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Writing and reading in Montessori preschools in the digital age – A valid teaching approach?

Summary

Writing and reading instruction in Montessori preschools remains consistent despite digital tools. In this article, the validity of Montessori's reading and writing instruction is reviewed and discussed in relation to both previous research and societal changes influenced by technology. In conclusion, initial writing and reading instruction in Montessori preschools receives support from existing research, as it emphasizes sensory-motor experiences, including paper-and-pen activities. However, preschool children's perspectives on the tools used for writing and reading instruction and the work they carry out in Montessori preschools have not yet been considered in research. Therefore, we suggest a need for further studies in order to better grasp the validity of her theory. Such studies could constitute an important contribution to the discussion about when and how writing by hand should be introduced within, as well as outside the Montessori community.

Keywords: digital tools, Montessori, phonics, sensorimotor experiences, writing instruction

Słowa kluczowe: narzędzia cyfrowe, Montessori, fonetyka, doświadczenia sensomotoryczne, nauka pisania

Introduction

Instruction in writing and reading in Montessori preschools has a longstanding tradition and has remained largely unchanged for over a century, despite the development of computers and other digital tools. In Montessori education, the significance of the motor component of writing is underscored, as cognitive processing is viewed as intricately connected with the body (Montessori 1989). Handwriting and the preparation of the hand for handwriting

are therefore emphasized (Montessori 1972). According to Mangen and Balsvik (2016), this contrasts with many traditional preschools and schools in Europe and the US, where children often have their initial writing experiences using digital tools.

The aim of this article is to review and discuss the validity of Montessori's writing and reading instruction based on both previous research and societal changes resulting from technological advancements, among other factors. The research questions this article seeks to answer is the extent to which Montessori's teaching approach to initial writing and reading instruction is supported by existing research, as well as areas where such support may be lacking. Thus, the article also underscores the need for further exploration of this approach.

Montessori's theoretical approach to writing and reading

The preparation for learning to write and read begins in Montessori education during the early preschool years, typically around the age of three to four. Montessori asserted that even at this young age, children display an inclination to express their thoughts in writing (Montessori 1972). Notably, Montessori advocated reversing the traditional sequence of learning to read and write, arguing that the ability to write precedes that of reading a text (Montessori 1972). Therefore, in the Montessori environment, didactic materials are provided with the aim of developing various aspects of fine motor skills necessary for handwriting. These materials are incorporated into exercises designed to engage and coordinate the children's motor skills in diverse ways (Montessori 1914). The exercises systematically increase in complexity over time. For instance, one such activity involves working with cylinder blocks, a sensorial material comprising four blocks containing ten cylinders of differing diameter and length. Children are tasked with lifting, arranging, and replacing the cylinders in their respective cavities. Montessori (1914) asserts that the primary objective of such activities is not for children to learn to place the cylinders correctly but, akin to other sensorial materials, to hone their skills in observation, comparison, assessment, reasoning, and decision-making. Montessori stated that:

> The didactic material, in fact, does not offer to the child the "content" of the mind, but the *order* for that "content." It causes him to distinguish identities from differences, extreme difference from fine gradations, and to classify, under conception of quality and quantity, the most varying sensations appertaining surfaces, colours, dimensions, forms and sounds (Montessori 1914: 136–137).

It concerns an internal goal of attention, which prepares the child to notice differences, such as the shape of letters. Simultaneously, the child is taught to use the correct pen grip, a skill not only trained with the cylinders, but also in various other Montessori materials. This is achieved by gripping the cylinders with the thumb, index, and middle finger. Additionally, the child engages in exercises with other sensorial materials aimed at identifying and recognizing pitch and loudness, which contribute to recognizing phonetic sounds. Practical

exercises for motor skills are also provided, preparing the hand for writing. These include structured materials for pouring exercises (to steady the hand) and whisking exercises (to mobilize the wrist).

