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COMPUTER-BASED INTERVENTION CLOSES LEARNING GAP IN MATH AMONG 3RD AND 4TH GRADE STUDENTS

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The dissertation focuses on the development and evaluation of a digital mathematics intervention program designed to improve multiplication and division skills for 3rd- and 4th-grade students in Hungary, particularly addressing learning losses from COVID-19 school closures and supporting disadvantaged students. A 35-item assessment tool was developed to evaluate these skills, showing strong reliability and construct validity through three subtests: multiplication, division, and word problems. The intervention integrated literature, national curriculum standards, and constructivist learning principles, featuring interactive activities, metacognitive prompts, and adaptive support. Following a pilot study involving 13 schools, the program was refined into 15 learning units comprising 306 tasks. A large-scale study included 810 students from 36 schools, using a quasi-experimental design with pre-tests, post-tests, and delayed post-tests. Key findings revealed: (1) Significant improvements in both short-term and long-term evaluations for the experimental group, with half of the progress credited to the intervention. (2) Low-achieving students exhibited accelerated learning gains. (3) Both genders benefited equally. (4) Enhanced conceptual understanding and procedural skills were confirmed across tests. (5) The program effectively supported disadvantaged students, narrowing the achievement gap with their non-disadvantaged peers. (6) In the control group, the achievement gap widened without targeted support. Overall, the program has been demonstrated to effectively enhance mathematical learning and address educational inequalities, promoting skill retention and narrowing achievement gaps. Despite limitations such as data loss and concurrent instruction influences, this research contributes significantly to mathematics education and equity in learning opportunities.