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## Editorial

# Problem solving—facilitating the utilization of a concept towards lifelong education

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This Special Issue presents a collection of articles that were submitted to the *International Journal of Lifelong Education* in response to a call for papers on facilitating the utilization of problem solving towards lifelong education. The relevance of problem-solving skills within the field of lifelong education is best reflected by ongoing societal and vocational changes that have led to an accelerated shift in human tasks at work over the last decades. Jobs formerly characterized by standardized routines and repetitive work patterns have transformed towards more complex problem situations, and nowadays increasingly include work on nonroutine tasks. Adding to these changes in established jobs, newly emerging work environments, for example, in the area of information and communication technology, focus strongly on the latter types of tasks, therefore requiring individuals to employ adaptive behaviour in changing problematic situations to a substantial extent. On a general level, demands in terms of flexibility, adapting to novel situations and performing nonroutine problem solving and communication have rapidly gained in importance due to substantial changes at the human workplace in the twenty-first century (cf. Autor, Levy, & Murnane, 2003; Spitz-Oener, 2006). To be able to cope with these requirements successfully on an individual, organizational and societal level, the changes in work requirements call for an in-depth understanding of skills that enable us to deal with such situations from a lifelong learning and lifelong education perspective.

Problem solving has increasingly received attention by scientists and practitioners during the last years. Thereby, different conceptions of problem solving

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have been proposed to date; among the most prominent is complex problem solving (CPS). CPS represents a person's ability to successfully interact with new and nontransparent problematic situations characterized by complexity, intransparency and dynamics (Funke, 2001). Located on a general and domain-abstract level, CPS reflects important cognitive prerequisites to deal with developments in the working place as mentioned above. Complementary to CPS, other conceptions of problem solving focus on domain-specific problem-solving skills predominantly involving content-specific strategies and processes in different fields such as at the workplace (i.e. problem solving in everyday working life) or in technology-rich environments (i.e. problem solving in technology-rich environments [PSTRE]).

The Organisation for Economic Co-operation and Development (OECD, 2014) and the National Research Council (2012) as representatives of institutions with high-strategic impact on a political and a research level, both emphasize the importance of problem-solving skills, which is in line with the view shared by scholars in a number of academic fields such as educational psychology (Mayer & Wittrock, 2006). Consequently, CPS found its way into the allegedly most influential large-scale assessment worldwide, the Programme for International Student Assessment (PISA; OECD, 2014) and PSTRE, for its part, into the Programme for the International Assessment of Adult Competencies (PIAAC; OECD, 2013). Further, CPS is currently included in a number of national school monitorings across Europe and in a FP7 project of the European Union that targets the development of CPS after initial formal education in the context of lifelong education. However, despite these efforts scattered information with regard to CPS and complementary problem-solving skills hampers the utilization and adaptation of resulting conceptual and empirical insights in the broader domain of lifelong education.

This Special Issue in the *International Journal of Lifelong Education* therefore aims at providing researchers and practitioners with a condensed view on current efforts on problem solving relevant for lifelong education. In particular, this Special Issue focuses on CPS as well as on its relation to domain-specific problem-solving skills (i.e. problem solving in everyday working life and PSTRE) in the context of lifelong education. Herewith, it aims at facilitating the transmission and discussion of information with regard to the elucidation and development of problem solving, their rationale and significance for policy, and presents critiques and implications of the concepts.

The current Special Issue consists of six contributions all dedicated to CPS and complementary conceptions of problem solving. In the first contribution, Vainikainen, Wüstenberg, Kupiainen, Hotulainen and Hautamäki provide theoretical and empirical connections of CPS to the Finnish learning-to-learn framework, thereby shedding light on the development of transversal skills in primary school pupils. In the second contribution, Mainert, Kretzschmar, Neubert and Greiff extend the focus towards adult learning, by empirically connecting CPS to lifelong learning efforts of individuals via job position and training efforts. Focused on theoretical explorations, in the third contribution, Baggen, Mainert, Lans, Biemans, Greiff and Mulder connect CPS to important considerations in innovation research, highlighting commonalities and differences between CPS and opportunity identification competence as the ability to identify ideas for new products, processes, practices or services. In the fourth contribution,

Ederer, Nedelkoska, Patt and Castellazzi take on an economical perspective and aim at investigating the market value of CPS in terms of actual salary changes related to CPS skills, thereby offering a complementary perspective from an interestingly different scientific approach. In the fifth contribution, Rausch, Schley and Warwas apply an Internet-based diary in order to penetrate problem solving in everyday working life in the attempt to bridge the often-criticized gap between performance in specific assessment situations and challenges and problems encountered in real life. In the final contribution, drawing on the PIAAC database, Desjardins and Ederer extend and connect the conception of CPS to PSTRE offering the kind of broad conceptualization and of synthesis of conceptions of problem solving that is needed for a comprehensive integration towards lifelong education.

We are convinced that this unique collection of conceptual and empirical contributions together making up this Special Issue will bring problem solving in general and, more specifically, the concept of CPS closer to a wider audience of researchers and practitioners. While the concept of CPS offers remarkable potential in terms of measuring and understanding individual-level prerequisites for twenty-first century work environments, it is through the connection to lifelong education that these insights will unfold their full potential. With this Special Issue, we hope to provide a starting point that initiates further research and discussion within the field of lifelong education.

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