Handwriting and Typing

Platform of Handwriting Development/section Childrens Writing

The Netherlands,September 2014

Justification

"An idea – Let's consider the pros and cons of technology along with the "old ways" of doing things in the world and realize here, today, right now, the amount of choices that we never had before. We must celebrate this." – Linda Larson 1/28/2014

This attractive idea was formed as the inspiration for our Handwriting Development Platform's written vision. We are presented with many favorable opportunities today, and in order to take these opportunities, we formulated the following questions.

Fundamentals (Part 1):

1. What makes writing by hand worthwhile?

2. What makes typing worthwhile?

3. What can we say about the relationship between handwriting and typing?

Practicals (Part 2):

4. Which handwriting activities should be used in elementary schools?

5. Which typing activities should be used in elementary schools?

6. How could handwriting on tablets be used in elementary schools?

These questions were presented to all the members of the Handwriting Development Platform, and then their reactions were compiled together. These contributions rounded out this article's final draft.

The attachments and sources are found at the end of the article.

We realize that this piece is only valid right now. Technology is always developing at a rapid rate. Our thoughts and ideas are also constantly evolving. Regardless, we still believe that there is value in writing this piece today.

hare their thoughts and reactions with us and allow reply on our website.

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Part 1: Fundamentals

1. What makes writing by hand worthwhile?

Our vision: Writing by hand is human and personal. It stimulates fine motor skills and is an excellent means of communication and stimulates the development of both sides of the brains.

Let us compare writing and walking. Both are movements of the human body. We learn to walk, but we can also move ourselves by bicycle, car, or plane. For different situations, we use the proper form of transportation or proper writing utensils. If your car breaks down, you still can walk to find help. If your power goes out and the computer shuts down, you can still use paper and pen to write. Writing is an outstanding human, cultural, and communicative gift. It has unique cognitive qualities. Young students develop many skills through writing: hand-eye coordination, fine motor skills, concentration on letters, words, and sentences, language acquisition, reading comprehension, spelling, writing composition skills, and memory. These skills are all learned in an appropriate way. Learning reading at the same time as learning writing speeds up the process of learning to read. Writing ability has a direct influence on the speed and quality of composition, especially in the early years of school.

Every method of writing by hand stimulates the brain synapses and the coordination between the left and right halves of the brain, but this does not happen when typing on a keyboard. Hand writing means brain stimulation and the creation of neural connections.

Handwriting is personal, because everyone does it in their own way. We can think of the saying: “We recognize the bird by its feathers.” If you write something yourself, it lasts longer. In addition, through writing, children learn to organize and assess space on the paper.

2. What makes typing worthwhile?

Our vision: Typing is businesslike, sets up the paper automatically, is legible, and speeds communication.

r yourself and communicate with others quickly. You use modern technology (like computers, laptops, smart phones (texting), tablets, iPads). The major advantages of typing instead of hand writing – as long as you can type without looking – are saving time and legibility. Through typing, the distances between letters, words, and lines, are automatically set, so printed work always looks the same. Typing is a relatively easy motor skill.

Typing is a part of modern life, and there is nothing wrong with that. How often do we actually write these days? Typing is always legible. It belongs in our digital era in 2014. Children today need to be able to use computers, tables, and phones. Typing is a skill that has to be taught, and practice is important to learn it. Students first learn graphemes and after that, vowel combinations. Once they are in Group 5 (approximately 8 years old), children write whole words or in orthographical parts when they write longer words.

Depending on the assignment (written or typed), cognitive ability remains important. Once students have whole word recognition, and they don't have to think about how to write or type the word, then it isn't important anymore.

3. What can we say about the relationship between handwriting and typing?

Our vision: Handwriting remains the main medium of communication in elementary school. When students reach Group 6 (approximately age 9, 10), they are given more typing assignments if they can type properly without looking at the keys.

Writing remains important in elementary school. When students reach Group 6 and can type properly without looking at the keys, they are given more typing assignments.

Writing remains the medium for keeping information and communicating. Once students are in Group 6 or 7, they are given more time to type, depending on the school's writing standards. These are group activities that benefit the entire class.

Handwriting cannot be seen as less important. Let the kids write as much as possible at school. Other ways of communication get enough attention. Pen and paper tasks have to be the most important in Groups 3, 4 and 5. When students are in Group 6, the balance should be 50/50.

