

# Mathematics, vocational education, and multilingualism: Epistemic aspects

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*In this presentation, we discuss epistemic aspects with regards to mathematics in relation to vocational mathematics and language use. We draw on two theoretical frameworks which build on praxeology, and “Language as resource” in multilingual mathematics activities. In so doing, we explore and try to combine assumptions from them with specific attention to epistemic aspects, such as questioning hierarchies among disciplines, and how language use may open up opportunities as to how mathematics is conceptualised and understood.*

## **Introduction and aim**

In this text, we discuss epistemic aspects with regards to mathematics, in relation to multilingualism, and vocational education. In the field of mathematics education, mathematics as such has been conceptualised in various ways. We perceive mathematics in line with the following quote:

There is not one single mathematic, absolute and infallible (Davis & Hersh, 1980/1983; Ernest, 1991; Kline, 1980, 1987), but rather a plurality of mathematics which operate on a pragmatic basis, linked to time and place. (FitzSimons, 2002, p. 15).

In connection to this, our interest is in reflecting on epistemic aspects, aspects of what knowing might mean, of mathematics as a body of knowledge, and as a social practice, in relation to multilingualism and to vocational learning content.

## **Epistemic aspects in relation to vocational contexts and language**

In the field of mathematics education, researchers have identified mathematics in connection to vocational contexts (e.g. FitzSimons, 2002; Muhrman, 2016). A significant aspect in these studies is the way the vocational knowledge is addressed with respect to authenticity, i.e. that not only (school) mathematics is taken seriously, but also the workplace content. Inspired by studies like these, Boistrup collaborated with mathematics and vocational teachers in developing an analytical model. The model (see Boistrup & Hällback, in print) builds on Praxeology by Chevallard (2006), and challenges an epistemic conception, where mathematics is taken as the theoretical knowing, while the vocational knowing is taken as purely

practical. Rather, the authors address both content areas, and interfaces between them, as consisting of practical (praxis) and theoretical aspects (logos).

A prevailing idea in the field of mathematics education and multilingualism, is “First Language as resource” (see for example Chronaki & Planas, 2018). In Ryan et al. (2021), an analytical model is presented for considering different epistemic potentials for multilingual mathematics activities that are embedded in the idea of Language as resource. This model displays continuums for; (1) epistemic potentials when moving from separating ways of knowing mathematics to synthesising plural ways of knowing mathematics; and (2) epistemic potentials when moving from separating named languages (e.g. Swedish and Arabic) to synthesising new language practices. These two dimensions are not separate. Rather, we argue, the way that mathematics teachers, and researchers, take language aspects into account, may, in fact, open up opportunities as to how mathematics is conceptualised and understood, in the sense of not being a restricted fixed body of knowledge but rather dynamic practises constantly in flux.

We are currently combining the two described models, and the similarities of epistemic aspects between the two. Examples here is how taken-for-granted assumptions of mathematics education may be elaborated on to problematize prevailing assumptions about for instance hierarchies among disciplines such as mathematics and vocational content as school subjects (Boistrup & Hällback, in print), or the idea that named languages are neatly separated and that multilingual students’ ways of knowing mathematics merely can be understood in a dichotomizing structure of formal and informal mathematics (Ryan, et al., 2021).

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