriting Continued

**Ages 5-6 years old:** Children learn how to sit properly, handle the pencil properly, and write using various writing patterns before starting to write cursive or block letters in first grade.

5

(Haberfehlner et al., 2023).

6



**Ages 6 - 7 years old:** Writing sentences and paragraphs: Children start to develop the ability to write sentences and paragraphs, using correct punctuation and capitalization (CDC, n.d.).

6



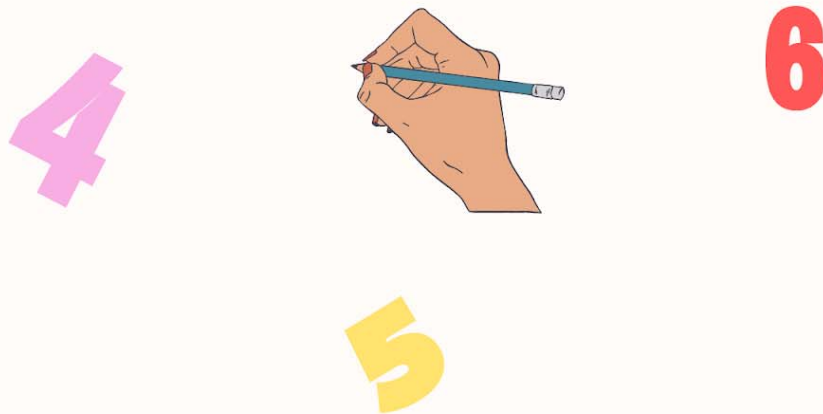
7

## Developmental Milestones of Grasp

**Ages 3-4 years old:** Tripod grasp is typically developed. This is a mature grasp, where the child holds a writing tool with their index finger, middle finger, and thumb (Schwellnus et al., 2012).

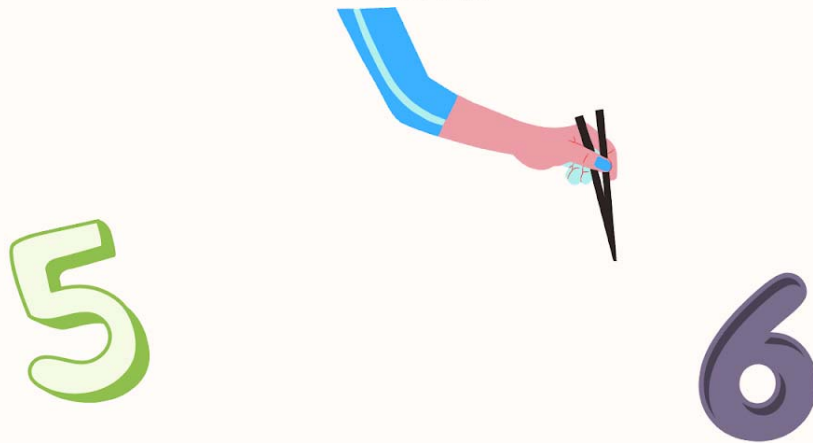


**Ages 4-6 years old:** Dynamic tripod grasp is typically developed. This is a more refined version of the tripod grasp, where the child uses their fingers to move the writing tool while the thumb provides stability. It typically emerges around 4-6 years of age (Schwellnus et al., 2012).



## Developmental Milestones of Grasps continued

**Ages 5 to 6 years old:** Lateral pinch grasp is typically developed. This is a grasp used for holding thin objects, such as pencils or chopsticks, between the thumb and side of the index finger. It typically emerges around 5-6 years of age (Schwellnus et al., 2012).





# Fine Motor Skills

## RED FLAGS:

- ✗ Difficulty in holding writing utensil with an appropriate grip (**refer back to pgs. 6-7**)
- ✗ Uncontrolled dynamic finger movements
- ✗ Excessive or lack of pressure on writing utensil
- ✗ Inability to direct pencil movements and correct errors of movement.

(Lelong et al., 2021).  
(Vries et al., 2015)

# Tracing Worksheets

**You will need:**

- Pencil, crayons, color pencil, or marker, etc.

**Instructions:**

1. Have the child sit in a chair with their feet touching the floor, if not, incorporate a stool for the child to stabilize their feet, and a table to write on for the best ergonomic positioning.
2. First, show the child the letter they will begin working on to familiarize themselves with it.
3. Model for the child how to draw the letter in the air using the ABC Chart worksheet.
4. Model for the child how to grip the writing utensil with the Capital Letter tracing worksheet.
5. Model for the child how to grip the writing utensil and move it smoothly along the lines on paper with the Lowercase Letters worksheet.
6. Be sure to state how much pressure you are using to trace the letter on each worksheet.
7. Have the child write the letters learned on a blank sheet with dotted lines.
8. Lastly, ask the child to write the letters learned on a blank sheet without dotted lines.



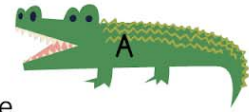
# ABC Chart



First, show the child a letter from the alphabet.  
Then, have them draw the letter in the air using their index finger.

Aa	Bb	Cc	Dd	Ee
Ff	Gg	Hh	Ii	Jj
Kk	Ll	Mm	Nn	Oo
Pp	Qq	Rr	Ss	Tt
Uu	Vv	Ww	Xx	Zz

# Capital Letters



First, trace the capital letter on the box above.  
Then, write the capital letter on the box below.