Handwritten text is always more personal than static printed text, where the letters are the same and motor skills are restricted - you only need to hit a key to make a letter. Also, the space between letters, words, and lines is determined for you. That increases legibility, but *lessens the learning of how to space the paper yourself.*

ne typing lessons are given – inside or outside the

Part 2: Practicals

4. Which handwriting activities should be used in elementary schools?

Our vision: Practice betters the development of fine motor skills and brain lateralization. You learn letters, words, and sentence spacing yourself. Writing supports learning and retention.

Writing activities for kindergarten (4-6 years old):

- The well-known fine motor skill activities (folding, drawing, cutting, stringing, pre-writing activities with patterns and movements)
- Working on writing prerequisites
- Pen and paper tasks (like coloring, drawing, shapes, writing movement preparations)
- Own first name, preferably in cursive
- Many double-sided motor practicing and two-handed movements on paper
- Many experiences with different materials: chalk, wax, paint, brush, sponge, marker

Writing activities for elementary school (6-9 years old):

- Follow writing methods; if necessary, with the extra help of LetterSchool or Digitaal schrijfschrift
- Writing in combination with learning to read
- Writing through language activities and tasks
- Supporting the learning of reading with the learning of letter writing. The research of James (2010) said that students who learned letters together with writing instead of just seeing the letters have higher brain activity in the part of the brain that involves learning to read as an adult (the left fusiform area). Hand writing activates this part of the brain.
- Research participants recognize letters better and retain letters better if the letters are handwritten, not typed. There is a multimodal connection between different parts of the brain (The left Broca area and the parietal lobe on the left and right side). Longcamp et al. (2008) found that more brain areas are involved in the doing, seeing, and thinking about an action. Longcamp also says that children learn letters better if they write them by hand than if they type them.

Writing activities for middle school (9-12 years)

- Using writing methods, with attention for speed writing and eventually calligraphy

in core classes
emos, essays, reflections, and presentations
- Using writing with digital devices, like digiboards, tablets, and iPads

At this age, the brain can do double the work. If there has been enough rehearsal with the help of writing tasks, the writing will be automatic and the lateralization will be stimulated.

We think this works just as well for mathematics, essay writing, and most other subjects. At school, workbooks often have fill-in-the-blank activities where the space to write is too small. This causes messy work and hand cramps. It should be paid attention to.

5. Which typing activities should be used in elementary schools?

Our vision: Typing practice betters the use of a mouse and a computer. Typing properly without looking makes it possible to work quickly, where LetterSchool and Digitaal Schrijfschrift can help. Typed work is easy to copy.

Typing activities for kindergarten (4-6 years old):

- Unwanted if it has to do with learning letters (first learn to write?)
- Using fun interactive games with the mouse or tablet pen (colors, playing with apps)
- Clicking on pictures, shape recognition practice - can choose which hand to use
- Becoming acquainted with the computer or tablet is most important to start practicing these skills

Typing activities for elementary school (6-9 years old):

- Unwanted. Writing needs to become automatic first. Handwriting skills should not be replaced by typed tasks.
- Actively play different learning games (the goal is to support cognitive development, from math to reading activities). Learning letters through apps (for example, the student writing letters on a tablet, such as stoplight letters). Learning to use social media?

Typing activities for middle school (9-12 years old):

- First students should learn to type properly without looking in Group 6 or 7, with the goal being proper ability and speed.
- Little by little giving more typing assignments, for example, typing a summary of a book, essay, presentation, report, project (with the purpose of copying it for the whole group?); this increases the speed, legibility, and exchangeability.
- Use the computer at the proper ability level.

e used in elementary schools?

Our vision: A tablet can challenge children to do comprehensive writing practices and help them learn to write their letters. It makes a connection possible with the real world. It also makes connections with practices, variations, and effective learning.

At this moment, tablets are not only used privately, but also as a learning tool in education. Children can learn to write in a new way by practicing on a tablet. The development continues! There is a writing board, there are writing letters, and writing postcards! (Holwerda, 2013)

Learning to write a letter on a tablet can be challenging for a child. Also, comprehensive writing practices, made within a known program, can be stimulating for a child (alongside "normal" writing practices). The most important is making connections to a child's life experience and to realize a high "time-on-task". (Varied) practice makes perfect!

