Handwriting in the heart of the Alps:
Current research studies with a digital pen

Sabrina Gerth
University College of Teacher Education Tyrol, Innsbruck

Introduction

Learning with digital technologies in educational settings can support and facilitate learning for everyone in class.
Digital tools can motivate children to learn and practice for a longer time. They can facilitate the learning process by providing feedback to the learners.

Nowadays, tablets are frequently used in handwriting research to analyze handwriting and its development. However, this is mostly done by researchers in labs and less often by teachers in school.

A digital pen might motivate children to become researchers themselves and explore handwriting through a different lens than in their everyday life in classrooms.

This way, children could experience handwriting not (only) as a complex and hard-to-learn skill. They might explore their own handwriting movements.

In my view, handwriting is not about meeting the norm or earning good grades in school. Learning handwriting well means to establish a motor pattern (with self-reflective practice) and might lead to more elaborative and longer texts later in the children's school careers.

Recent Developments in Tyrol

- The magic pen lab is part of a research project (2022–2025) supported by the Ministry of Education, Austria (INNALP).

- We started using the digital pen in a learning arrangement at a primary school in Innsbruck (research school of the University College of Teacher Education Tyrol) during the school year 2022/23.

- Two digital pen were available: the NeoSmart Pen and the Lamy ncode all black (Fig. 1). We did a pilot testing and decided on the digital pen by Lamy (https://shop.lamy.com/de_de/ncode-technologie, ca. 139€).

Figure 1 Possible selection of digital pens:
NeoSmart Pen M1+ (left), Lamy safari all black ncode (right)

- We developed several handwriting tasks on special paper with an integrated coordinate system (download for free: https://www.neosmartpen.nl/producten/ncode-pdf/?lang=en) using Inkscape or InDesign (vector-based software).

- The Lamy pen has an internal memory, and the data can be downloaded after data collection in a software provided by NeoSmart (via Bluetooth).

- The software outputs the x- and y- coordinates, the pressure of the pen tip onto the writing surface and the timestamp. Further, the writing product can be saved as an image.

Learning Arrangement – Magic Pen Lab

- Children in primary education (1st to 4th grade) participated in nine learning arrangements over the school year 2022/23.

- 10-12 children per group attend each learning arrangement for two times (bi-weekly) in the afternoon at the school.

- 1st lab date: they explore the digital pen and its functionalities; write on the developed materials (Fig. 2) and visualize their handwriting traces on the digital class board with the App https://github.com/NeoSmartpen/Windows-SDK2.0

- 2nd lab date: they reflect on their handwriting and practice their individual writing competences in the learning environment.

Figure 2 Children writing with digital pen on the writing materials.

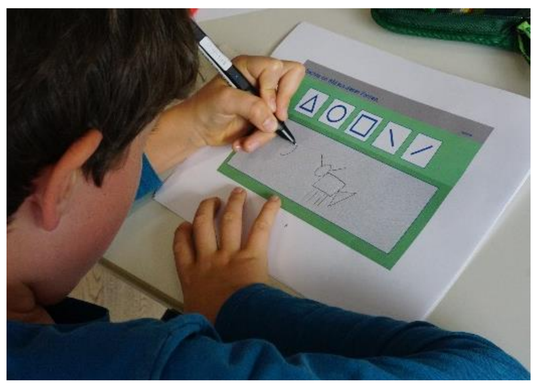

Figure 3 I visited the learning arrangement in the first appointment.

Aim of the project

- Provide children with an opportunity in the classroom to self-reflect on their writing skills using a digital pen and an app.

- Motivate children to practice handwriting and improve their individual skills (e.g., lower pressure onto the writing surface, faster or more legible writing).

- Develop a software (free to use for teachers and children) in the research project for three groups:

1. Children can see their digital writing product and visually recognize, e.g., the difference in writing pressure or writing speed (self-reflective learning).

2. Teachers get an objective impression of the individual writing competencies of all children in the class: Which child needs exercises on writing speed? Who is still exerting too much pressure on the writing surface?

3. Researchers (e.g., bachelor and master students) will be able to use the software to create the material for their own research, collect data, and analyze the data in terms of various handwriting parameters.

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Details about the INNALP Project: https://www.innalp.at/en/
Contact sabrina.gerth@ph-tirol.ac.at
www.ph-tirol.ac.at/sabrina_gerth