

## DEVELOPMENT OF AN ONLINE TEST BASED ON KLAUER'S THEORY OF INDUCTIVE REASONING: PSYCHOMETRIC PROPERTIES AND CONSTRUCT VALIDITY IN GRADE 5

T-11

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From an educational perspective, Klauer's view of inductive reasoning is one of the well-structured and detailed theories. Several intervention programs have proved its applicability in theory and in practice (Klauer & Phye, 2008). In his definition, inductive reasoning refers to the detection of regularities and irregularities between relations and attributes of objects (Klauer, 1990). He describes six processes of inductive reasoning: Generalisation, Discrimination, Cross-classification, Recognizing relationships, Differentiating relationships and System construction. Previous research has shown the construct validity of the model using mathematical content, however, there is a lack of studies applying more domain-general stimuli.

The aim of this study is to develop a domain-general instrument for inductive reasoning based on Klauer's model and to analyse its psychometric properties and construct validity.

The sample of the study was drawn from grade 5 (age 11) students (N=160, males 46.3%). The online figurative test consisted of 42 items: seven items were developed for each scale described by Klauer's theory. Generalisation (Ge) was defined as class formation; Discrimination as identifying disturbing elements (find the odd one out). In Cross-classification (Cc) tasks students had to classify nine objects into four sets. Recognizing relationships (Rr) items were operationalized as analogies; Differentiating relationships (Dr) as disturbed series; System construction (Sc) as matrices tasks. Items were developed and delivered by the eDia system (Molnár & Csapó, 2019). Data collection was carried out in the schools' computer labs.

Items with negative or low test-item correlations were removed from the subtests. The final test version contained 36 items; Cronbach's  $\alpha=.86$   $M=54.9\%$   $SD=18.7\%$ . The psychometric properties of the subtests were the following: Ge (7 items)  $\alpha=.71$ ,  $M=60.9\%$ ,  $SD=26.9\%$ ; Di (5 items)  $\alpha=.58$ ,  $M=61.6\%$ ,  $SD=28.5\%$ ; Cc (6 items)  $\alpha=.59$ ,  $M=25.5\%$ ,  $SD=23.4\%$ ; Rr (7 items)  $\alpha=.74$ ,  $M=55.1\%$ ,  $SD=30.7\%$ ; Dr (4 items)  $\alpha=.58$ ,  $M=63.9\%$ ,  $SD=30.7\%$ ; Sc (7 items)  $\alpha=.67$ ,  $M=64.2\%$ ,  $SD=26.9\%$ . Correlations of the subtests and the test scores ranged between .48 and .79. The model fit for the 6-dimensional model was good ( $\chi^2=611.09$ ,  $df=579$ ,  $p=.17$ ,  $CFI=.973$ ,  $TLI=.971$ ,  $RMSEA=.019$ ). The fit indexes for the 1-dimensional model were significantly weaker ( $\chi^2=754.27$ ,  $df=594$ ,  $p<.01$ ,  $CFI=.866$ ,  $TLI=.857$ ,  $RMSEA=.041$ ). The model fit of the two-level hierarchical model defined by the theory was also good:  $\chi^2=621.44$ ,  $df=585$ ,  $p=.14$ ,  $CFI=.969$ ,  $TLI=.967$ ,  $RMSEA=.020$ .

The psychometric properties of the test were acceptable; however, the reliability of the subtests should be improved. The construct validity was empirically tested and provided further evidence for the theory. Sample size and age range should be increased in order to improve the generalizability of the findings.

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