Editorial

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During the past few decades, several interconnected research traditions have paid more and more attention to the process of educational design. Educational design research and other design-oriented methods seek complex educational problems through systematic, iterative, and continuing process of design, development, and evaluation of educational practices. This special issue presents six articles including research on educational design research methodology as well as research utilizing educational design research methods.

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Educational design research

Educational design research (EDR), also known as design-based research (DBR), is a methodological approach that enables systematic research-oriented praxis. EDR can be used for developing all kind of educational artefacts like e.g. learning materials, courses and software (Pernaa & Aksela, 2013).

EDR studies have been conducted since the early nineties (Brown, 1992; Collins, 1992). Nowadays it is a well-known and widely used approach for educational research (Anderson & Shattuck, 2012). Scholarly interest on the EDR can be seen, for example, in the growing number of handbooks, guides and special issues in educational research journals focusing on it (e.g. Barab & Squire, 2004; Kelly, 2003; Pernaa, 2013; Plomp & Nieveen, 2010; Sandoval & Bell, 2004).

This special issue presents six studies, which either utilise or discuss the use of EDR in the context of mathematics, science and technology education research. They provide concrete examples on how to use the approach in the development of materials and approaches as well as to develop our understanding of the EDR methology.

In the first paper, Helén Sterner discusses about the teachers' role in educational design research. She explores the opportunities and challenges teachers encounter when they participate in educational design research projects. The study shows, that teachers' pariticipation in all the phases of educational design research helps to focus

the project to the instructional practices of the participating teachers. Thus such participation can play a central part in interweaving research and practice.

In the second paper, Ana Kuzle reports a design research project on the development of practice-oriented materials for supporting students' problem-solving competences were developed. Problem-solving through working backward strategy was selected as the focus for the learning environment design. Kuzle has selected this context, because according to earlier research literature, it has been found difficult for students to learn and use.

Jani Hannula reports a design research project in which a course for mathematics education has been developed. The aim of the course was to strengthen connections between university-level mathematics and school mathematics, which is an important issue in mathematics teacher education. Hannula presents the course design process and a case study carried out in the designed course. The study focuses on pre-service mathematics teacher knowledge produced during an open-ended problem-based learning task.

Terhi Kaarakka, Kirsi Helkala, Antti Valmari and Marjukka Joutsenlahti introduce MathCheck – an online application supporting mathematics learning by giving learners feedback on their math solutions. MathCheck is a research-based software designed through constructivism learning theory. They study MathCheck's effect on learning via five pedagogical experiments.

In the fifth paper, Maija Aksela focuses on studying the collaboration occurring in a diverse multi-stakeholder educational design research project. The aim of her case study is to demonstrate how a co-design approach can be used within such projects. Possibilities and challenges of co-design approach are analysed through a large framework, where a large design community is developing several student-based solutions and pedagogical innovations simultaneously

The last paper is a systematic review of Finnish doctoral dissertations applying research-based design methods in the context of mathematics, science and technology education research. In their review of 21 recent dissertations, the authors Daranee Lehtonen, Anne Jyrkiäinen and Jorma Joutsenlahti provide an overview on how educational design research has been used and developed in Finland.

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