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O

# Capital Letters



P	Q	R	S	T
---	---	---	---	---

--	--	--	--	--

U	V	W	X	Y
---	---	---	---	---

--	--	--	--	--

Z
---

--

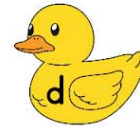
# Lowercase Letters



First, trace the lowercase letter on the box above.  
Then, write the lowercase letter on the box below.

a	b	c	d	e
f	g	h	i	j
k	l	m	n	o

# Lowercase Letters



p	q	r	s	t
---	---	---	---	---

--	--	--	--	--

u	v	w	x	y
---	---	---	---	---

--	--	--	--	--

z
---

--

# Trace Your Letters!



Trace the letters the letters of the alphabet.

Note: State how much pressure the child should use on the writing tool.

Aa Bb Cc Dd

Ee Ff Gg Hh

Ii Jj Kk Ll

Mm Nn Oo Pp

Qq Rr Ss Tt

Uu Vv Ww Xx

Yy Zz



# Try On Your Own!



Write the letters of the alphabet on your own.

Handwriting practice lines consisting of 10 sets of three horizontal lines (top solid, middle dashed, bottom solid).

# Visual Perceptual Skills

## RED FLAGS:

- ✗ May present as incorrect letter or number formation
- ✗ Can present problems with legibility and speed
- ✗ May exhibit problems with poor accuracy on paper (ex: upside down, uneven, bumpy, etc.)
- ✗ Unevenness between characters or letters (ex: difference in size between capital letters)

# Play Dough Activity

You will need:

- Play dough (assorted colors)
- Word Template (pgs 19-21)
- Rolling pin (optional)
- Child-safe knife or plastic utensil (optional)

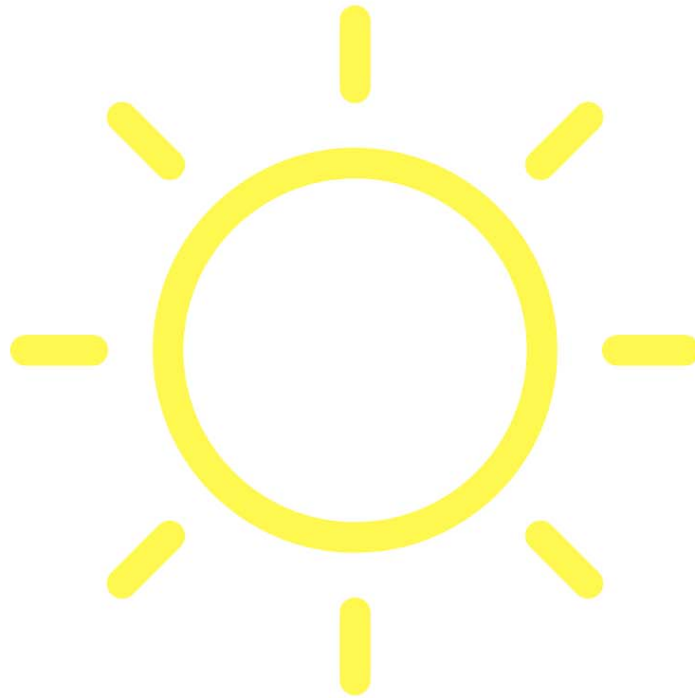
**Instructions:**

1. Begin by selecting the templates that you would like your child to replicate using play dough.
2. Provide your child with different colors of play dough. Encourage them to knead and roll the play dough in their hands to make it soft and malleable.
3. Show your child the word you want them to replicate and help them identify the individual letters that make up the word. Talk about the order of the letters and emphasize any unique features or letter combinations
4. Encourage your child to replicate the word using the play dough. Assist them in shaping and molding the play dough to form each letter of the word accurately. Offer guidance and support as needed.
5. When completed have the child outline the picture using the play dough
6. Repeat the activity with different words, allowing your child to explore and practice forming various words using play dough.



# Play Dough Word Play

Use play dough to form the letters of the word and then recreate the picture



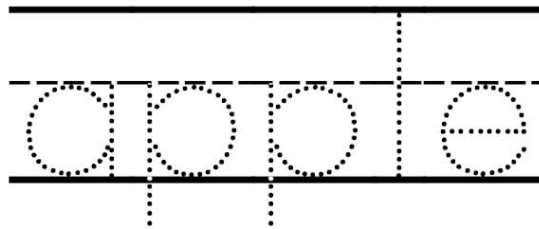
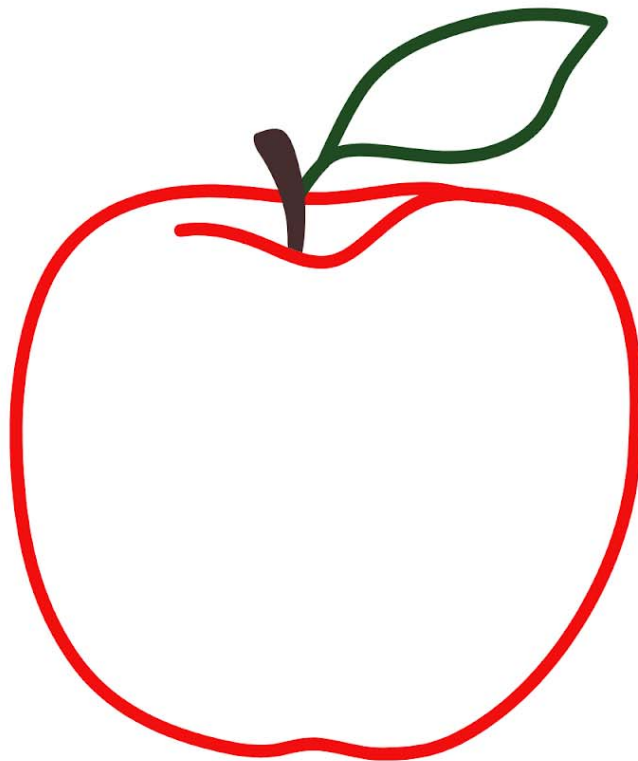
\_\_\_\_\_