Learning a letter can be done well on a tablet. It can be challenging, but it's about the learning and recognition of the distinguishing characteristics of a letter (visually supported on the tablet – for example, the stoplight letters).

There are no variations, but just the remembering of the features of the letter until the basics are learned (blocked practice). After that, the learned letters will be regularly combined with other learned letters or learn a new letter and then combine the two learned letters (for example, l and e -> le, el, ele, eel, lee, elel, lel, etc.)

When the distinguishing features of a letter are known, then variation is important (in material, size, speed, direction, pressure, etc.) The child is in the associative learning phase and you want to practice the use of pressure, direction, and size (the parameterization). It's important to practice learned letters in different sizes, hitting targets, varying the pressure, and varied speed. They practice the prerequisite writing movements of curls, loops, and individual letters. The child learns to set parameters under ever-changing circumstances. This is better than practicing the same thing - the same letter height, movements, etc. (Literature says this has a better learning effect).

Appendix:

LetterSchool: The iPad app looks nice, colorful, and is designed for children aged 4-6. It has three levels.

nd names of the letters

Level 2: Children have to tap on different parts of the letter to learn where it starts and what direction to follow to write it properly.

Level 3: Children can see how they have to write the letter, and then they can copy the letter.

LetterSchool is an app where students learn letter sounds and how to write letters through playing. The app is based on current research results.

Digitaal Schrifjschrift

This app is simpler than LetterSchool. When you open the app, you see a notebook with words the child can trace. You can add more pages with extra words and sentences. It is recommended to use a iPad stylus pen to use this app.

There might be a new trend to replace pen and paper with digital devices because of the use of tablets. It remains important to be able to write legibly. A computer can recognize good handwriting and identify or translate the text. Computerized handwriting recognition systems are less capable of recognizing illegible text than people are. This is another reason why handwriting must conform to minimal norms of legibility. With digital software, the dynamic writing process as well as the static writing process can be analyzed. Cito (Central Institute for Test Development) used NeuroScript/Teulings for research on periodic measures of education.

The medium of information-giving (paper or tablet) is not a barrier to analyzing handwriting. The most modern, sensitive stylus can also determine the pressure with which you write. The Jot Touch 4 has 2000 pressure levels, costs $89.99, and you can see it on http://www.adonit.net/jot/touch (Holwerda, 2013)

Extra information about tablets:

- The thickness of the stroke of the pen is determined by the writing program, not the pen's thickness.
- The size of what is written is important. The smaller the format, the more difficult to analyze
- Using a stylus gives less refined details
- Pen and writing surface are important. The stylus can give you the feeling that you are writing on a white board, but also gives the feeling that the surface isn't good

dwriting. Sometimes with another stylus, there are no
on a credit card.

- It makes sense to pay attention to the grip of the pen (high, steep, slanting) and the position of the tablet. (Holwerda 2013).
- You usually use one hand on a tablet, and so brain works differently than with handwriting.

Writing: To make connections in the brain and carry over knowledge

- Handwriting makes us more human. I'm glad that Lincoln didn't use speech recognition on his cell phone.
- Learning to write by hand is a keyhole in the development of literacy, and the writing skills stay crucial for success in schools in general. The spiritual processes that are involved with writing are connected with other important functions of learning, as well as preserving and remembering information from memory, manipulating letters, and connecting them to sounds during reading, spelling, and writing.
- Explicit, active explanation from the teacher about how to make every letter, how to connect letters within words, and words in sentences. The instruction must be in short sessions of about 10-15 minutes daily, or frequently weekly. In 80% of elementary schools in the United States, students never use speech recognition software for writing. Very little schools have computers to use regularly for word processing (Laura Cutler and Steve Graham, "Primary Grade Writing Instruction: a National Survey."Journal of Educational Research 100 (2008): 907-919.)
- Direct, explicit handwriting and spelling lessons are an investment in the future of young minds. This will produce readers with more self-confidence - fluent readers and writers who are prepared to succeed in school, who will pass tests, and succeed in their work (Genry & Graham, 2010).

According to education and child psychology specialists, elementary students learn writing and spelling better if they write letters with pen first. Students should only learn to write on iPads after they master writing on paper. Tablets should not replace notebooks and pens. Tablets are a good addition, but not a replacement (Donker, 2013).