Montessori emphasizes other exercises as essential precursors to formal writing. These involve tracing the outlines of wooden geometric shapes using the index and middle fingers. Following this, children progress to using geometric shapes in metal, known as the "Exercises for the Management of the Instrument of Writing" (Montessori 1965: 140). Subsequently, they trace these shapes with a pencil on paper. Finally, children are encouraged to fill in these shapes freehand, incorporating vertical lines, horizontal lines, diagonals (in triangles), and eventually circular shapes (in circles and ovals). This teaching approach ensures that children not only practice vertical lines, which Montessori considers easiest for young learners, but also gradually progress to drawing circular shapes with a pencil.

Once the children have completed this variety of motor and practical exercises, they are introduced to tracing the shapes of letters using didactic materials. These materials consist of letters punched out of sandpaper, each attached to a wooden plate. Also, in this activity Montessori underscores the significance of preparing the child's hand for writing.

> Without the previous practice, however, the child's hand does not follow the letter with accuracy, and it is most interesting to make close observations of the children in order to understand the importance of a *remote motor preparation* for writing, and also to realize the *immense* strain which we impose upon the children when we set them to write directly without a previous motor education of the hand (Montessori 1914: 151).

Using the index and middle finger, the child traces the shape of the letter while simultaneously vocalizing the phonetic sound associated with it. Montessori explains the theoretical rationale behind this procedure, stating, "when a letter is given to a child and its sound pronounced, the child fixes an image of it in his mind with the help of his visual and his tactile-muscular senses" (Montessori 1972: 215). This teaching approach embodies a didactic principle whereby the initial letters presented to children are contrasted with each other. According to Ahlquist Tebano, and Gynther (2019), this principle aligns with variation theory, which assumes that in order to be able to discern something, a varied experience of the aspect in question is thus required.

Once children are acquainted with the shape and sound of all the letters, they progress to using the movable alphabet. This alphabet comprises wooden letters, with vowels coloured pink and consonants blue, allowing for the construction of words. With this material, children identify letters corresponding to individual sounds in different words. Montessori describes how, through this activity children will:

> succeed[s] in breaking them up into their component sounds, and in translating them into a row of signs. When the child has composed the words in this way, he knows how to read them. In this method, therefore, all the processes leading to writing include reading as well (Montessori 1914: 154).

According to Montessori (1914), it is only through working with the movable alphabet that children acquire the skills necessary to write by hand. Simultaneously, as described earlier, they learn to read the words they have written.

Evaluating the Montessori educational framework through recent research

In this section, we will examine what previously has been described in relation to existing research in the field. It is worth noting that research on Montessori's teaching approach to writing and reading in Montessori preschools is relatively limited in scope. Nonetheless, several studies suggest that children in Montessori preschools demonstrate superior performance compared to control groups in terms of letter-word identification and phonological decoding abilities (e.g., Lillard 2012; Lillard, Else-Quest 2016; Lillard, Heise 2016). However, as Marshall (2017) emphasizes, there is still a lack of studies elucidating the underlying reasons for this phenomenon,

> if children in the Montessori group do score higher than those in the non-Montessori group on a particular outcome measure, then assuming that that effect can be attributed to being in a Montessori classroom, what exactly is it about Montessori education that has caused the effect? (Marshall 2017: 3).

What Marshall underscores is that isolating specific elements within the Montessori pedagogic theory inevitably presents methodological challenges for any researcher undertaking such a study. It is reasonable to assume that these challenges, to some extent, contribute to the scarcity of such studies. Therefore, in the following section, we will examine key elements in Montessori's teaching approach to early writing and reading instruction, focusing on what has been identified as effective in general research. Given the extensive body of research in this field, we will prioritize systematic reviews and meta-analyses.

Phonics and systematics

As emphasized earlier, Montessori advocates the ideal timing of early writing and reading instruction during preschool, typically around the age of three to four. However, while considerable research has focused on reading and writing acquisition in school-aged children, there has been relatively limited investigation into these processes during the preschool years. Consequently, in a research overview conducted for the Swedish Research Council, the authors underscore the necessity for studies demonstrating the practices employed and potential strategies available in preschool settings to prepare children for formal reading and writing instruction (Taube et al. 2015).

