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5th International Congress: Education and Knowledge

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(Eds.)



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Construyendo el conocimiento de forma colectiva

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Bringing (powerful) knowledge back in: How to avoid creating a ‘mile-wide, inch-deep’ science curriculum

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As highlighted by the OECD global project on the future of education and skills, curriculum overload has emerged as one of the most pressing educational challenges of the twenty-first century. This phenomenon of overcrowded curricula suggests that, in an attempt to cope with multiple social and cultural pressures, schools have adopted a ‘mile-wide, inch-deep’ approach to learning. Such a model prioritizes the quantity of topics covered over the depth of understanding, which ultimately comes at a significant cost to the learner. Specifically, it neglects the deep, generative structures of knowledge that allow students to connect disparate facts into a coherent framework. However, mastering these structures is crucial in an era of ‘knowledge explosion’, characterised by hyper-specialisation and the pervasiveness of tools for instant information retrieval and AI-driven content generation. Recent global events, including the recent pandemic and ongoing geopolitical crises, have highlighted how easy access to vast amounts of information can, counterintuitively, lead to epistemic deprivation, with a progressive increase in false beliefs and a reduction in genuine knowledge. In fact, without the proper epistemic tools to interpret it, more information can often lead to greater confusion or the reinforcement of biases. Therefore, to prevent individuals from developing or strengthening erroneous beliefs that could lead to dangerous behaviors while navigating virtual environments and social networks, it is more important than ever that schools focus on cultivating sound epistemic habits. In this context, the goal of quality education is to train citizens who can evaluate the quality and validity of information they encounter, debunk misinformation and make rational, evidence-based decisions, especially in situations characterized by high levels of uncertainty. Taking science education as a case study, this proposal aims to address this highly topical matter by examining two closely related issues. The first issue concerns the urgent need to reconsider the crucial relationship between the school curriculum and the nature of knowledge itself, particularly in light of the problem of curriculum overload. The first research question this work intends to answer is: what specific type of knowledge is of most worth to avoid a ‘mile-wide, inch-deep’ approach to science education? To address this, the study offers a detailed interpretation of what constitutes ‘worthwhile knowledge’ in relation to modern educational challenges, proposing clear criteria for its identification. For this purpose, the concept of ‘powerful knowledge’ is adopted – i.e., specialised, systematic knowledge that can intellectually emancipate those who master it – to connect the key insights of the structuralist approach to curriculum theory with the social epistemology of science. The second issue concerns the process of didactic transposition and reconstruction—the process by which such powerful knowledge is transformed into teachable school content. Thus, the second research question asks: what epistemological (i.e., what to teach) and pedagogical (i.e., how to teach) constraints must this process conform to in order to foster sound epistemic habits in students when complex socio-scientific issues are at stake? To answer this, the contribution advances a hypothesis drawing on the PISA Science Framework, identifying three forms of scientific knowledge (content, procedural, and epistemic) as epistemological constraints and the teaching of science as a practice as a pedagogical constraint. Building on these insights, a spiral curriculum model based on procedural principles is proposed to ensure compliance with both types of constraints. Finally, the research discusses the practical implications for teacher training and the potential for generalizing this model to other disciplines.

