A Kazakh experiment in handwriting

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Young girl learning to write. Credit: EPFL

New EPFL research on whether handwriting skills transfer when a child writes in two different alphabetic scripts may pave the way for cross-lingual digital tools for the detection of handwriting difficulties.

Despite the increasing digitization of education and the use of use of tablets and laptops in schools, handwriting has maintained its central position in learning as the basis of many core educational activities such

as taking notes, composing stories and self-expression. It is also a complex, involving attention, perceptual, linguistic, and [fine motor skills](#).

Yet, around one in four children experience handwriting difficulties and this can have ongoing developmental impacts, including trouble learning other skills, increased fatigue and behavioral problems, and low self-esteem, making early detection key to successful intervention.

Tablets and AI to collect better information

Now, a new EPFL spin-off, School Rebound, has developed Dynamico, a handwriting analysis tool that can provide a fast, accurate and reliable analysis of handwriting, assessing multiple dimensions, providing adapted remediation through different activities that target specific handwriting skills.

EPFL researcher and School Rebound CEO, Dr. Thibault Asselborn, says that by analyzing a child's handwriting done on a tablet, Dynamico can collect four times more information than in traditionally used, analog tests. "Our research has shown that all speed and pressure data, as well as the angle of the writing tool, although imperceptible to the naked eye, are more important than static information. Our tool also removes subjective human bias."

Designed in collaboration with therapists, the application then uses artificial intelligence to suggest innovative remediation activities specific to each child and their needs.

A unique Kazakh experiment

Initially available in French, with Italian, English and German in the pipeline, the latest research from the team, led by Professor Pierre

Dillenbourg head of the Computer-Human Interaction in Learning and Instruction Laboratory (CHILI), published in *Nature Science of Learning*, has shown that the app can also be developed for different scripts or alphabets.

The researchers wondered whether handwriting skills transfer when a child writes in two different scripts, such as the Latin and Cyrillic alphabets, that is, are our handwriting skills intrinsically bound to one alphabet or will a child who faces handwriting difficulties in one script experience similar difficulties in the other? A recent change of policy in Kazakhstan provided an opportunity to measure this as the country transitioned from Cyrillic to a Latin-based Kazakh alphabet.

They followed students in grades 1-4, measuring the influence of the number of years spent practicing Cyrillic on the quality of handwriting in the Latin alphabet. The results showed that some of the differences between the two scripts were constant across all grades, reflecting the intrinsic differences in the handwriting dynamics between the two alphabets. They also observed that, despite the differences observed across the two alphabets (the pressure, speed and other factors are different if a child writes in Cyrillic or Latin) the difference is constant across children. That is, a child that had handwriting difficulties in Cyrillic also had difficulties in Latin.

They found that the quality of Cyrillic writing increased across all grades due to increased practice, at the same time as the quality of the Latin writing increased as well, despite the fact that all of the pupils had the same absence of experience in writing in Latin. This improvement in Latin script can be interpreted as an indicator of the transfer of fine motor control skills from Cyrillic to Latin.

Cross-lingual possibilities

"One interesting aspect of these findings is that the algorithms that we developed for the diagnosis of handwriting difficulties among French-speaking children could be relevant for other alphabets, paving the way for the creation of a cross-lingual model for the detection of handwriting difficulties," said Professor Dillenbourg.

The development of digital tablets in the last decade has allowed researchers to tackle these problems as the dynamics of handwriting can now be assessed, this study shows the potential for developing tests for different alphabets or scripts, something that has not happened to date.

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