Nevertheless, the available research suggests that early reading and writing acquisition, particularly with an emphasis on phonetic awareness during the preschool years, generally yields positive outcomes (Wolff, Gustafsson 2022). Indeed, there is evidence supporting its effectiveness (e.g., Torgerson et al. 2006; Hattie 2009; Taube et al. 2015). Consequently, in their conclusion, Taube et al. assert that initial instruction should "incorporate activities where children hear, identify, and blend language sounds in words" (Taube et al. 2015: 111), while integrating these activities with systematic instruction on the correspondence between letters and their sounds.

In Montessori's writing and reading instruction, phonemic awareness holds a central role and is systematically taught. For instance, as demonstrated earlier, the progression of teaching letter-sound associations begins with letter-sound associations which contrast. Montessori's phonics approach, as observed by Marshall (2017), is also characterized as synthetic rather than analytic. This means that children "are taught the sound-letter code before using it to encode words (in spelling) and decode them (in reading)" (Marshall 2017: 6). However, this synthetic approach is embedded within a linguistically rich spoken and written language environment, which, as Marshall (2017) emphasizes, aligns with recommendations from previous research.

Motor skills

Motor skills have consistently been identified as crucial for later academic performance (Dinehart, Manfra 2013). In the realm of reading and writing, numerous studies have indicated that children with motor deficiencies, such as balance and coordination difficulties upon starting school, often encounter challenges with reading and writing later on (e.g. Cantell 1998; Kadesjö, Gillberg 1999; McPhillips, Sheehy 2004). Lodalf and Bond (2016) suggest that one contributing factor may be the clear link between children with motor difficulties and low self-esteem, although this relationship is intricate and appears to vary depending on age and gender.

In line with the aforementioned findings, other studies have demonstrated a general positive correlation between motor exercises and learning (e.g., Ericsson 2003; Denervaud et al. 2021; Thibault et al. 2021). For instance, Ericsson's study (2003) revealed that seven classes in grades 1–3, which received additional motor training, achieved superior results in reading and writing, among other areas, compared to the five classes forming the control group that did not receive similar additional motor training.

The research outlined above unequivocally underscores the importance of preparing the child's hand for writing, a principle emphasized in Montessori's approach to writing instruction and its practical application.

Sensory-motor experiences: Paper and pen versus digital tools

Aligned with Montessori's teaching approach to early instruction in writing and reading, sensory-motor experiences have consistently been highlighted as crucial for learning (Shams, Seitz 2008; Bornstein et al. 2013; Ahlquist, Gynther 2020). Specifically, regarding reading and writing acquisition, research indicates that when children engage in simultaneous handwriting and reading of their written work, the brain forms representations of letters owing to the incorporation of sensory information, which is fundamental for long-term memory storage. Strong evidence suggests that writing movements play a role in letter memorization and contribute to visual letter recognition (Longcamp et al. 2003; James, Gautier 2006; Naka 2006; James 2010; James, Engelhardt 2012; Velay, Longcamp 2013).

Unlike typing on a keyboard, handwriting provides continuous feedback to the brain regarding the shape of the letters being written. Multiple studies have demonstrated the significant importance of this feedback (Longcamp et al. 2005, 2006, 2008, 2011; James 2010; James, Engelhardt 2012). A letter written by hand on paper is, in contrast to keyboard typing, essentially an "imprint of action" (Longcamp et al. 2006). Research involving preschool children (Longcamp et al. 2005) and adults (Longcamp et al. 2006) both indicated that letters and characters learned through computer methods were less well-remembered than those learned through handwritten methods. Additionally, studies revealed that brain functions supporting visual letter categorization responded only to letters that preliterate children had handwritten, compared to machine-written or visually and auditorily experienced letters (James 2010; James, Engelhardt 2012; Kersey, James 2013). Handwriting training, according to these studies, resulted in better letter recognition compared to computer typing training.