sun

\_\_\_\_\_

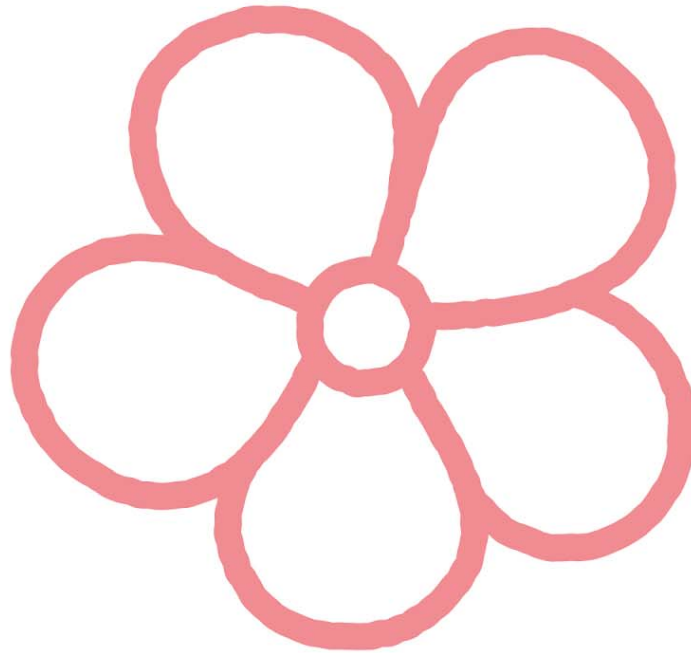
# Play Dough Word Play

Use play dough to form the letters of the word and then recreate the picture



# Play Dough Word Play

Use play dough to form the letters of the word and then recreate the picture



flower

# Blocks Activities

## Materials:

- Blocks of various sizes and/or colors
- Template (provided in the handbook)



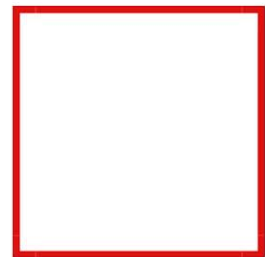
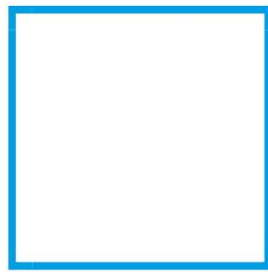
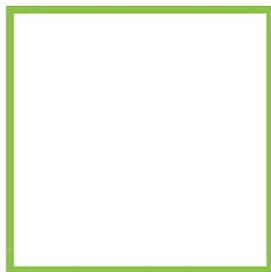
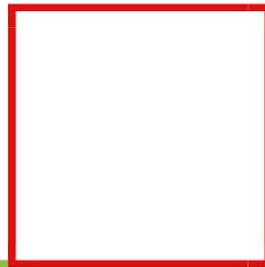
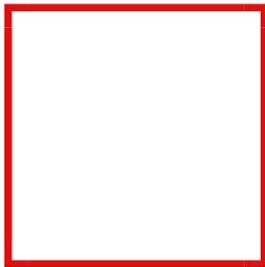
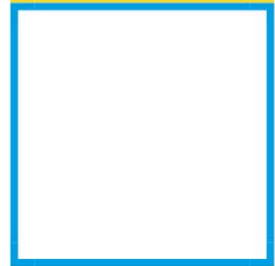
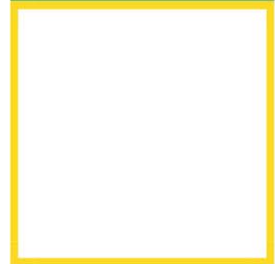
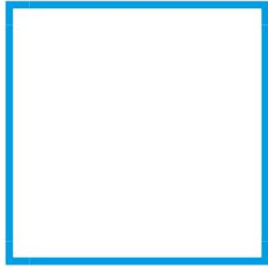
## Instructions:

1. Place the template on a clear flat surface within reach of the participant.
2. Demonstrate how to place the blocks on top of the template to match its shape.
3. Start activity: instruct the child to choose blocks that can be arranged or stacked to match the shape of the template.
4. Once the participant has placed the corresponding blocks on the template, they can either move on to another template OR continue with the same template.

**Note:** To add more challenge, you can introduce time limits, require participants to use specific colors or types of blocks, or even encourage them to create their own design.



