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The Influence of Traditional and Digital Homework on Students' Academic Performance and Attitude towards Physics

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Abstract. Due to the advances in digital technology, many new perspectives have been opened in the educational system. Due to the COVID-19, the educational systems had to change perspectives of teaching and the teaching environment has changed, too. This study discusses the effect of digitalized education on students' academic performance, cognitive development and long-term information processes, and investigates the role of handwriting in education – focused on the homework solving – and compares it with the opportunities given by using digital methods.

1 Introduction

Nowadays, the traditional handwriting-based education has partially been replaced by a digitised way of teaching, as the use of digital technology is popular in education. Our students are members of the Generation Z [1], they find the out-of-classroom digital environment natural. They have grown up in a world, which offered them rapidly changing and powerful impulses, thus they have shortened concentration span and reduced single focus attention [1]. Most of the students find traditional, paper-based education less appealing, while there is a strong need for digital teaching. Is handwriting still important? Why is it necessary to rely on digital technology in education? We seek to answer these questions based on the results of literature review and our own investigation.

2 Objectives and research questions

In this paper, we investigate the role of traditional, paper-based and digital teaching methods in education. Our research focuses on the advantages and disadvantages of handwriting, as well as how it contributes to the development of cognitive skills. The study concentrates on the field of Physics education, and investigates the opportunities offered by the digital environment to Physics teachers. The investigation focuses on solving homework assignments with different methods – in the paper-based and in the digital way. We observe the influence of handwriting-based and digital homework solving on students' academic performance, and investigate which methods allow for the acquisition of long-lasting, solid knowledge. We organised our investigation based on the following research questions:

1. What are the effects of traditional handwriting-based teaching and learning methods on the development of cognitive skills?
2. Why and to what extent is it necessary to digitize education, to use digital tools in the Physics lessons?
3. Is digital homework more effective than traditional handwriting-based homework?

With the results, we hope we could support colleagues in choosing appropriate methods for their students.

3 Research procedure – methods

After examining and critically evaluating literature in the role of handwriting-based education on the development of students' cognitive processes and comparing it with the opportunities of digitised education, we conducted a research to investigate the influence of the different methods on students' long-term information processes and their level of motivation among 26 7th graders in Budapest. We organised the students into two groups. Both groups had to prepare homework for each class. The test group completed digital homework – Google tests, multiple-choice questions – while the control group solved paper-based homework. The tasks were completely identical. At the end of the unit, students took a post-test, and in order to examine the effect of the different methods on long-term memory they took a follow-up test two months later. The results were analysed with statistical methods [2]. To find out the opinion of students on the applied method, they filled in a questionnaire, they indicated their opinion on a 4 point Likert-scale.

4 Results

The results of the post-test of the two groups didn't indicate significant difference. On the other hand, there is a significant difference – decline – between students' post- and follow-up test results in the digital group, but there is no significant change in time in the academic performance of students who did homework with the handwriting-based method.

The results of the questionnaire indicated that homework-solving is not motivating, even if it is digital, but all of the students from the test group found the digital way of work interesting. Students from the control

group stated that the traditional method helped them achieving good academic results.

5 Conclusion

In our study, we compared the traditional paper-based and digital teaching and learning processes. We investigated the difference between the effect of traditional and digital homework solving methods on students' school performance and their attitude towards learning Physics. Our students seem to have a similar attitude to both methods. The results of our research indicated that digitally acquired long-term knowledge was significantly poorer than knowledge acquired through paper-based methods. The results of our investigation contribute to the further investigations and development of digital Physics teaching methods.

References

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