Steins Bisschop (2013) is adamant: Flood children with tablets, but don't take away their hand writing.

Other writing educationalists agree. They notice that the quality of their handwriting lessens with the use of a tablet.

For anyone looking for a good app to help their children learn to write (along with pen and paper!) – Tablet.nl has two recommended apps (Tim, 2013).

and a lower writing speed (Bibliotheekcommissie

Writing versus typing: What does neuroscience say?

Computers and tablets are a part of our society and education. The question arises if it's still necessary to teach our children to hand write letters – we have keyboards. Research shows that writing and typing have different effects on various cognitive functions. This influences not only writing but also reading skills.

Steve Jobs Schools, iPad apps for babies, and for every child, a laptop: computers are an indispensable part of the education of our current generation of children. Experts in the media argue about whether this is a progression or not.

One of the opponents of child computer use is Manfred Spitzer, a German psychiatrist. In his book *Digital Dementia: How we break our brain*, he writes about how children learn from real contact with people, from real experiences, and not from screens. One of Spitzer's claims is that writing is important for children's reading development. "Young Chinese children are less able to remember characters when they learn them on the computer. You have to draw them with your own hands. Then you remember them! That's how our brains work"(NRC Next, 25 June, 2013). Paradoxically, digital aids can support writing. There is an app called "abc PocketPhonics" with which children can learn hand writing. Similarly, there are more computer programs that intend to promote or advance writing with the help of the computer, tablet, or digital school board.

But what is the effect of typing on writing and reading skills? Do people that handwrite less unlearn those motor and cognitive skills? Are there differences in brain activity in writing and typing? There have not been thorough scientific studies researching these questions. This is partly because it's difficult to find two groups to compare. There are not many people who don't use computers. There are a number of studies, though, that are trying to find answers to these questions. If you write less, your handwriting will be worse, and you will probably write slower. That wouldn't be surprising. Do your fine motor skills worsen in general if you type more than you write? In a research study, two adult groups were compared: one *computer group* (they mostly used the computer for word processing) and one *writing group.* Both groups were asked to complete a number of tests to test their fine motor skills. They were given a test where they had to trace a line with a pen (and not go off the line). The computergroup was much slower than the writinggroup (Sulzenbruck et al. 2011). More typing and less writing doesn't just influence writing itself, but other basal motor skills, too. (Francken, 2013).

ly and take notes on their laptops and iPads. Does
g reading on laptops and iPads is less effective.
(Janssen, 2014).

The effect of writing on literacy

The recognition of letters is a prerequisite of fluent reading. The speed and precision of which toddlers can name letters is a good prediction of their future literacy (James & Engelhardt, 2012). To be able to differentiate letters and, at the same time, to categorize letters in different sizes and types, you have to pay attention to certain characteristics while ignoring others.

Researchers think that children learn to make this differentiation because they write the letters. Initially, their written letters are not yet stable – and just that variation is essential. Because they make different versions of the written letters and look at them, they learn what the crucial characteristics of a specific letter are.

Researchers tested this hypothesis by teaching letters to a group of children who could not yet read, either by writing them out or by just showing them. Both groups successfully learned to recognize the letters, but the group that learned by writing them out had higher brain activity (in the area of the brain that is active while reading letters in adults – the left fusiform area) while viewing the letters (James, 2010).

Why was it relevant to look for differences in brain activity if both groups of children learned to recognize the letters? Children are not born with special “reading” and “writing” sections of the brain: They develop this specialization during childhood through language experience. Researchers who research child development first look at adults to see how fully matured brains function. Then they compare that with child brain activity, in this case with those of children who cannot yet read. The group who learned to write the letters showed similar brain activity to adults, more than the brain activity of those who just looked at the letters. In other words, both groups of children could recognize the letters after their training, but there was a difference in their brain activity.

In a follow-up study, researchers looked specifically at the difference between typing and hand writing. The outcome was the same: The left fusiform area was more active while seeing letters hand written than when they were learned through typing or tracing the letter with a finger. *Writing letters by hand is specifically what activates the brain. (*James and Engelhardt, 2012).

When children write letters by hand, the same part of the brain is activated as an adult’s would be doing the same thing. This doesn’t happen when children learn letters through typing. An explanation for this is that writing gives more variety in the production of letters.

should be able to remember letters better when types. This has not yet been examined, but this appears to be another important difference between writing and typing (Francken, 2013).