Place blocks on top of the template  
below  
\*color matching is optional

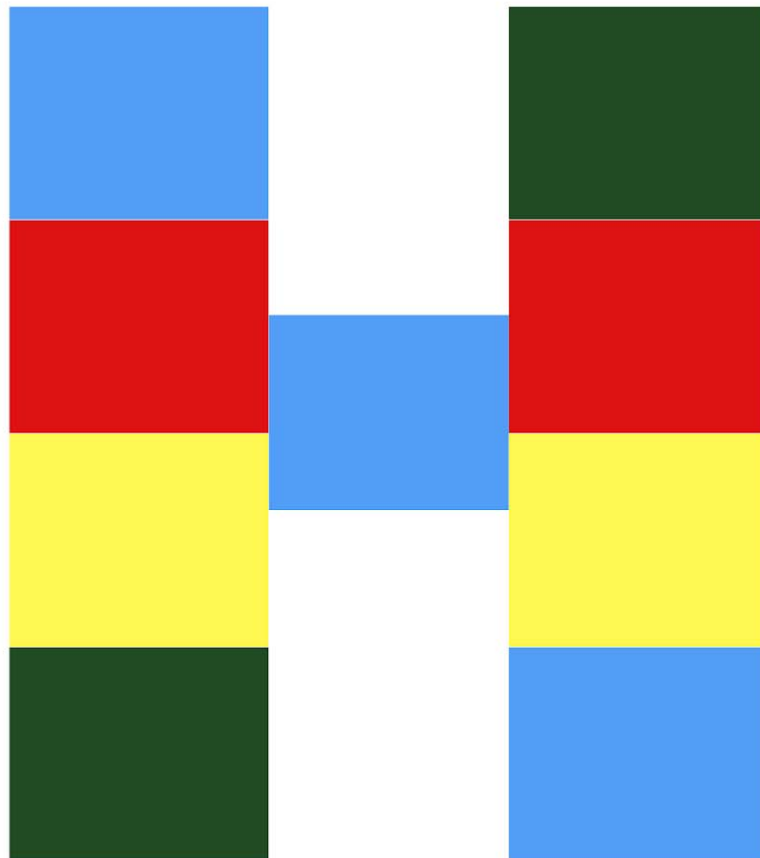






Place blocks on top of the template OR build it in 3D

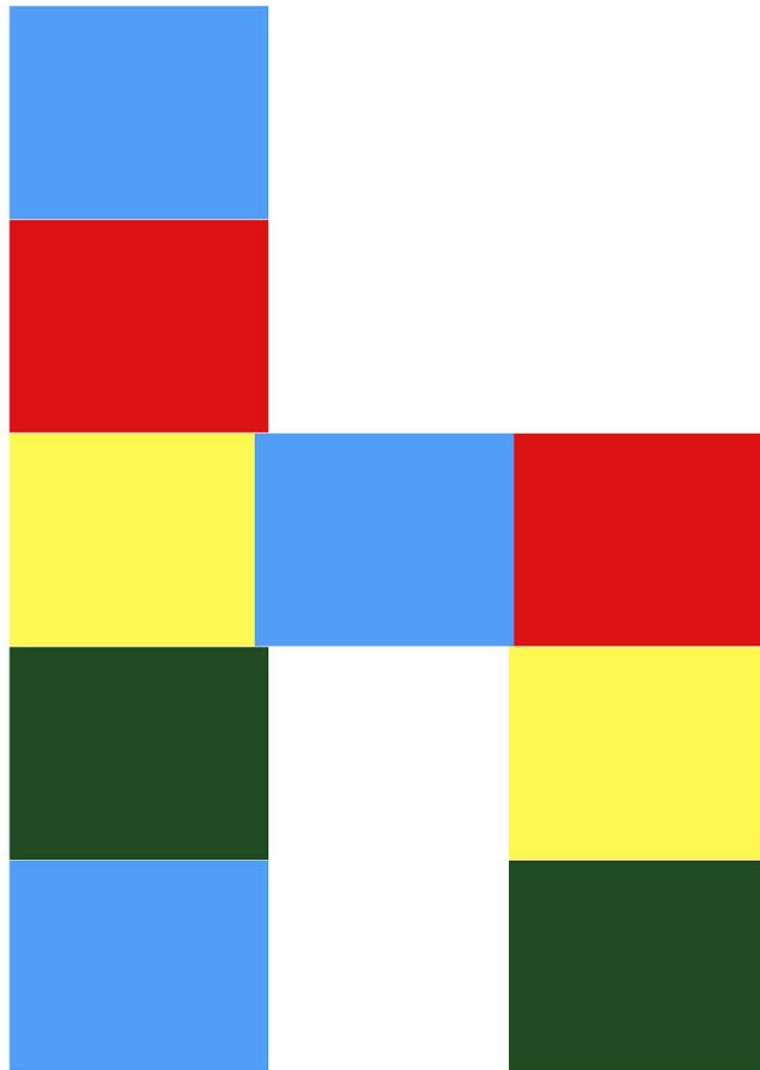
# I can build H





Place blocks on top of the template OR build it in 3D

# I can build h



# Visual Motor Skills

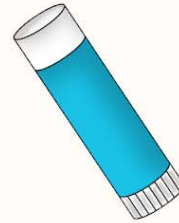
## Red flags to look out for:

- ✗ Children may have difficulty accurately using their hands or manipulating objects in response to visual stimuli.
- ✗ May struggle with tasks that involve precision and control, such as drawing shapes, coloring within the lines, or copying pictures.
- ✗ The child has trouble keeping their writing between the lines on the paper.
- ✗ The child may struggle with accurately reproducing written material from a board or a given text.

# Cut and Paste Activity

## Materials:

- Scissors
- Glue stick or liquid glue
- Worksheets



## Instructions:

1. Gather all materials. Make sure the scissors are age appropriate and safe for the child.
2. Have the child cut out the objects on the paper.
3. Once the child has cut out all objects then match the objects to the picture on top.
4. Once all objects are on the matching picture, ask the child to glue each object one at a time.

