HABERMAS' CONSTRUCT OF RATIONALITY TO BRING OUT MATHEMATICS AND PHYSICS DISCIPLINARY IDENTITIES

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The study is conceived within the European Erasmus+ project IDENTITIES, whose goal is to promote interdisciplinarity in prospective teachers' education. As a preliminary step in order to design teacher education activities, we investigate the disciplinary key aspects of mathematics and physics reasoning in disciplinary instructional materials (namely, physics textbooks) as well as interdisciplinary issues. As key aspects, we refer to the epistemic core of disciplines: aims and values, methods and methodological rules, practices, and scientific knowledge (Erduran & Dagher, 2014). To reflect on implicit reasoning structures, implicit goals, or implicit communicative strategies, we investigate the three dimensions of Habermas' rational behaviour: epistemic, teleological, and communicative (Morselli & Boero, 2009).

In this contribution we focus on the chapter about parabolic motion from an Italian high school physics textbook. The analysis shows a decreasing weight of the three dimensions of rationality: the communicative dimension (choices inherent to text presentation, for example use of bullet lists, highlighted or boxed words or sentences, repetition and use of terms) emerges more, followed by the epistemic one (explication of used hypotheses, laws and results), while the teleological one (goals, strategies, and decisions) remains more implicit. We also identify elements of the epistemic core of disciplines: physics aims, like modelling phenomena, and mathematical methods, like algebraic substitutions. Interdisciplinary issues emerge in the comparison between communicative strategies to introduce a concept (use of different examples vs definitions) and in the different structures of arguments (principles conciliating expected and deducted results vs deductive and algebraic reasoning from premises to general end). Further results and details will be provided in the oral communication. We are currently carrying out the second step of the study, i.e., involving prospective teachers in this kind of analysis of physics and mathematics textbooks.

References

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