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## Pencil or Keyboard? Boys' Preferences in Writing


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### Abstract

Handwriting is an important subject in primary schools, especially in the Early Years. The importance of writing skill is now seen as a debate with the increasing demand on children to learn technology skills to help them with 21<sup>st</sup> Century learning—how to write on the keyboard effectively. The topic is important because handwriting is an essential life skill to have with or without technology. In this study, I looked at the importance of both in the context of the qualitative case studies in three schools in Melbourne, Australia. The aim of the research is to explore how do students understand the learning of handwriting and keyboarding in schools? This qualitative case study employed a Thematic Analysis approach in which the central intention was to understand the lived experience of six Year 6 boys across three schools and their attitudes to writing and technology. In this article, I addressed the importance of teaching handwriting to primary school students, especially in the first four years of their school life from Foundation to Year 3. The findings suggest that teachers should continue explicitly teaching handwriting to their students despite the heavy reliance on technology in today's lifestyle.

### Keywords

Handwriting, Keyboarding, Writing, Boys, Elementary Education, Digital Technology, Thematic Analysis, Qualitative Research

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## **Pencil or Keyboard? Boys' Preferences in Writing**

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*Handwriting is an important subject in primary schools, especially in the Early Years. The importance of writing skill is now seen as a debate with the increasing demand on children to learn technology skills to help them with 21<sup>st</sup> Century learning—how to write on the keyboard effectively. The topic is important because handwriting is an essential life skill to have with or without technology. In this study, I looked at the importance of both in the context of the qualitative case studies in three schools in Melbourne, Australia. The aim of the research is to explore how do students understand the learning of handwriting and keyboarding in schools? This qualitative case study employed a Thematic Analysis approach in which the central intention was to understand the lived experience of six Year 6 boys across three schools and their attitudes to writing and technology. In this article, I addressed the importance of teaching handwriting to primary school students, especially in the first four years of their school life from Foundation to Year 3. The findings suggest that teachers should continue explicitly teaching handwriting to their students despite the heavy reliance on technology in today's lifestyle. Keywords: Handwriting, Keyboarding, Writing, Boys, Elementary Education, Digital Technology, Thematic Analysis, Qualitative Research*

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Handwriting has been traditionally a focus as a subject in primary schools up until recent years, “writing is a skill involving coordination of motor processes, perception and cognition” (Margen & Balsvik, 2016, p. 100). With the increasing availability of technology to assist students to learn how to write and the importance of keyboarding skill in the twenty-first century, many educators question whether there is a need to teach handwriting to students in primary schools today. Despite the importance of this skill in the early primary years, there is little research on the teaching of handwriting in primary schools (Mackenzie, Scull, & Bowles, 2015). In this article, I discuss the main arguments that deal with the issue of explicit teaching of handwriting in the primary years. I assess the extent to which these handwriting skills lay a groundwork for learning how to read and write in primary schools. The article is structured as follows: after giving an overview of the scope of the research project, I review the particular research literature review. Next, I provide a summary of findings. Finally, in the last two sections, I consider several implications derived from the data collected and argue that handwriting is important and should be teach as a separate subject, particularly important in the Early Years.

### **Teaching Handwriting to Young Children**

When children start school, their handwriting skill is a prerequisite for further learning and academic achievement (Dinehart, 2015a; Wollscheid, Sjaastad, & Tomte, 2015). Preschool children who have good handwriting skills are more likely to excel once they start school (Renauld, 2012). There is emerging research on the importance of handwriting in young children's ability to learn at school. If teachers focus on handwriting as much as they would focus on mathematics and reading in primary schools, their students would become better

academically (Dinehart, 2015b). The teaching of handwriting to young children, especially when they start school (Dinehart, 2015a; James & Engelhardt, 2012) because of the metacognition benefit of the brain recognising the decoding of letters. In distinguishing between handwriting and keyboarding, it is my purpose to highlight the benefits of handwriting to the brain in the learning process by pointing to the meta-cognition of how the brain is wired when students handwrite (Korth et al., 2017). When children handwrite the letters, they are using the visual cortex part of their brain thereby stimulating the prefrontal cortex, an area of the brain that is responsible for maintaining attention while learning (Dinehart, 2015b; Margen & Balsvik, 2016). When teachers teach children explicitly how to handwrite, this leads to an improvement both writing and penmanship (Graham, Berninger, Weintraub, & Schafer, 1998).