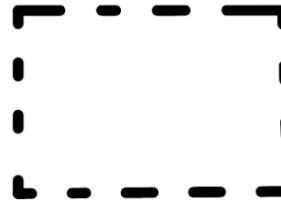
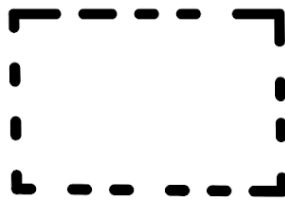
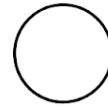
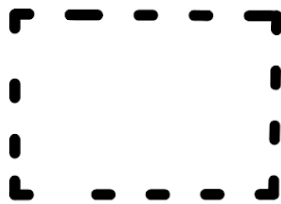
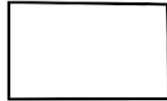
**NOTE:** Make sure child has worksheet on table. Activity could be completed either standing or sitting. Read the directions that are on top of each page. Assist child as needed.



Name: \_\_\_\_\_

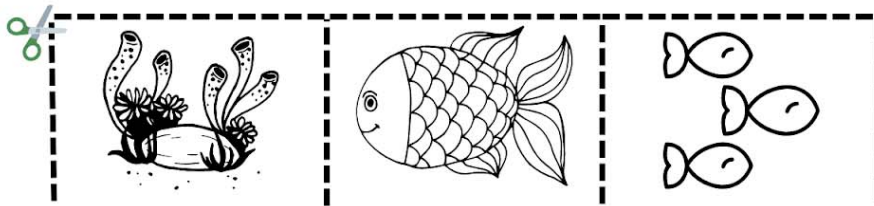
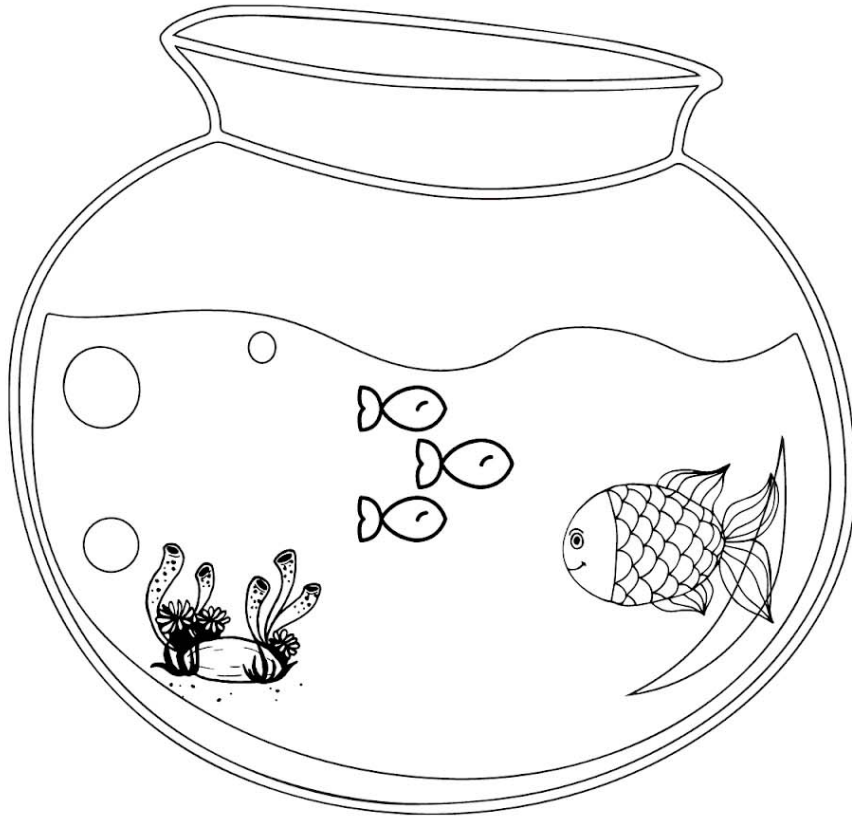
# Shape Matching Adventure

Color the shapes and cut the objects. Then match them to the correct shape!



# My Fish Bowl

Color each object at the bottom, cut objects, and then find the matching object and paste it in the fishbowl



# Color by Number

**Materials:**

- Crayons and/or markers(colors listed on worksheet)
- Work sheet (provided in handbook)

**Instructions:**





1. Have child gather colors needed for activity  
(colors needed are on the worksheets).
2. Explain to the child, that he will have to look closely at the design and locate the numbered areas. Each number corresponds to a specific color.
3. Have the child begin to color the sections by using the color key.

