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Between Research Ideals and Practical Implications

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Introduction

The 1990s and early 2000s saw the publication of several studies and special issues on design-based research (DBR) by prominent scholars within the field of educational technology (e.g., van den Akker, 1999; Design-Based Research Collective, 2003; Barab & Squire, 2004; Cobb et al., 2003; Brown, 1992). Taken together, these scholars described DBR as a new methodological approach for conducting research through a combined approach to design interventions and theory generation.

This first wave of DBR researchers, based mainly in the US, raised numerous methodological issues, which were discussed and remained an open invitation for further development in the years to follow. One researcher, Chris Dede, pointed out how DBR lacked a coherent understanding of the standards for what constitutes quality of the approach; he criticised DBR for being promoted as the 'Swiss army knife' (Dede, 2004, p. 106) of methods without a sound, theoretical foundation. This metaphor has somewhat foreshadowed things to come.

Twenty years later, DBR has now become a mainstream methodological approach to conducting design interventions with educational technology in the US, in Europe, and, in particular, the Nordic countries. As a recent (Danish) example, the LEGO Foundation has funded 12 Ph.D. projects, which all study different aspects of playful learning by using DBR as a methodological approach *Playful Learning* <https://playful-learning.dk/forskning/>. There have been attempts to further develop DBR, for example, by describing how projects should strive to conduct more effective, sustainable and scalable projects (Fishman et al., 2013). Other scholars who have attempted to develop DBR draw on methods from speculative design, emphasising the transformational element of DBR (Ehret et al., 2019), thereby pushing the design element forward.

Despite these developments, DBR methodology appears to struggle with many and diverse critical issues that may indicate that DBR has become too complex, or even too complicated, to realise. As a methodology, DBR seems to be caught between an ideal about conducting interventional and theory-generating research, and a reality where this ideal is difficult to implement, due to both the entangled and contradictory interests of stakeholders.

Issues of engaging with DBR

Critics of DBR claim that its research approach is too deterministic or linear when it comes to 'refining' theories and design principles through iterative design processes, and too diffuse when it comes to identifying problems and providing sustainable solutions (e.g. Engeström et al., 2014; Ross, 2017; Holmberg, 2014). To some extent, we agree with these critics. Consequently, we argue for the next step in DBR evolution to be a more critical-constructive approach, reflecting the implications of choosing a problem for the design to solve, articulating and exploring design principles, and considering the context in which the design is implemented beyond project termination. The unsolved methodological diversity pointed out by Dede still appears to create problems. Rather than being used in unison, select tools of the Swiss army knife are used towards what Oh and Huang (2016) describe as a divergent field of research. This contributes to a fragmentation of DBR on several levels, rather than to its consolidation.

Our overall point is not to abandon DBR, but to emphasise the importance of pairing it with continuous critical reflection, in order to develop and strengthen it as a methodology. We perceive DBR's systematic approach, the iterative operationalisation of problems into design solutions, and the striving for generalisation, as resources that the approach already possesses, but that can be further developed. Despite its methodological challenges, we argue that DBR contains qualities that make the research approach productive in a broad field of educational contexts: the employment of a collaborative aspect in the research (e.g. Barab & Squire 2004), the combination of design, practice and theory building (e.g. Anderson & Shattuck, 2012), the interaction with and situatedness in practice (e.g. Brown 1992), and the principle of iterations (e.g., Design-Based Research Collective, 2003).

In summary, there seems to be a gap between the somewhat idealised goals of DBR researchers and the 'messy' practices involved in carrying out the processes of the methodology with the purpose of conducting technology interventions in educational settings. Still, DBR has an essential combination of theory generation and practice development of digital learning environments, giving it the potential to contribute to educational research. Consequently, the aim of the current proposal is to discuss and reconceptualise DBR as a methodological approach, by focusing on specific aspects of the DBR processes as fields drawing on theoretical knowledge.

Three issues concerning challenges in DBR

We trace three challenges of practising DBR that also point to the further evolution of the methodology.