Despite the availability of technology and its influence on the way we communicate, handwriting remains relevant. It is still critical to devote time to teach and learn handwriting for children when they start school and beyond to help them with their learning. Learning to write is a “complex physical and cognitive task” (Mackenzie et al., 2015, p. 568). It demands motor skills, thinking, memory, and complex interaction of cognitive and physical factors involving the hand, eye and both sides of the brain (Bromley, 2007; Mackenzie, 2011). Writing requires an interaction from both cognitive and physical forces including the hand, eye and the brain. As such, handwriting affects fluency and the quality of the written words. If children experience handwriting difficulties, this influences their written language (Medwell & Wray, 2007, 2008, 2014). Early intervention to teach handwriting may lead to the improvement of handwriting and the students’ written composition (McMaster & Roberts, 2016). Handwriting is a compounded skill requiring hand-eye co-ordination and teaching young children to handwrite would improve their fine motor skill (Margen & Balsvik, 2016). Wicki and Lichtstenier (2018) concurred if pre-schoolers practise lots of drawing before starting school; this would aid the handwriting process when they begin schooling.

### **The Researchers**

I, Jennifer Sze am a teacher and PhD candidate whose doctoral journey and the passion for the research topic of boys’ writing comes from my two identities: one as a mother of two primary school age boys, and the other as a teacher. As a ‘teacher mum’ of boys, I have seen my sons’ engagement with literacy and technology and how that has affected the ways they learn. I wondered if what I observed at home while supporting my boys’ learning experiences would be the same for other boys in primary schools. From the perspective of my identity as a teacher, I am concerned about boys’ under-achievement in literacy in the recent National Assessment Program (NAPLAN) and the Australian Curriculum Assessment Reporting Authority (ACARA, 2019, 2020; NAPLAN, 2018, 2019). These reports of boys’ underachievement in literacy made me wonder as to what is happening in the way teachers teach and the way the boys learn at school. I wanted to investigate and understand this phenomenon to find out who has the problem? Is it just boys? Girls? Or teachers? And the role technology has with the way the children learn.

Jane Southcott is Jennifer’s main doctoral supervisor. Jane is an experienced qualitative and phenomenological researcher. Jennifer researched, wrote and edited the article from inception to completion. Jane provided guidance and directions in the shaping of the paper. To ensure the rigor and trustworthiness of the data, both authors independently read and analysed the data via sorting and then coding. We then shared our analyses and came to an agreed interpretation and a set of overarching themes. In addition to numerous meetings and discussions, we challenged ourselves and refined our interpretation. We wrote this article together. Throughout the article, Jennifer, the main author, will be referring to the research data in the first person. When we speak from our shared understandings, we use the plural pronoun.

## Research Question

1. How do students understand the learning of handwriting and keyboarding in schools?

## Methodology

In this qualitative study, I explained a bounded system of a case study comprising the experiences of two students interviewed in their school setting (Kervin, Vialle, Howard, Herrington, & Okely, 2016; Merriam, 2014). Data were collected in three schools. In total, there were six participants (two in each school). Case studies were undertaken at each site as it is necessary to understand the school's culture and the context in which the students operate in (Merriam, 2014; Stake, 1995; Yin, 2014). A case study is a detailed study "of a specific person, place or thing" (Kervin et al., 2006, p. 70). As such, the context of the school and their approach to teach handwriting explicitly from the moment when the students start school until the end of their primary years. After gaining ethical approval, individual semi-structured interviews were undertaken by Jen with the participants. All interviews occurred at a convenient time and place and were approximately half an hour in length (Jenkins & Southcott, 2016). We do not report the entire case studies here, rather we focus on the single research question above.