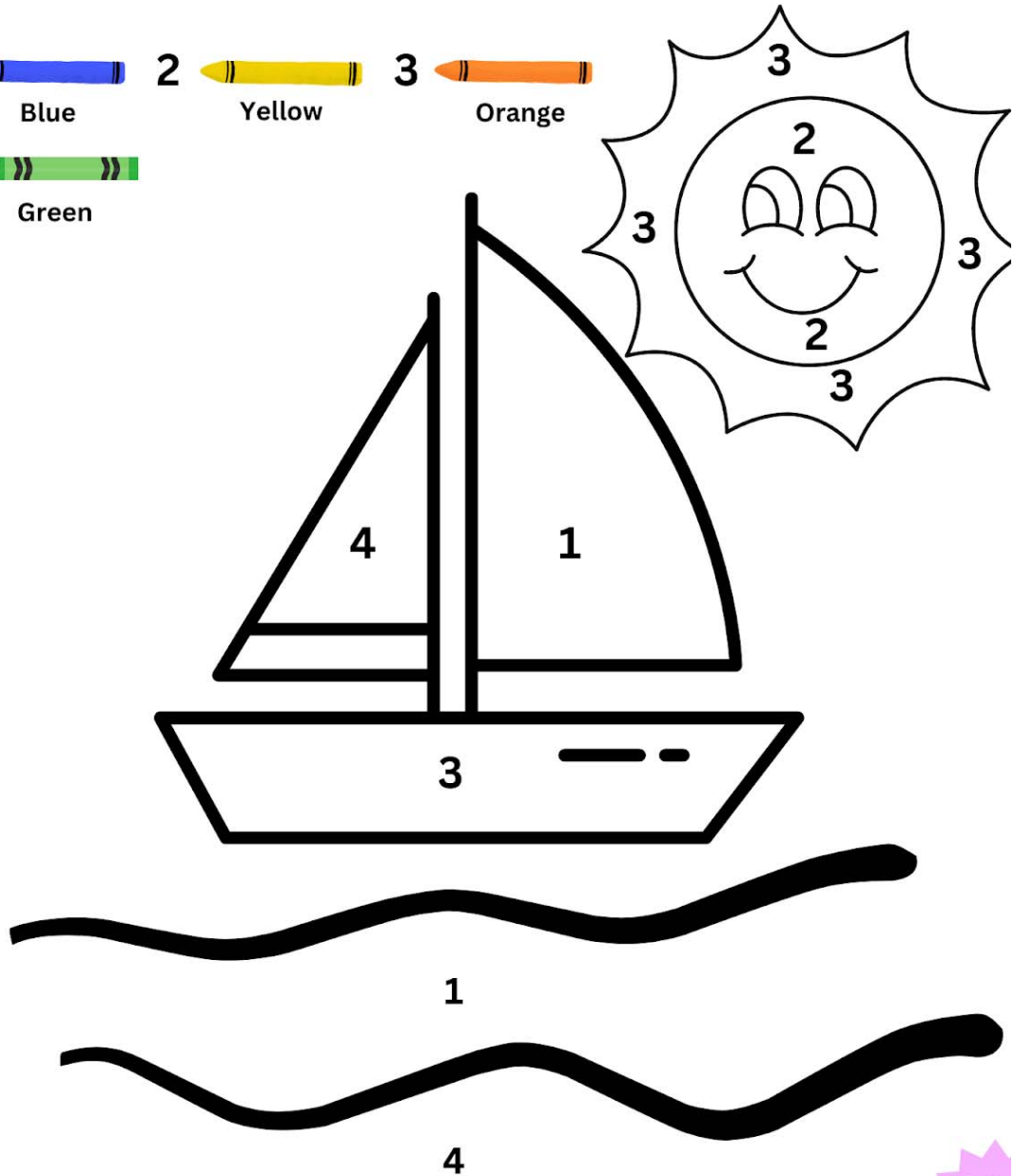
**Note:** Have child complete activity sitting down. To make it fun, the child could add any designs to their colored object!



# Cruising Colors

Color by number, use the key to find the numbers/colors

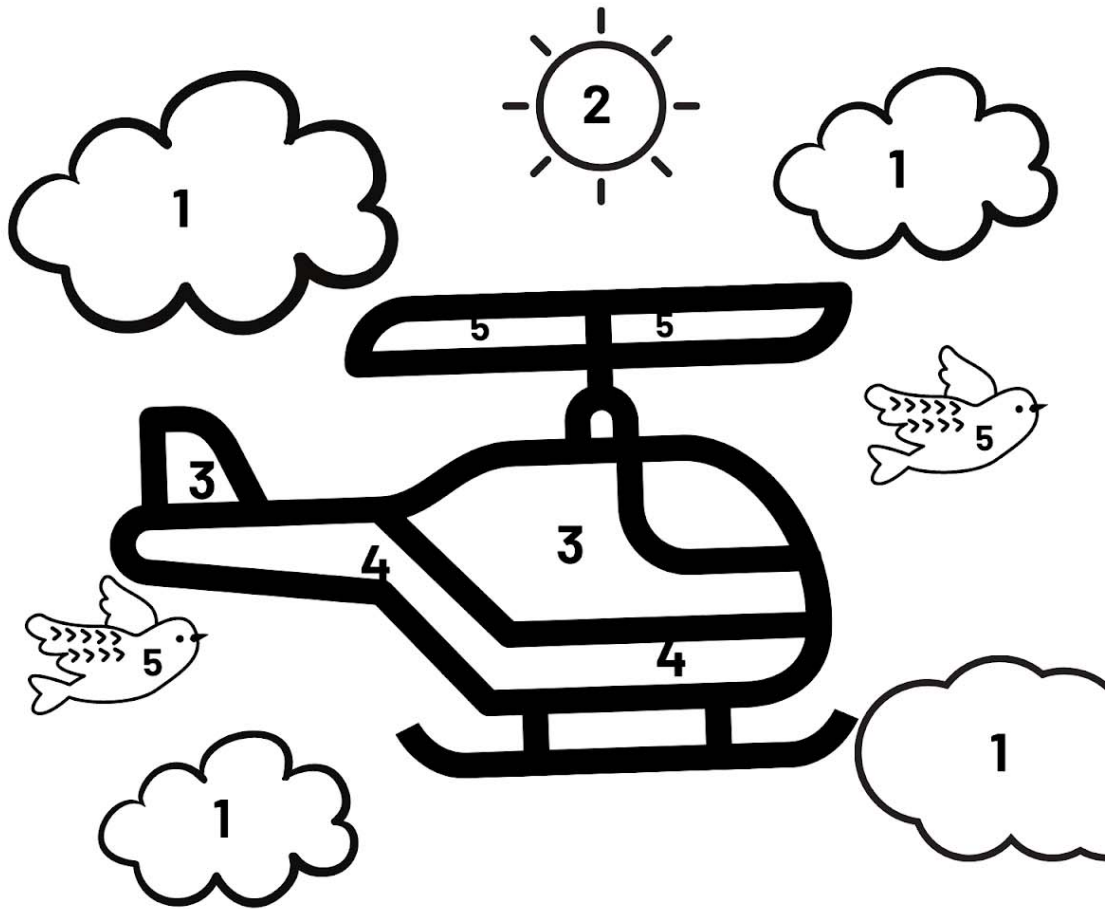
- 1  Blue
- 2  Yellow
- 3  Orange
- 4  Green





