

17 June 2018

**A review of the doctoral thesis by Maciej Koniewski
„Measuring the teacher effect on academic achievement.”**

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This review is in response to a request by the Council of the Institute of Sociology of the Jagiellonian University to assess the merits and limitations of the doctoral thesis prepared by Maciej Koniewski.

The thesis, “Measuring the teacher effect on academic achievement,” comprises an introductory paper (Intro) setting the context for the following three journal articles, which constitute the core of the thesis:

- (Art1) Koniewski, M. (2014). Estimating the teacher effect on academic achievement by hierarchical linear modelling. *Edukacja. An interdisciplinary approach*, 5, 70–91.
- (Art2) Koniewski, M. (in press). The Teacher Self-Efficacy Scale (TSES) Factorial Structure Evidence Review and New Evidence From Polish-Speaking Samples. *European Journal of Psychological Assessment*.
- (Art3) Hawrot, A., Koniewski, M. (2017). Factor Structure of the Maslach Burnout Inventory-Educators Survey (MBI-ES) in a Polish-Speaking Sample. *Journal of Career Assessment*.

In accordance with the provisions of the ACT (“Ustawa o stopniach naukowych i tytule naukowym oraz stopniach i tytule w zakresie sztuki” (Dz.U. z 2016 r. poz, 882)) the review focuses on the consistency (Art. 13 paragraph 2) of the collection of papers that constitute the thesis, the originality of the scientific contribution of the papers (Art. 13

paragraph 1), theoretical knowledge of the Author of the thesis (Art. 13 paragraph 1), and the degree of self-reliance in conducting scientific research (Art. 13 paragraph 1) of the doctoral candidate.

The review begins with a summary of each of the three papers (Art1 to Art3). Since the three papers (Art1 to Art3) had successfully undergone a stringent peer review process, the review does not reassess their scientific merits. Instead, the review evaluates the extent the papers meet the criteria for doctoral theses specified in Art. 13 paragraph 1 of the ACT. Next, a summary of the introductory paper (Intro) is provided together with an assessment of the degree of the consistency (Art. 13 paragraph 2) of the collection of papers that constitute the thesis. The review concludes with a discussion of some of the shortcomings of the thesis and a formal statement of the degree of meeting the criteria specified in the ACT.

The first paper (Art1) was published in a peer-reviewed educational research journal listed in the ERIH bibliographic information index. The paper begins with an extensive literature review of studies on the teacher effect on student academic achievement. However, the primary purpose of the paper was to report a study addressing the problem of identifying teacher characteristics that are important in predicting student academic achievement in math and Polish language learning in Polish lower secondary schools. The criterion variables were student test scores obtained from the math and Polish language sections of a standardized test administered at the end of lower secondary school. The following “teacher” (or class level) predictor variables were used: age, experience, professional advancement, style of work, “authority/classroom management,” “active teaching style” and “helpful teacher” scale scores. Several “control” variables at the student, class, and school level were used. At the student level, the control variables were: prior student achievement, gender, dyslexia status, intelligence, parent’s education, “household wealth,” and household size. At the class level, the control variable was “average student achievement score.” At the school level, school location and area unemployment dynamics were used as control variables.

The data were collected as a part of a nationwide “Research on determinants for academic achievement of pupils in primary and secondary schools” carried out by the Educational Value-Added Section of the Educational Research Institute between January 2010 and June 2012. The data for the analysis of teacher predictors (“determinants”) of mathematics achievement was collected from 3882 students in 246 classes taught by 202 math teachers in 137 schools. The data for the analysis of Polish language achievement was collected from 4119 students in 260 classes taught by 215 Polish language teachers in 143 schools. The analyses of the teacher effects comprised fitting a sequence of hierarchical

(multilevel) linear models separately for the mathematics and language test scores. The results demonstrated that teacher characteristics (included in the models) explained 5% and 4% variance in math and language test scores respectively. Among the teacher factors, the “authority/classroom management” skills had the most substantial impact on student achievement.

The paper (Art1) fulfills all requirements set for doctoral theses specified in the Art. 13 paragraph 1 of the ACT. The paper makes an original contribution to the literature on identifying teacher characteristics facilitating student achievement. The literature review in the paper gives a relatively exhaustive up-to-date survey of teacher effectiveness studies from a process-production perspective. The modeling approach taken in the paper can be characterized as covariate adjustment strategy within the framework of value-added hierarchical modeling. Although the paper does not make new methodological advances, it uniquely contributes to the substantive knowledge in the area of teacher effectiveness. The literature review demonstrates a theoretical knowledge of the Author in the area of studying teacher effects. The empirical part of the paper demonstrates high statistical skills of the Author. The single authorship of the paper is a testimony to an independent, high-quality scholarly work of the Author.