The interviews with the teachers and students provided insights into the way the teachers teach the students to handwrite when they first started school and until the final year of primary school. From the students' perspective, interviews explored their views on handwriting and, how they felt about technology and its availability. The semi-structured interviews with open-ended questions developed organically (Brown & Danaher, 2017; Creswell, 2014). Questions asked during the interview included 'Do you prefer to type on the computer when you write? Or do you prefer to write in your writing book?' The purpose of these questions was to find out if students prefer to type on the computer when they write, or do they prefer using technology.

The analysis was undertaken using Thematic Analysis which requires researchers to interpret the lived lives of the participants and make sense of the world they live in and in their social context (Kim, 2016; Smith, Flowers, & Larkin, 2009). It allows researchers to explore the structure of experiences from the first-person perspective and to understand the participant's experiences (Pringle, Drummond, McLafferty, & Hendry, 2011; Smith & Zaltha, 2013). This method of analysis recognises the role of the researcher in trying to understand the participant's personal experiences (Pringle et al., 2011). After each interview and once transcription was completed, notes were made on the left-handed margin to identify keywords, phrases and common themes. The transcription would be re-read and, analysed with a higher thinking order through careful interpretations of the related topics by clustering them into groups. The same process was applied to all text based data gathered in this study (Mawson, Berry, Murray, & Hayward, 2010). Data from the six interviews were analysed and described thematically. After each interview, we looked for emerging themes and patterns through the participants' responses. The most common themes and patterns were noted and investigated further accordingly (Moustakas, 1994; Shaw, 2011). We discussed the emergent themes after initial coding (Smith et al., 2009). From the emergent themes and via robust discussion, we built the overarching themes. After each interview, we looked for emerging themes and patterns through the participants' responses. The most common themes and patterns were noted and investigated further accordingly (Moustakas, 1994; Shaw, 2011). To give voice to the participants, I used direct quotes to enrich my analysis (Bainger, 2011; Jenkins & Southcott, 2016; Larkin, Watts, & Clifton, 2006; Watts, 2014).

With ethical approval from appropriate authorities (our university, the Department of Education and Training, and school principals), we invited the students to participate in the

study and explained that they could stop taking part of the research at any time during the time of school visits. We aware of our responsibility as researchers in how we use the data and the disclosure of the data collected from the study (Hammersley, 2014). To protect participants' identity, all research sites and participants have been masked to protect their privacy (Guenther, 2009; Mellick & Fleming, 2010).

### **Data**

Data collected from this research spanned a four-month period from May to September 2017 at three different school settings in Melbourne, Australia. Athena College (AC), Beach Primary School (BP) and Creative Primary School (CP). Given the time constraints on the research, I would have liked to spend more time at each school to gain deeper understanding of the school culture and how it operates. Each school became a case study and the students' transcriptions, field notes and classroom observations became data. There were six male students at three different schools. It was a small-scale study with a close focus on a small number of participants. Each setting enabled me to investigate their learning and skill development in writing. I wanted to understand their preferences in the instrument of writing, whether they preferred to handwrite or to type on their computer devices. If there was a preference, I wanted to understand the reasons for this preference.

### **Schools and Participants**

AC is a non-government school in Melbourne, Australia. It had 720 students and is co-educational. The school's demographic is middle-upper and middle-class families. The cultural demographic of the school is predominantly European background. AC was chosen for its diverse teaching ethos at three different sub schools. In the Junior School, the school practised the Reggio Emilia philosophy. In the Middle School, it has the International Baccalaureate program. The Senior School has the Victorian Certificate of Education curriculum and it offered a range of different academic subjects.

Andrew is eleven years old; he has a younger brother and sister. He loves reading, playing computer games and writing narratives on his typewriter. Aiden is eleven years old. He has two sisters and he speaks Greek. He is a quiet boy but would open up once the rapport was made for one on one conversations.