# Soaring the Sky

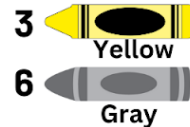
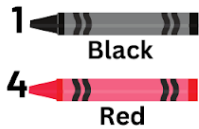
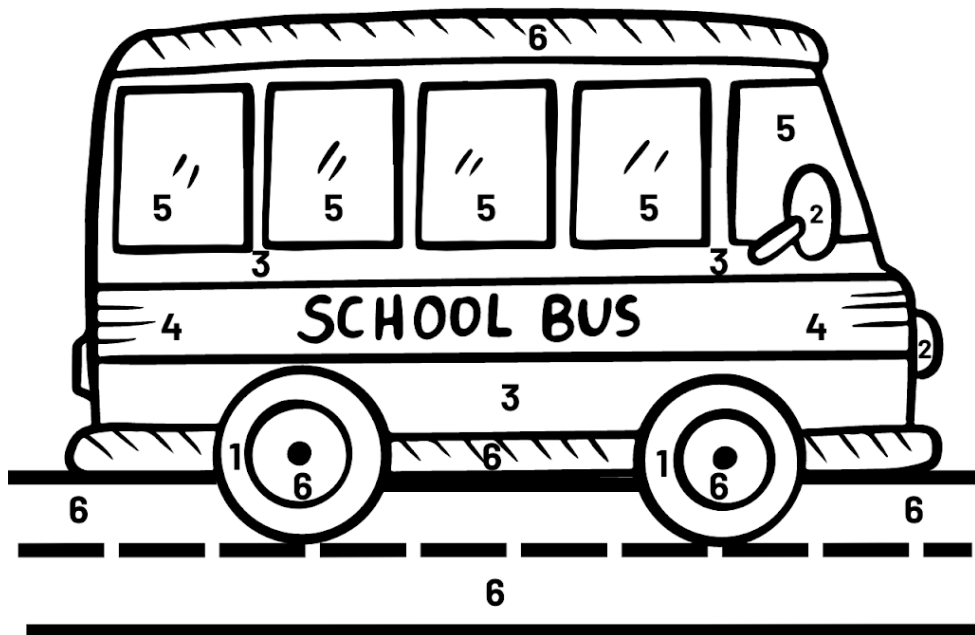
Use the key at the bottom of the page to color the picture.



- 1  Blue
- 2  Yellow
- 3  Orange
- 4  Green
- 5  Black

# Wheels On The Bus

Color by number, use the key to find the numbers/colors



# Adaptations and Modifications

- A highlighted lined paper for 'Try On Your Own' Activity.
- Boxes are shaped according to the letter the child has to trace or write in with 'Capital Letters' and 'Lowercase Letters' worksheet.

# Try On Your Own!

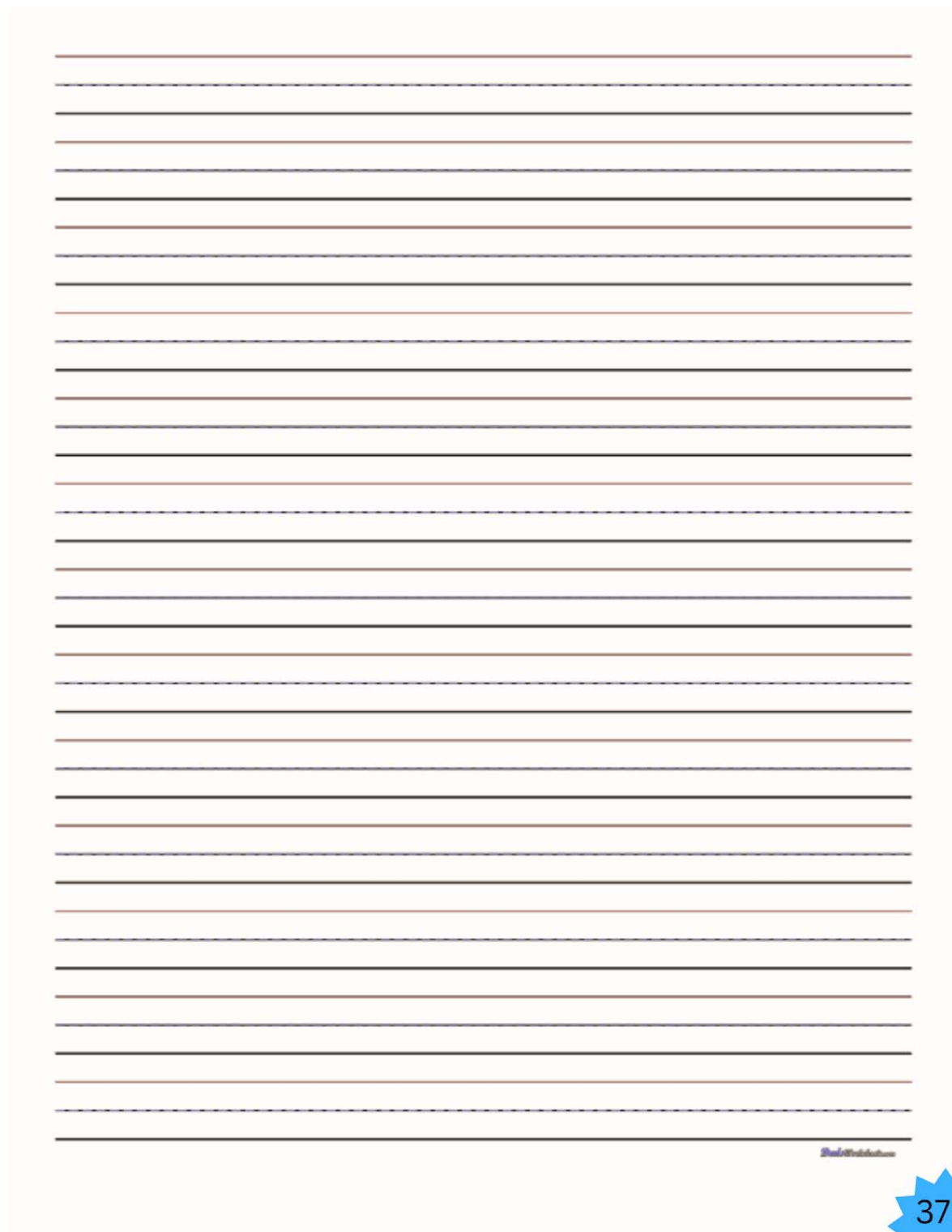
Write the letters of the alphabet on your own.