Similarly, research has shown that when children explore the shape of letters with their fingertips, they demonstrate greater letter recognition, consequently facilitating decoding (Bara et al. 2004, 2007; Bara, Gentaz 2011). The effectiveness of finger tracing is further supported by Fernald (1998), who observed that children could typically recognize printed words after tracing them with their fingers while vocalizing the word aloud.

In addition to what has been highlighted earlier, researchers have also explored the significance of tactile experiences facilitated by various writing tools. For instance, a study conducted by Alamargot and Morin (2015) revealed that second-grade children encountered "more difficulty calculating segment trajectories when they handwrote on the screen tablet surface with a plastic tip" (Alamargot, Morin 2015: 38) compared to writing with a ballpoint pen on paper. Furthermore, as noted by Mangen and Balsvik (2016), it is essential not only to acknowledge "differences in sensorimotor contingencies of ergonomic affordances of writing implements but that even tactile affordances of the substrate texture may significantly impact central processes and mechanisms of writing" (Mangen, Balsvik 2016: 5).

Discussion

This article is not about whether preschool children should use digital tools or not. We live in a digital world, and children inevitably encounter it. Instead, it addresses when digital tools can interfere with the development of certain essential skills.

The initial writing and reading instruction developed by Montessori over a century ago is strongly supported, as outlined above. The importance of fostering phonemic awareness, preparing the hand for writing, and integrating sensorimotor experiences into initial writing and reading instruction is undeniable when considering the research presented here. Montessori's strong emphasis on sensorimotor experiences in initial writing and reading instruction can be understood in light of her theory of the interconnectedness of the body and mind (Ahlquist 2012). However, it is crucial to acknowledge that the educational landscape has evolved since Montessori's time, with new literacy contexts emerging. Nowadays, many young children have their first writing experiences through digital resources rather than traditional pen and paper. Mangen and Balsvik (2016) highlight a trend in the USA and Europe towards the decline, and sometimes complete abandonment, of paper-and-pencil writing and reading instruction. Advocates of digitalization in education argue for the potential of tablets and keyboards to motivate students, particularly those with underdeveloped fine motor skills (e.g. Trageton 2012). Studies, such as that by Genlott and Grönlund (2013), indicate a preference among young children for writing on computers or tablets over traditional paper methods. However, this trend towards digitalization has raised concerns, as noted by Mangen and Balsvik (2016). There is a growing scientific interest in understanding the role of our bodies and fine motor skills in learning, including reading and writing. From both a theoretical perspective and in alignment with Montessori's principles, the questioning of traditional writing methods may have detrimental effects on children's reading and writing development.

However, research regarding writing and reading has also shown that reading and writing are closely related to engagement and attitudes, which is why reading and writing instruction aimed at developing internal motivation, perceived independence, and self-confidence has been successful. This can be related to the concept of the Matthew effect (Stanovich 1986), which suggests that students who find it easy to learn to read and write tend to enjoy it and, consequently, read and write more and will improve their skills over time. From this perspective, there is reason to pay attention to students' feelings, experiences, and thoughts about the tools that are used for writing and how they are implemented. Even if Montessori's teaching approach to writing and reading is supported by research which clearly shows the value of incorporating sensorimotor experiences in initial writing and reading instruction, we know less about how this approach is received by children. For example, as shown in this article, Montessori stressed that the hand must be prepared for writing, as a couple of studies indicate (e.g. Rule, Stewart 2002; Stewart et al. 2007; Bhatia et. al. 2015). If this is the case, it may have significance for the child's feelings and thoughts about writing in particular. However, this is, as far as we have found out, something that has not been

acknowledged in previous research. Therefore, we argue that there is a need for studies which also pay attention to children's perspectives on the work they carry out in Montessori pre-schools to better grasp the benefits of this approach. Such studies could constitute an important knowledge contribution to the discussion about when and how writing by hand should be introduced within, as well as outside the Montessori community.

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