BP is situated in a south-eastern suburb of Melbourne. BP was the school I taught as a Year 1 teacher in 2014. The school's demographic is made up of professional parents and middle-class backgrounds. BP was chosen due to its Bring Your Own Device (BYOD) introduced to the Year 5/6. Academically, the school has an enviable reputation amongst its peers in the area. The students are ranked above the National's average scores in Reading, Persuasive Writing, Spelling, Grammar and Punctuation and Numeracy (MySchool, 2019). In 2014, the school introduced the BYOD program to the Year 5 cohort. The school is quickly becoming a leader in the application of Information and Communication Technology to all areas of Primary Education in South Eastern Region of Victoria. With a firm belief that student learning is enhanced with the inclusion of a variety of interactive and mobile computer technologies, the school is adapting to 21st Century learning approaches, that incorporate computers devices as a part of everyday learning in all areas of the curriculum.

Ben is twelve years old and he is the school Captain. He is a bright and articulate boy. He has a permanent smile on his face. He is extremely sporty, a

good athlete and he has a ready sense of humour. Ben comes from a loving and supportive family with mum, dad and a sister. Bill is twelve years old and he is also the school's Youth Ambassador. He loves to play soccer and loves running. He completed a ten-kilometre run at the end of July, 2017. At school, he likes Maths, Writing, Reading and, Sports. Bill's parents are both doing a Master of Teaching and are very supportive of his education.

CP was found in 1976 as the founders (an English and a Math teacher) wanted a small school within their small, inner-city Melbourne suburb so that every child would belong to an extended family – a community. CP was different to the mainstream schools not just in size but also in their teaching philosophy. The small number of students is capped at seventy students for the whole school. In addition, classes are small, with twelve students per class and a focus on free time and camps. The approaches to teaching involve: a morning meeting every day for the entire school sitting in a big circle. They would have sport in between blocks of daily numeracy and literacy lessons. They would go to four camps per year. The small class size of children grouped into their year levels – Foundation to Year 2 (the Littlelies), Year 3-4 (the Middlies), and, Year 5-6 (the Biggies). Due to their small class size, the students have ample time to converse to the teacher and other adults who volunteer at the school on a regular basis. Each child has their own Individual Learning Plan and would be working at their own level. The emphasis on the communication skills instil in all students at all levels is a key to its success. The involvement of parents and the community makes this school a unique school in Victoria. CP's education philosophy mirrors Rudolph Steiner's education ethos in the aim to nurture a love of learning, moral and ethical empathy and to be resilient (Steiner Education Australia, 2018).

Charlie is twelve years old and he has two little sisters aged nine and six and they all attend CP. He loves drawing, reading and has exceptionally beautiful handwriting. He loves playing cricket, footy, rugby, basketball and netball. He loves action books and likes to read for leisure. Colin is eleven years old and he has an older brother. He loves being outdoors and lived in a farm for a year with his family prior to coming back to Melbourne. He does not like technology and prefers to be playing sports or being outside.

### **Trustworthiness**

To establish the trustworthiness of this study, I used several different techniques. First, when collecting data, I used a prolonged engagement approach and a persistent observation technique, which are often emphasised in qualitative research (Whiting & Sines, 2012). I spent a considerable amount of time at each school as an observer in order to build close relationships with the participating children and their teachers. When analysing data, we adopted Patton's (2002) approach to triangulation, and compared several sources of data. This involved the use of different data sources including classroom observation, field notes, individual interviews and information collected from the schools' website and artefacts such as the students' sample work and the teacher's lesson plans (Shenton, 2004). Documents included texts collected from the schools' website, field notes, journal entries from classroom observations and interview transcriptions, which all provided description for analysis (Stake, 1995). Using a member check method (Birt, Scott, Cavers, Campbell, & Walter, 2016), I shared the interview transcripts, interpretations, and analyses of data with Jane, an expert in qualitative research methods.

As a teacher, I was very familiar with classroom settings. I have experience teaching the Year 5 and 6 cohort and am very used to talking to students. I tried not to intervene in the students' conversations and interactions. Given my previous experience in teaching the same cohort, I am aware my presence may have influenced on participants' behaviours, so that data

can be analysed and interpreted within this context (Kervin et al., 2016). My past experience gave credibility to my data collection and interpretation. In addition, Jane was also an elementary and high school teacher, very familiar with classrooms and conversations with students.

