Evaluation of Norway's 2020 Curriculum Reform using PISA Data

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Project Proposal

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Introduction and Rationale

The curriculum revision (*fagfornyelsen*) in 2020 (*kunnskapsløftet* 2020, K20) marks a major change in how students are taught in Norway (UDIR, 2020). It was the first time a substantial reformation of curricula was implemented since the 2006 reform (*kunnskapsløftet* 2006, K06). In mathematics, one major change was the establishment of core elements (*kjerneelementer*) across all curricula spanning from Year 1 to 10. These core elements, namely, inquiry and problem solving, modelling and applications, reasoning and argumentation, representation and communication, abstraction and generalisations, and mathematical domains, to a large degree resemble the PISA mathematics framework (OECD, 2018)—both share genesis with the eight competencies firstly proposed by Danish mathematician and educator Mogens Niss (Niss & Højgaard, 2011; Niss, 2003; Niss & Højgaard, 2019).

The implementation of the core elements in K20 and their close alignment with the PISA framework provides a golden opportunity to study Norwegian students' learning outcomes using one cycle of PISA *before*, and one *after*, the introduction of K20. Since mathematics was the major domain in PISA 2012 and once again in 2022, these two time points may serve as the pre-test and post-test in an "experiment" with K20 being the "treatment" (Shadish et al., 2002). Two factors, however, complicate this quasi-experimental interpretation. First, K20 was implemented *concurrently* with the COVID-19 school closures and the resultant home schooling. Separating effects attributable to the pandemic from those of K20 is therefore a chief task in this project. Second, PISA employs a cross-sectional rather than longitudinal design, limiting any causal inferences. Yet, PISA data sets, and especially when combined with Norwegian register data, are the best data sources available in Norway to study the effect of K20.

Mapping students' knowledge, understanding and skills within these core elements, in particular, *problem solving*, *modelling* and *reasoning*, is important for three reasons. First of all, an in-depth understanding of students' mastery of these key capabilities would provide insight into their command of 21st Century skills (OECD, 2018, p. 31). Secondly, (Pettersen & Braeken, 2019; Pettersen & Nortvedt, 2018) *overall* mathematics

Overall Aims and Research Questions

In this PhD, I wish to address this gap in research and the need to [insert more] through the following overarching aim:

The aim is to examine students' competencies within the core elements of K20 with special focus on problem solving, modelling and reasoning using primarily PISA 2012 and PISA 2022 data.

Theoretical Framework

The Norwegian Education System

Norway's Recent Curricular Changes

Mathematical Competencies

Mathematical Modelling

Mathematical Reasoning and Argumentation

Problem Solving

Methodology

Data and Sample

The present study will primarily use data sources from the Program for International Student Assessment (PISA). PISA is a major international large-scale assessment project conducted by the Organisation for Economic Co-operation and Development (OECD) every three years that aims to assess 15-year-old students' literacy in reading, mathematics and science, with one literacy being the main focus in each cycle. Mathematics served as the major domain in 2012 and 2022, giving stakeholders significant insight into mathematics teaching and learning around the globe. PISA uses the two-stage sampling procedure and rotating booklet design to produce multiple plausible values (five for the 2012 cycle and ten for 2022) to represent candidates' competency (Rust, 2014). Statistical analyses often need to accommodate complex design features by incorporating weights, scalings and the hierarchical data structure. Although differ in wording, both the 2012 and 2022 PISA framework for mathematics recognise the interrelated aspects of process, content and context (OECD, 2013). The process aspect refers to an individual's capacity to formulate situations mathematically, then to employ mathematical concepts, facts, procedures, and reasoning to interpret, apply and evaluate mathematical outcomes (OECD, 2013, p. 28). The 2022 framework,

furthermore, highlighted the mathematical reasoning and problem solving elements of the process aspect, and introduced 21st Century skills into the context dimension in recognition of youth as consumers of quantitative, sometimes statistical, arguments (OECD, 2018).

Methods of Analyses

Articles

Article 1

Article 2

Article 3

Article 4

Progress Plan

Table 1

PhD Candidacy Time Frame

Milestone	2022H	2023V	2023H	2024V	2024H	2025V	2025H	2026V
Coursework	✓	✓	✓	✓	✓			
Align K20 and PISA	✓							
Merge with register data	✓	✓						
Article 1		✓	✓					
Article 2			✓	✓	✓			
Article 3					✓	✓	✓	
Article 4						✓	✓	
Kappe								✓

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