Handwriting practice lines consisting of four sets of horizontal lines. Each set includes a solid top line, a dashed middle line, and a solid bottom line. The area between the dashed middle line and the solid bottom line is highlighted in yellow.

Handwriting practice lines consisting of a solid top line, a dashed midline, and a solid bottom line. The area between the dashed midline and the solid bottom line is highlighted in yellow.

Handwriting practice lines consisting of multiple sets of horizontal lines. Each set includes a solid top line, a dashed middle line, and a solid bottom line, providing a guide for letter height and placement.

Handwriting




# Resources

- Cantin, N., Ryan, J., & Polatajko, H. J. (2014). Impact of task difficulty and motor ability on visual-motor task performance of children with and without developmental coordination disorder. *Human Movement Science, 34*, 217–232. <https://doi.org/10.1016/j.humov.2014.02.006>
- Centers for Disease Control and Prevention. (2023). CDC's Developmental Milestones. *Centers for Disease Control and Prevention*. <https://www.cdc.gov/ncbddd/actearly/milestones/index.html>
- Haberfehlner, H., de Vries, L., Cup, E. H. C., de Groot, I. J. M., Nijhuis-van der Sanden, M. W. G., & van Hartingsveldt, M. J. (2023). Ready for handwriting? A reference data study on handwriting readiness assessments. *PLoS One, 18*(3), e0282497. <https://doi.org/10.1371/journal.pone.0282497>
- Hong, Q., Jiang, B., Xu, Q., Zhang, L., Ou, J., Zhang, Q., Li, N., Wang, J., Xie, Y., Hua, J., Guo, X., Tong, M., & Chi, X. (2020). Reliability and validity of Handwriting Test for Preschool Children (HT-PRE): A new tool to assess the handwriting ability of preschool children aged 5–6 years old in mainland China. *PLoS One, 15*(3), 1–18. <https://doi.org/10.1371/journal.pone.0229786>
- Lelong, M., Zysset, A., Nievergelt, M., Luder, R., Götz, U., Schulze, C., & Wieber, F. (2021). How effective is fine motor training in children with ADHD? A scoping review. *BMC Pediatrics, 21*(1). <https://doi.org/10.1186/s12887-021-02916-5>
- Schwellnus, H., Carnahan, H., Kushki, A., Polatajko, H., Missiuna, C., & Chau, T. (2012). Effect of Pencil Grasp on the Speed and Legibility of Handwriting in Children. *American Journal of Occupational Therapy, 66*(6), 718–726. Occupational Therapy for Children with Handwriting Difficulties: A Framework for Evaluation and Treatment
- Vries, L., Hartingsveldt, M. J., Cup, E. H. C., Nijhuis-van der Sanden, M. W. G., & Groot, I. J. M. (2015). Evaluating fine motor coordination in children who are not ready for handwriting: Which test should we take? *Occupational Therapy International, 22*(2), 61–70. <https://doi.org/10.1002/oti.1385>



## Appendix B

### Research and Grant Writing Committee Approval




 Dr. Sheila Espina <sespina@stanbridge.edu> 😊 ↩️ ⏪ ⏩ 📅 ...  
To: Gabriela Aguilar; Research and Grant Writing Committee <research@stanbridge.edu> Thu 5/18/2023 8:03 AM  
Cc: Karen Dorantes; Andrea Orozco; Gabriela Badillo; njatherapy01@gmail.com

Good morning,

**Congratulations!** Your application has been reviewed and approved. We look forward to seeing the outcomes of your study.

Sincerely,

**Dr. Sheila Espina, PT** | Lead Physical Therapist & ACCE, Los Angeles  
sespina@stanbridge.edu | P. 626.655.9391 Ext. 5522 | F. 888.882.4216

Orange County | Los Angeles | Riverside

...