## Findings

The more children handwrite, the more their handwriting skills become habitual and automatic, thereby resulting in speed (Graham et al., 1998; Graham, Berninger, & Abbott, 2012). Charlie from CK asserted that he preferred to write in his writing book because that was how he had always been taught and added that, "I would write in my writing book because I find it more unique. Because of your handwriting. On the computer, the 'writing' is the same. Handwriting is more unique" (Charlie). Colin (also from CK) also likes to handwrite even if there was an option to type on a computer. His reasons were because he had grown up with handwriting and he thinks he is not a fast typist. He explained that, "I never had a choice, I always do handwriting. I would still do handwriting because that's what I am familiar with" (Colin). The comments from the two students from CK suggested students would handwrite if this was the only option they had. The students' attitudes towards handwriting would be driven by the teacher's attitude towards handwriting. If there was support from the school and the teachers to handwrite and there was no technology available for the students to use. The students would get on with it and handwrite.

The findings of the study included mistakes and worrying, the physicality of handwriting, fluency and iPad. This section will report the six participants' attitudes towards handwriting versus keyboarding or touchscreen using the iPad. The authors analysed the emergent themes after the initial coding and then group them under sub-themes (Smith et al., 2009). The intention of a Thematic Analysis is to draw themes by "firmly anchoring findings in direct quotes from participant accounts" (Pringle et al., 2011, p. 21).

## Mistakes and Worrying

The common concern amongst the participants were the fear of making mistakes which included producing neat work and avoiding spelling mistakes. Four out of the six interviewed boys replied to my question do you prefer handwriting on writing on the keyboard? All the answers had one common theme: "my handwriting is sloppy and I spend most of my time worrying about the neatness of my writing than the actual content of writing itself". They found by typing on the keyboard or typing on the iPad provided them the comfort of avoiding making spelling mistakes. Aiden summarise this understanding by stating "Well, if you make a mistake on the computer, you can just backspace it as supposed to rewriting the whole thing in your book". Typing on the computer or iPad also helped the students with the flow of their writing. As two of the participating schools have BYOD, the students mentioned that once they had finished their writing piece and were able to type it in the iPad, or had the option to record their work by reading the work using the voice recording device had also helped them with the writing process as well.

The connection between negative attitudes to writing and lower achievement is well documented (Edwards & Jones, 2018), the boys who favoured typing on their computer or using their iPad were worried about making spelling mistakes and the physical tiredness of handwriting. Four of the six participants articulated that spell checks in word processing programs in their computer or iPad helped them to save time on searching for the correct spelling of the words, thereby helping them to carry on with the process of writing. Andrew succinctly stated that, "When I write on the computer, it helps to correct my spelling." Ben agreed that, "I prefer to type. I just think it is easier to type and sometimes it would fix my



spelling mistakes” and Bill connected this with less concern about making errors, stating “On the computer, it is clearer and it auto-correct, so you don’t really worry about spelling too much, because the computer will correct your spelling mistakes.” It was important to note that just because technology automatically fixes spelling errors, students still needed to have knowledge of the words to choose from a list of possible spellings. This prior knowledge was based on their reading abilities, which, comprised of phonics knowledge and word meaning to make their choices (Berninger, Nagy, Tanimoto, Thompson, & Abbott, 2014).

