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Artificial Intelligence in Inclusive Instruction for Braille-Using Students

Extended summary

Inclusive education is one of the key starting points of modern education systems and involves creating conditions in which all students can participate in the teaching process in a more equal manner. In practice, however, it seems that the mere inclusion of students with visual impairments in regular classrooms does not necessarily mean the full accessibility of the teaching content. Teaching materials are generally designed visually, while their adaptation for students who use Braille requires additional time, appropriate technical support, and specific professional knowledge. In this context, modern digital technologies, especially tools based on artificial intelligence (AI), are increasingly being considered as potential support for inclusive teaching.

The paper discusses the potential role of artificial intelligence in supporting teachers working in inclusive classrooms where students who use Braille are also educated. Special attention is paid to the issue of accessibility of teaching materials and the way in which their structure affects the understanding of the content by students who use tactile forms of reading. Unlike visual reading, Braille involves a linear organisation of information, which is why the arrangement of elements, the relationships among the concepts, as well as the structure of the tables and tasks, play an important role in the learning process. The accessibility of teaching materials therefore does

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not only involve technical conversion of the content, but also the preservation of their logical organisation.

The character of this paper is conceptual and it is aimed at considering the possibilities of applying artificial intelligence in inclusive teaching. Within this framework, three areas are highlighted in which the potential role of AI has been identified: improving access to teaching materials, supporting a more active participation of students in teaching activities, and facilitating formative support in the learning process. Modern digital tools can help teachers restructure texts into more readable and linear forms which are more suitable for reading using Braille displays or for creating embossed teaching materials. In addition, some systems allow for the generated descriptions of the visual content, such as graphs or diagrams, which makes it easier to access information that was originally presented visually. Digital tools can also support differentiated teaching activities and provide faster feedback to students.

At the same time, the application of artificial intelligence in inclusive education entails certain risks. Automatically generated content can lead to simplification or disruption of the structure of information, which can make it difficult to understand it in Braille form. There is also the possibility of incorrect or overly confident answers generated by the system. Therefore, the teacher retains a key role in checking and adapting the material. Artificial intelligence is viewed in this paper as a support for teaching practice, not as a substitute for pedagogical assessment and teachers' professional experience.

Pedagogical implications refer to the need for thoughtful integration of digital technologies in inclusive education. The effective application of these tools requires the development of teachers' digital competencies, as well as cooperation with experts in the field of special education and rehabilitation. Their application also depends on the local educational context, including the availability of technologies and support for the Macedonian language.

In conclusion, the paper indicates the potential of artificial intelligence to contribute to improving the accessibility of teaching materials and supporting inclusive teaching for students who use Braille. At the same time, for the responsible and pedagogically justified application of these technologies, further empirical research is necessary to examine their real effects in everyday school practice.

Keywords: artificial intelligence in education, inclusive education, literacy, Braille, accessibility

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