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THE ASSESSMENT OF STUDENTS' ABILITIES

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PREDICTING STUDENTS' ATTAINMENT IN PISA MATHEMATICAL AND SCIENCE LITERACY TASKS

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Any educational index poses three research questions related to time. The first is cross-sectional and regards the composition of the index and its relation to other concurrent measures. The second regards predicting the index with earlier cognitive or attitudinal measures and the third is the predictive validity of the index regarding future attainment. In the present study, we focus on the first two questions using a sample of open OECD PISA tasks. The data is from the ongoing Helsinki longitudinal study begun in autumn 2007 with a random sample of 800 first graders, extended to cover the whole age cohort at grade 9 (N=4,500) with five measurement points across the grades. In this study, we use cross sectional data from grade 9 and longitudinal data from grades 1, 7 and 9. Accordingly, there are two sample sizes in the study: for PISA descriptive data for school-class-student level variance estimation N=3,971 for students, N=47 for schools and N=219 for classes; and for longitudinal prediction N=5,054. The cognitive measures used in the model (SEM) comprise the Finnish First Steps for grade 1 (working memory, Piagetian water level task and geometrical analogies), the Finnish Learning to Learn Scales for grades 7 and 9 (working memory, arithmetical operations, verbal reasoning), and nine PISA tasks (18 items) in the domains of mathematical and science literacy (OECD, 2009). Motivational measures for grades 7 and 9 comprise attitudes toward school, agency: effort, achievement orientation, self-handicapping, avoidance orientation, and means-ends-belief: luck). Data on gender, class and school were used for analyses on variance. The analyses were performed using SPSS-AMOS and MLwiN statistics. The decline of the results of the Helsinki students in relation to the PISA students of the 2003 and 2006 cycles was to be expected (mean correct 47% vs. 66%). The role of the class, missing in the official PISA data, was shown to be decisive in Finland; explaining 20.2% of the variance with 8.7% explained by the school (for TIMSS 2011, see Yang Hansen, Gustafsson & Rosén, 2014). The model was supported by the data (Chi square=128.035, df=14: CFI=.969; TLI=.920, RMSEA=.040). The model explained 42% of the variance in students' PISA score with and independent impact of the cognitive domain at all grade levels (.12 for grade 1, .24 for grade 7 and .34 for grade 9) while only grade 7 detrimental attitudes and grade 9 positive attitudes had an independent impact on the score (-.08 and .11, respectively). International comparative studies have gained in importance in education policy since the inauguration of the OECD PISA in 2000. Yet, there is relatively few studies linking PISA to other educational measurements so the present study, even if not relying on original PISA data, offers a rare view to factors predicting the development of the kind of knowledge and skills measured in PISA.