### **Physicality**

In addition to the worrying of making spelling mistakes, the physical pain of handwriting hindered the boys from producing what they perceived to be the neat quality work that their teacher expected from them. Ben explicitly stated that, “Writing on the computer is better because you don’t get as tired. When you do handwriting in your writing book, your hand get tired and your handwriting might not be so neat”. This was a major complaint from the participants who frequently mentioned the physical pains associated with handwriting which caused them to write slowly and illegibly. This resulted in the students getting tired and worried about their penmanship, and not about the cognitive thinking of their writing. This problem was also acknowledged by teachers and researchers where the majority of students experienced this issue of fine motor skills were boys (Marquardt, Meyer, Schneider, & Hilgermann, 2016) who could become disengaged, lose interest in writing, and become frustrated, as one student intimated, “When I write in a book, I’d have blisters and it gets really annoying” (Andrew). Despite this, he did not use an adaptive aid, rather, he persevered with the pencil. For the boys to have the love for writing, encourage them to write freely without being judged by the quality of their handwriting. Teachers might want to consider the ultimate goal when teaching boys writing in the primary classroom in this context, handwriting is important, but is it a minor issue. It is the cognitive thinking of writing that is what matters to boys in this age group (Coleman, 2011; Edwards & Jones, 2018; Fletcher, 2006).

### **Fluency**

Fluency is the ability for the students to write with their thoughts flowing without the restrictions of the mechanics of writing or the pain associated with hand writing. Fluency according to Fletcher is “speed. Writing with velocity allows students’ hands to keep pace with what’s happening on their minds” (Fletcher, 2006, p. 75). Four of the boys preferred to write on the iPad or the computer because it helps them to write fluently without worrying about spelling errors or the tiredness of handwriting. Aiden explained the process, “If I am drafting a story, I would write it in my book. If I were finalising it, I would type it in my computer”. Fluency was linked to easy correction. Bill described his process:

On the iPad, it is really easy because if you make mistakes, you just delete them by delete or back spacing. First, I did the draft by handwriting, and then I transferred the writing to the iPad by using voice recording. Once that done, I print my work out. I had to upload my work to Seesaw. I really enjoyed that process. (Bill)

This was a common theme amongst the participants who used technology devices as part of their teaching and learning. In Bill’s case, his school used Seesaw, Seesaw is a digital portfolio. His teacher empowered her students to share their work using photos, videos, drawings, text, PDFs, and links. It is a platform to get students work in one place and share with their families.

The ability for the students to publish their work to share them with an audience was a motivation factor for them to write (Senn, 2012).

### Using iPads

Since the launch of the iPad on 27 January 2010, many schools had taken up the 1:1 iPad program (Ritchie, 2018). At BP, the students brought their own tablet device from home. The teaching and learning were conducted using the iPad. In primary schools, children were often referred to occupational therapy for poor handwriting and, perhaps the use of assistive technology such as iPads might offer a writing intervention for students with fine motor skills (Wells et al., 2016). The use of technology such as iPads could help students to be more engaged, motivated and worked faster (Hu & Garimella, 2014). Two of the schools allowed the students to bring their own device (BYOD) to school, both schools used iPads as their technology device to teach and for students to learn. As Bill pointed out “I actually prefer to write on the iPad because I am not the best at handwriting...um, I admit that. My handwriting is not the best and if I make a mistake, I have to cross it out.” This sentiment is confirmed by professionals working with primary aged children. Many children are referred to occupational therapists due to handwriting difficulties. It is not unreasonable to suggest assistive technology may help these students with handwriting difficulties (Wells et al., 2016). The correlation between technology and writing for these year six students allowed them to integrate visual, auditory and text input (Martin & Lambert, 2015). Assistive technology such as voice recording also helped students to write as indicated by one of the participants:

When I was writing Hero Quest (Hero Quest was a writing topic for the students where they had to write about the qualities and characteristics of their hero, authors’ explanation). I discovered voice recording and I used voice dictation. It is easier to type compared to handwriting, you are much slower, and with the iPads it saves you a lot of time as with the voice dictation. (Ben)

A similar sentiment was expressed by another student relating to writing on the iPad:

Probably because on my iPad, I have this app called Pages. I like writing stories on there too. Stories help me to become better at writing. If I am writing a story, if I think about it, I can go deep. It helps to corrects it. I typed the story on my computer. I don’t know how to explain it. But it helps me. (Aiden)

Keyboarding helps with the cognitive process of writing and when transferring writing on the computer or technology device, keyboarding fluency is important (Weigelt-Marom & Weintraub, 2018).

