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Theory development and measurement strategies in research on teaching quality. A view from philosophy of science.

Abstract

In research on teaching quality, leading scholars have argued in favour of programmatic research that will move the field forward. At the same time, a concern is articulated that a lack of consensus and coherence in terminology, methodology and contrasting epistemological and ontological premises may go against such an ambition (Charalombous et al., 2021; Chambliss et al., 2012; Kelly & Elliott-Kelly, 2018). In the present paper, I will depart from the two basic analytical models introduced by White et al. (2021), the reflective and the formative model. The authors claim that an inquiry into these models will contribute to the alignment of "theoretical understanding of teaching quality and analytical approaches to measure teaching quality". I will discuss the distinction between reflective and formative models in light of recent discussions about "underlying" epistemological and ontological assumptions (Jarvis, 2003; Bollen & Diamantopoulos, 2017). In this literature (Vessonen, 2019) the reflective model is roughly connected to scientific realism and assumed to promote theory development (what is teaching quality?), whereas the formative models would advocate a flexibility in analytical approaches (how are measures of teaching quality predicting measures of student learning). This paper will discuss to what extent these are incompatible models and in what way they could be combined. The relevance of views from philosophy of science in balancing programmatic research and theoretical and methodological pluralism is addressed.

Extended abstract

In research on teaching quality, leading scholars have argued in favour of programmatic research that will move the field forward (Grossman & McDonald, 2008; Kuger et Klieme, 2016; Klette, 2020). At the same time, a concern is articulated that a lack of consensus and coherence in terminology, methodology and contrasting epistemological and ontological premises may go against such an ambition (Charalambous et al, 2021; Chambliss et al., 2012). A major concern has been about theory development in this field (Kuger & Klieme, 2016) and related research (school effectiveness research, Maag Merki et al., 2015).

The aim of this paper is to outline and discuss a strategy for making explicit the epistemological and ontological assumptions that may steer our ambitions when theorizing and measuring teaching quality. Neighbouring but subsidiary themes are contrasting views on scientific progress, programmatic research and the need for a common terminology about teaching quality (Grossman & Pupik Dean, 2019) as a vehicle for advancement in the field.

The methodology used in this paper is a version of integrative literature review (Torraco, 2016) that selectively trace arguments on conceptual frameworks, theories etc. in order to critically examine, clarify or synthesize the literature. I will depart from the two basic conceptual models introduced by White et al. (2021), the reflective and the formative model,

when discussing "the need to align theoretical understandings of teaching quality with analytical approaches to measure teaching quality" – in this case standardized observation systems, notably the Plato-manual. The reflective models assume that the domain constructs such as Instructional Scaffolding are unobservables that are inferred from the observed dimension scores; Modeling, Strategy Use and Instruction and Guided Practice. Then these observed scores are believed to be caused by the unobservable key construct and error factors. The formative model does not assume that the measured scores are all caused by a single underlying construct (Jarvis, 2003). Rather, it assumes that the measures all cause a single construct. That is, a reversed flow. White et al. (2021) add other distinguishing characteristics to these models related to standard measurement approaches and provide examples from standard observation systems (PLATO, CLASS, MAIN-TEACH) how different studies may analyse relationships (between analytical levels) that may violate both the formative and reflective models. If such deviations from the underlying theory are not made explicit, accumulation across studies is weakened and may hamper further development of measurement tools and theory about teaching quality.

In the literature that draws on philosophy of science (Yarkoni, 2020) the reflective model tends to be connected to scientific realism and epistemological / ontological assumptions underpinning theory development (for example. what is teaching quality?), whereas the formative models would advocate a flexibility in analytical approaches (how are measures of teaching quality predicting measures of student learning?). The latter are also contended to represent operationalism (for example, "teaching quality" is defined by the procedures to measure the construct). Edwards & Baggozi (2000) attribute the formative view to the basic tenets of classical test theory and the reflective to item response models, but opinions differ on such a pairing.

In the practice of psychometrics formative models and operationalism (Borsboom, 2006) has been the main trend in measure validation (Vessonen, 2019), but this may not be the case in educational research. Among common criticisms of operationalism there is the tendency to generate arbitrary stipulation and an uncontrollable proliferation of concepts (Lovett & Hood, 2011). On the other hand, the verbosity in research on teaching quality may also reflect inconsistencies in the use of both a reflective model and a formative, possibly aligned with implicit operationalism. Schlesinger & Jentsch (2016) maintain that the teaching effectiveness research understands instructional quality in a functional way, i.e. the main goal is to predict students' achievements at school – in line with the process-mediation-product paradigm (Brophy, 2000). In principle, this framework is not conductive to theory development that will advance our understanding of teaching quality and its constituents (Schlesinger & Jentsch, 2016). However, a pragmatic (operational) approach may be advisable in establishing a logic of discovery and scoping exercises in areas where theoretical knowledge is lacking and / or in a stage with radical reformulations, such as the recent call for including equity (Kyriakides et al., 2021), basic democratic ideas (Praetorius & Gräsel, 2021) etc. and the role of students' construction in teaching quality (Seidel, 2014).

The debate on reflective and formative models with contributions from philosophy of science and measurement theory does introduce frameworks that combine these two alternative views and permit contextual approaches (Vessonen, 2019) to our understanding of teaching quality. However, authors converge in stressing the need for explicitness about theoretical / analytical assumptions and choices for example when it comes to the accumulation of evidence (Charalambous et al., 2021). As commented by White et al. (draft) these deliberations crucial in addressing what Praetorius & Charalambous (2018) have noted as problematic with the standardized observation systems about teaching quality – the labelling and I will add the categorization of levels – domains, dimensions, components.

In sum, the paper by White et al (draft) pioneers an introducing of the literature on reflective and formative models in psychometrics and measurement theory and convincingly exemplified its relevance for research on teaching quality. In the present paper, I draw a line to authors that discuss these models in terms of epistemological and ontological issues. To what extent such a meta-perspective may bring more clarity to the field, is a rather open question at the present. However, as pointed out by Matta (2021) and Phillips (2005) philosophy of science needs to be brought in close interaction with ongoing educational research if it is to be used to promote explicitness and not primarily contribute to "paradigm wars". Such perspectives may contribute to discussions about research strategies for balancing programmatic research and the need for justified theoretical and analytical pluralism in research on teaching quality.

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