The second paper (Art2) is set to be published in a peer-reviewed psychological assessment journal with a current Impact Factor of 2.328. The paper establishes the factor structure of the Teacher Self-Efficacy Scale (TSES) in an American and two Polish samples of teachers. The paper presents a concise but exhaustive literature review of studies reporting the psychometric properties of the TSES in several countries giving mixed evidence of the hypothetical three-factor structure of the instrument. In the empirical part the article reports on a reanalysis of the original Tschannen-Moran and Woolfolk Hoy (US) data ($n = 255$) for in-service teachers, and an original analysis of two Polish samples of primary ($n = 2083$) and lower-secondary ($n = 2382$) teachers from approximately 180 and 150 schools respectively. Both (Polish) data sets were collected as a part of nationwide studies (the Educational Value-Added for Primary and Lower Secondary Schools studies) conducted by the Educational Value-Added Section of the Educational Research Institute.

The reanalysis of the US sample data with confirmatory factor analysis (CFA) indicated only marginally adequate fit of the hypothesized 3-factor model to data. The analysis of the Polish data was conducted with a CFA estimator that corrected the standard errors and the model fit statistics for the clustered (teachers within schools) nature of the sample design. The results of separate CFA analysis for the primary and lower-secondary

school samples of teachers were relatively consistent and allowed for the retention of the hypothesized 3-factor model only when two cross-loadings and three “error” covariances were introduced in the model in each sample data. Further analyses of measurement invariance demonstrated moderate (in factor loadings and factor covariance matrix) degree of factorial invariance across the two teacher populations.

The article (Art2) fulfills all the requirements set for doctoral theses specified in the Art. 13 paragraph 1 of the ACT. The original contribution of this paper to the area of measuring teacher self-efficacy has two dimensions. First, the literature review of the empirical studies examining the factor structure of the TSES provides an original contribution of the Author. Second, the factorial invariance analyses conducted across the primary and lower-secondary school teacher populations represent a unique contribution to the study of teacher self-efficacy. The empirical part of the paper demonstrates both theoretical knowledge in the area of psychometrics and high statistical skills of the Author. The single authorship of the paper gives testimony to an independent and high-quality scholarly work of the Author.

The third paper (Art3) is set to be published in a peer-reviewed psychological assessment journal with an Impact Factor of 1.330. The paper establishes the factor structure of the Maslach Burnout Inventory-Educators Survey (MBI-ES) in a Polish sample of teachers. The paper presents a concise but exhaustive literature review of studies, published between 2000 and 2016, on the psychometric properties of the MBI-ES and highlights the mixed evidence for the hypothesized three-factor structure and reliability of the instrument. In the empirical part of the paper, the Authors examined the factor structure of the instrument in a nationwide Polish sample of 1206 teachers from 179 primary schools. The data were collected as a part of a study (the Educational Value-Added for Primary Schools study) conducted by the Educational Value-Added Section of the Educational Research Institute.

To establish the factor structure of the MBI-ES the Authors tested a sequence of increasingly more general CFA models starting with a one-factor model and ending with a five-factor model. The Authors also tested a bifactor (CFA) model and a corresponding exploratory (ESEM) target-rotated bifactor model. All analyses were conducted with an appropriate estimator for ordered categorical indicators, and a correction of the standard errors and model fit statistics appropriate for the clustered nature (teachers within schools) of the data. In light of the obtained measures of fit for the different tested models, the Authors retained the bifactor (CFA) model with three a priori hypothesized (original MBI-ES subscales) factors and a general factor representing a “general burnout” dimension. The authors also attempted to confirm the “rationality” of the retained bifactor (CFA) model by

comparing its fit and factor loading estimates to the fit and loading estimates of a corresponding exploratory (ESEM) target-rotated bifactor model.

The paper also reports model-based internal consistency reliability for the “general” factor and the each of the three subscale factors based on the factor loadings and unique variances estimated for the bifactor (CFA) model. The results indicate an adequate level of internal consistency reliability for the general factor. However, the reliability levels for the specific dimensions were substandard. Consequently, the Authors in their discussion of the implications of the study’s results caution against using the subscale scores for diagnostic purposes.

