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This paper presents results from the development of an online test for assessing combinatorial reasoning using innovative item formats and automated scoring. The objectives of the study are to analyze the psychometric characteristics of the online instrument, examine age and gender differences, and explore the possibilities of further analyses. The sample was drawn from students in third (N=186) and fourth (N=219) grades. An online test was developed based on a former paper-and-pencil test that measured a number of operations of combinatorial reasoning with two types of content (formal content with letters and numbers and figural content with pictures). Online data collection was carried out by means of the eDia (Electronic Diagnostic Assessment) platform. Students entered their responses by keyboard (formal content) or by dragging and dropping figures on the screen with a mouse (figural content). The reliability indices for the test were good (Cronbach's $\alpha = .84$ for figural and $.88$ for figural and formal items). Mplus was used to analyze model fit and scale invariance; the results provided evidence of the test's construct validity. Grade and gender differences were found: girls achieved significantly better test scores than boys, and fourth graders performed better than third-grade students. The differences between the third and fourth graders indicate that there may be structural differences between younger and older children's thinking skills. The findings indicate that online assessment may provide teachers with an easy-to-use instrument for monitoring the development of students' combinatorial reasoning.

Computer-based assessment of creativity: The case of divergent thinking

Qualitative methods, Assessment methods and tools, Educational technology, Achievement, Cognitive skills, Reasoning

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The purpose of this study is to explore the possibilities of technology-based assessment of divergent thinking and to contribute to the development of a reliable online instrument. The sample for the study was drawn from sixth-grade students (N=917). The computerized instrument comprised six tasks and was based on Torrance's and Wallach and Kogan's item types for divergent thinking. Answers were scored by the scales of fluency, flexibility and originality. The online data collection was carried out by the eDia platform via Internet in schools' ICT rooms. The comparison was made between the respondent database and the database with the categorized answers using a computer program which calculated the three indices automatically. The online assessment tool proved to be reliable (Cronbach's α ranged between $.80$ and $.87$). Correlation patterns between verbal and figural subtests provided empirical evidence for the convergent and discriminant validity. The three-dimensional model based on fluency, flexibility and originality fit the data better than the one-dimensional model (Chi-square=972.54, $df=3$ $p.001$), thus factors of divergent thinking distinguished in paper-and-pencil testing could be empirically distinguished in a computer-based environment as well. Within the three-dimensional model, all three dimensions correlated on a latent level ($r_{flu_fle}=.61$, $r_{flu_or}=.65$, $r_{fle_or}=.80$, $p.001$). Online test administration and automatic scoring reduced time

and cost of the testing process and made the assessment tool suitable for everyday school practice and large-scale assessments. However, further research is necessary to make the instrument fully automated.