### Discussion and Conclusion

This research sought the understanding of six Year 6 students’ preferences concerning their use of handwriting or keyboarding. In this article, writing is defined as creating text using pen or pencil on paper, using Word Processing, creating text on a digital device by sign Apps and creating text verbally by recording through a digital device (Green, 2012; Mayard & Lowe, 1999;). I appreciate writing is a complex skill in both traditional literacies and new literacies (Graham et al., 2012). The understanding of writing that underpins my research in this paper is that writing is a social practice (Kostouli, 2009), as well as an individual activity (Gerde, Bingham, & Waskik, 2012). Writing is an important communication between the writer and

reader (Christie, 2005). Writing helps students to develop higher order cognitive skills, because it allows the learner to demonstrate the ability to understand and analyse texts, and process meaning (Adams, Simmons, & Willis, 2015).

The sample size was limited but it did give an understanding of the dilemma boys faced when they learned writing at school. The teaching of keyboarding as a writing practice is an emergent field of research, notably more explained in the field of Occupational Therapy. In education, the common themes emerged from researchers such as Berninger, Tanimoto, Thompson, and Abbott (2014), Margen and Balsvik (2016), and Martin and Lambert (2015). The argument seemed to be about differentiating digital writing (keyboarding) versus handwriting. There is a gap in the literature concerning the pedagogy of teaching writing in primary schools to encourage children to write creatively. This indicates that this is an emergent field in education and requires more research. The study found that the two schools participated did not explicitly teach students to handwrite in Year 6. The third school, on the other hand, not only explicitly taught the students to handwrite but also did not use any technology in its teaching.

If writing was a means of communication as a written text, one needed to ponder the question: how did students understand the learning of handwriting and keyboarding in schools? The hand and brain connection between handwriting related to the pathways when we used handwriting, our cognitive thinking process was more activated compared to when we typed into the keyboard. We disadvantaged children if we did not have a lot of handwriting in the classroom. Technology is an important tool to teach children, but in the early years, it is important to teach children explicitly how to handwrite (Dinehart, 2015a; Mackenzie, 2011; Wolf, Abbott & Berninger, 2017).

We know that handwriting is an important skill to have, this is essential for students who start school (Mackenzie & Spokes, 2018a). Moreover, writing is a skill where students can transform and express ideas into communication that encourage social, emotional and cognitive development (Malpique, Pasternak, & Valcan, 2017). More research needed to be conducted on the impact of children's learning if they were not taught how to handwrite. We know keyboarding is an essential skill to have 21st Century requirements to prepare students in the workforce. However, more study is needed on the impact of children's learning if all we teach is keyboarding. We also do not know what future technologies will be available to replace keyboards such as touchscreens (touchscreen computers are already available now), smart pens and voice recognition device (Daffern, Mackenzie, & Hemmings, 2017; Mackenzie & Spokes, 2018b). It is about finding a middle ground of teaching handwriting explicitly to the Early Years students and teaching upper primary students keyboarding skills. Keyboarding is a twenty-first century skill, but it should not replace handwriting. Teachers need to find a balance for both in their classroom (Kiefer et al., 2015; Mackenzie & Spokes, 2018a).

What this paper has shown is the importance of teaching handwriting to children in the Early Years of primary schooling from Foundation to Year 3 (Mackenzie & Spokes, 2018b; Medwell, Strand, & Wray, 2009). As we have demonstrated with this in-depth study of the boys, although the sample was small, but it did give the boys a voice to demonstrate their frustrations of handwriting such as mistakes and worrying, the dexterity issues, flow of writing and the use of digital device to help them with touch screen typing and voice recording. The challenges for teachers lie in teaching students who are technology-savvy to read and write using multimodal formats, whilst still maintaining the importance life skill of handwriting. While gaps remain in the literature about how teachers incorporate new, technology-based pedagogies of writing into their classrooms, this paper seeks to respond to some of the ways that is being understood and enacted in the senior years of three primary schools.

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