Like the previous two papers, this paper (Art3) fulfills the requirements set for doctoral theses specified in the Art. 13 paragraph 1 of the ACT. The main two contributions of this paper to the area measuring teacher burnout are its literature review of studies on MBI-ES and the establishment of the factor structure of the scale in the Polish population of teachers. The literature review of the empirical studies examining the psychometric properties of the MBI-ES provides an original contribution of the Authors. The review is relatively concise. However, it provides an exhaustive survey of studies examining the factor structure of the MBI-ES in different populations of teachers in different countries. The application of the bifactor model is innovative and addresses in a robust methodological way inconsistent finding of previous research on the factor structure of the MBI-ES.

The introductory paper (Intro) gives a brief historical survey of studies exploring the drivers of teacher effect on student academic achievement. The paper focuses on the pioneering research of Coleman conducted in the sixties of the previous century on the drives of student school achievement, and the work of Hanushek conducted during the seventies from an econometric input-output perspective.

The paper further discusses student (sec. 2.1), family (sec. 2.2), and class (sec. 2.3) factors, and the interaction of classroom and teacher factors (the “boutique effect”) (sec. 2.4) that have been identified as predictors/determinants of student academic achievement. Setting the stage for the discussion of the three papers, which constitute the base of the doctoral thesis, Maciej Koniewski reviews (sec. 3) the weaknesses of the extant literature on isolating the teacher effect on student academic outcomes. He rightly identifies a possible selection (to school) bias of both students and teacher as the main confounding factor in estimating the causal effects of teachers. He then discusses the covariate adjustment model within the value-added framework as a possible solution to the selection-bias problem. He also points out that such directly measurable teacher characteristics as experience, education, and gender have

been shown to have little explanatory power in explaining students' gains in test scores. In light of these results, Maciej Koniewski proposes that teachers' attitudes and dispositions might be the most important teacher factors in explaining student academic achievement. However, studies of the teacher effect and measurement properties of available instruments for assessing teachers' attitudes and dispositions often do not meet such statistical and psychometric standards as a) using the hierarchical linear model (HLM) to account for the nested structure of the data; b) using confirmatory factor analysis (CFA) to determine the dimensionality of the measures; c) using model-based reliability estimates to accommodate realistic assumptions about the measurement structure of the instruments; and d) using item response theory (IRT) to obtain high-precision scaling of student exam scores.

Thus the three papers (Art1 to Art3) proposed as the foundation of the doctoral thesis address the significant shortcomings of past and current research on "the teacher effect" as identified by Maciej Koniewski in the introductory (Intro) paper. As such the introductory paper and the three published articles constitute a consistent collection of papers on the identification of teacher effect on student academic achievement and meet the thematic consistency requirement specified in the Art. 13 paragraph 2 of the CAT.

As a reviewer, I am also obliged to comment on the possible limitations of the thesis. It is hard to find shortcomings of papers that had been subjected to a stringent peer review process before their publication. However, the first paper (Art1) leaves me with a quandary about the nature of the relationship of the student-level and class-level (teacher) factors in "determining" student achievement. Is the teacher effect ("helpful teacher" or "teacher authority/classroom management" variable) moderated by student characteristics (e.g., gender or parent education) or the teacher and student characteristics constitute additive effects on student test gain scores? This question was not addressed but might have been addressed in this paper.

The two remaining papers (Art 2 and Art3) share a common limitation of being strongly exploratory despite using confirmatory analytic (CFA) tools. However, cross-validation of the retained factor structures (models) was attempted in neither of the two papers. The conclusions of the two papers might have been stronger if the resulting models had been cross-validated, or at least the exploratory nature of the retained models had been addressed in the corresponding discussion section of each paper.

Finally, the introductory (Intro) paper suffers from a conspicuously absent consideration of (quasi)experimental and longitudinal studies on the teacher effect. The quality of the introductory paper would have benefited by extending the scope of the review

to these types of studies. On the one hand, it would have shown that the “value-added” approach is not the only possible strategy to study the teacher effect. On the other hand, it would set a broader context for the type of research (design) that is the primary focus of the doctoral thesis.

These are however only minor limitations. Overall this is an excellent thesis comprising three important publications and an introductory paper that may constitute a solid base for a fine publishable review of studies on the predictors/determinants of student academic achievement.

To conclude, the thesis fulfills all the criteria set by the ACT (“Ustawa o stopniach naukowych i tytule naukowym oraz stopniach i tytule w zakresie sztuki” (Dz.U. z 2016 r. poz. 882)) and I move for its acceptance by the Council of the Institute of Sociology. In recognition of the high quality of the thesis, I recommend the thesis for a Thesis/Dissertation Prize to the Council of the Institute of Sociology.



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