It is clear that handwriting maintains a lot of brain activity.

Writing and the learning of new motor programs

Beside the hypothesis that writing by hand leads to more variation, and therefore to better learning of letters, there is another complementary explanation. Perceiving and acting are strongly connected: You learn to better perceive if you connect it with an action. This is also true for reading and writing. But how does that work, precisely?

During the learning of writing a letter, a special motor program is saved in the brain: some kind of description of the precise movements that have to be considered to write a certain letter. This program is activated if you want to write the same letter again. But the same program is activated if you see the letter after this. That's what scientists think.

If you learn a new letter by typing, no new motor program is developed. This is because the hand movements of typing do not have an intrinsic relationship with the form of the letters. You make the same movement with every key. The connection that takes shape does not help you learn to recognize letters. Is that why you can't remember the letter as well?

A study was done where adults had to learn new letters, either by hand writing them or by using a keyboard. After that, researchers measured if the test subjects recognized the orientation of the new letters (for example, b versus d) and at the same time, they measured their brain activity with a fMRI scanner.

The test subjects remembered letters better and for a longer period of time if they had written them by hand. Their brain activity was higher in a number of areas when there was a comparison between the perception of the letters that were learned by writing: the left area of Broca (IFG) and the left and right parietal lobes (IPL). Earlier research tells us that these brain areas are involved in the execution, imagination, and perception of actions (Longcamp et al, 2008).

In a similar study, this time with illiterate child test subjects, researchers found that they also learned letters and characters worse on the computer than if they hand wrote them (Longcamp, 2005).

Learning letters by handwriting them helps both adults and children recognize letters better. When test subjects see new letters, brain areas are activated that are involved with motor

the letters by hand. This proves that letter-specific n writing, but also in reading (Francken, 2013).

Writing versus Typing

These studies prove that handwriting has very different effects on several cognitive functions than typing on a keyboard does. Researchers think that motor action, the hand doing the writing, causes these differences. First, writing leads to better fine motor skills. Secondly, through reading (finding and recognizing letters), one uses the same motor skills as you would by writing them. Children don't develop these skills as much if the letters are learned by typing. Furthermore, the variation in the production of letters is important for learning the invariant qualities of letters. This contributes to the recognition and differentiation of letters. Finally, children who learn letters through writing have similar brain activity as adults who read.

Researchers show the same: namely, writing is different than typing. But there is no proof that children without writing motor skills will not be able to learn to read. The research just shows that the motor components in reading education makes learning to read easier (Francken, 2013).

Typing: Seen from Education

The real learning of typing is possible the moment that children can read well, know punctuation marks and numbers (group 5/6). At this age, they can handle homework and whatever else is necessary for a typing lesson.

The ability to use the keyboard can start at an earlier age, actually when students are in Group 3 and 4 and know all their letters. For example, you can teach children to be aware of the keyboard by working with simple words and pictures. You should keep in mind the combination of writing and typing. First, writing the words, and then typing the words – two birds with one stone. Keep in mind that young children need to be sitting at the right height and have a properly adapted keyboard. There are special keyboards available for little children where the keys are matched with a color. Once students are in Group 5/6 they can use an adult keyboard (depending on the size of the child).

In many schools, big and small children use the same computers. Good posture, table height, and good use of the hands are often underestimated, but they are surely an important part of using to learn the keyboard (Tempelman, 2014).

In the end, the pros and cons of handwriting and typing contrast each other.

Reactions on writing by hand

Positives:	**Negatives**
Writing skills are crucial for general school success	Next to motor skills, emotion influences the results and the legibility
Writing stimulates the brain so you can better remember and better organize	Writing needs more practice - therefore more time
Learning to read is easier	Writing uses more paper
Writing influences language skills	
Being able to write gives self-confidence	
You learn to use available space on the paper	

Reactions on Typing

Positives	**Negatives**
Typing can be used with all modern communication mediums	When you use a screen, you lose contact with your environment
It's not necessary to train and maintain motor skills, emotion is not involved	Word picturing (recognizing the whole word at once) is not as easily remembered
The result is always legible and synoptic	Language skills suffer by typing
Use of space is automatic	You don't learn to space the paper