RECENT DISSERTATIONS

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Scientific inquiry in TIMSS and PISA 2015. Inquiry as an instructional approach and the assessment of inquiry as an instructional outcome in science

Department of Teacher Education and School Research, Faculty of Educational Sciences, University of Oslo, Norway

Abstract

The aim of this thesis is to investigate the theoretical, methodological, and empirical aspects of inquiry as an instructional approach and the assessment of inquiry as an instructional outcome. The empirical investigations used data from student and teacher questionnaires, student assessment, and student log files in the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) 2015. This thesis is based on four articles, which collectively examines inquiry in Norwegian context through the lenses of science education and international large-scale assessments.

Article 1 focuses on inquiry as an instructional approach and outcome by exploring the relationship between inquiry-based science teaching and student achievement in science. This article attempts to resolve conflicting findings from previous studies by demonstrating the existence of curvilinear rather than linear relationships between inquiry and achievement. *Article 2* addresses the research gaps in comparing inquiry as an instructional approach between primary and secondary education. It examines the interplay between teachers' self-efficacy in teaching science and perceived time constraints in explaining the opportunities for students to engage in cognitively challenging learning activities in Grades 4, 5, 8, and 9. *Article 3* presents an investigation on the assessment of inquiry as an instructional outcome. It identifies distinct profiles of students' performance on simulated inquiry tasks that require the skills to coordinate the effects of multiple variables and to coordinate theory with evidence. While *Article 3* takes a micro approach, focusing on specific scientific inquiry skills, *Article 4* explores inquiry as an instructional outcome from a macro approach, taking into account a range of formal and informal reasoning skills students need to acquire in order to participate in inquiry practice. This article argues for the importance of assessing formal and informal reasoning and provides a short overview on utilizing the potential of computer-based assessments to assess both types of reasoning.

Taken together, the findings presented in this thesis advance the existing knowledge about the important distinction and role of inquiry as a means and an end in science education. This thesis argues that, to understand inquiry in a comprehensive context, it is essential to consider the relationships of the data gathered from various sources: the input (i.e., student and teacher characteristics), process (i.e., classroom characteristics), and output of inquiry (i.e., student performance). This study contributes to inform the ongoing science education reform in Norway and to improve the assessment of inquiry as an instructional approach and outcome in international large-scale assessments.

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Contact: nani.teig@ils.uio.no

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