The methodological diluting of DBR

From a methodological perspective, a disturbing development that moves DBR from being a coherent approach to being a toolbox to pick and choose from can be traced through the numerous uses of DBR, which aim to either implement didactic procedures into educational

settings (Ji & Pham, 2020), implement curriculum requirements (Glasswell et al., 2016; Wilkie, 2016), test out the potential of a particular technology (Dousay & Weible, 2019), or use DBR in a linear, non-iterative manner. While DBR originally sought to impact practices and contribute to a theoretical field through design principles (van den Akker, 1999; Baumgartner & Bell, 2002), the lack of attention to sustainable impact indicates an academic rather than practical or collaborative turn of events. Instead of co-authors defining problems and subsequent designs, participants become test subjects or change recipients, and DBR is at risk of losing the participatory orientation by diluting what originally made it distinct from the laboratory experiments it sought to depart from. Paradoxically, the successes that over the past 20 years have proved DBR an effective methodology for not just studying, but also developing educational practice, appear contributory to its ongoing fragmentation, turning DBR into a buffet of convenience, rather than a meticulously planned concert of efforts. As a coherent, collaborative and iterative methodology, we consider DBR a powerful framework for driving research and development in unison, but when separated, DBR becomes a vague label for an instrumental approach.

Why should we conduct DBR?

The diluting of DBR is related to another, larger discussion, which is concerned with why educational researchers should conduct DBR. Originally, the methodological approach of DBR was promoted in response to a dominant trend for conducting controlled experiments in educational research. DBR was seen as a meaningful alternative based on design interventions (or design experiments) in real-life settings, with stakeholder involvement and iterative design cycles with close attention to the importance of the local context (Cobb et al., 2003). In this way, DBR created research that could generate new learning designs, new findings and new theories, with high relevance to practice.

However, design interventions are notoriously complex, and can be conducted in countless ways (e.g. there may be huge differences between explorative development projects informed by locally defined problems versus validation studies driven by general research hypotheses) (van den Akker, 1999). Moreover, in the current political climate of Nordic countries, design-based research projects are often defined by agendas promoted by stakeholders outside the domains of research, in addition to the demands of practitioners. More specifically, the agendas of policy makers, technology developers and/or private foundations often have a large say in defining what needs to be researched, and how this should be done. As examples, the articles in this special issue mention examples of Danish DBR projects, which have been funded by the Innovation Fund Denmark, the Lego Foundation, and the Danish Ministry of Education. As the field of educational research is increasingly being defined by external stakeholders with strategic goals, it becomes extremely important for researchers and practitioners to be given sufficient opportunities to define and to participate in specific DBR projects. This points to a need for a more critical discussion of who actually defines the aims and methods of DBR projects (Gundersen, 2021).

Who are the stakeholders that collaborate in DBR?

Finally, the diluting of DBR is related to the question of the extent of collaborating and involving the different stakeholders in the initial problem identification and analysis. Brown (1992) addressed the importance of situating DBR in real-life contexts; the notion of collaboration in DBR was coined by Barab and Squire (2004). An interactive process between stakeholders from real-life contexts may hold the potential to improve problem-solving and reach the target group. But which stakeholders should be included in the different phases

of DBR? If the problem arises from real-life contexts, the stakeholders should be case givers, such as an educational institution; a company initiating a learning practice; or an organisation reorganising digital competence development. They can point out a practical problem, and collaborate with the designer and/or researcher to analyse it. How can this form of collaboration be orchestrated, and what will be the stakeholders' further role in, for example, the design or testing of a design? Likewise, the target group for the design represents a stakeholder position, since the design is intended to improve their learning practice. Will they have a say with regard to the problem analysis and design, or will they be merely recipients to the implementation of government policies (see Schweisfurth, 2015)? The initiating researcher is an obvious stakeholder, but how is the interaction with the designer position, and what are the two positions' roles in cases of designing a digital learning application, or developing a principle for a digital learning process? Furthermore, the involvement of 'local' stakeholders creates another challenge: on the one hand, the involvement of stakeholders strengthens the problem analysis, and on the other hand, DBR strives for generalising results to be implemented in other contexts.

Engage! Embrace! Expand! The contributions of this special issue

When venturing into DBR, the process is often driven by a desire to explore a particular technology and its use, in order to improve performance in a particular educational setting. Over the past 20 years, DBR has evolved in several directions, serving various purposes. Besides technology-driven exploration, DBR has been used to implement particular technologies, policies and standards, and to turn efforts away from exploring *what*, and focusing instead on exploring *how* to use a particular technology, how to implement particular policies, and how to align with particular standards.

While the whole point of testing a design is to learn from how it impacts upon practice, we learn from such activities as long as they do not proceed as planned. As soon as a design 'works', we resort to concluding, and cease to make further iterations. However, DBR processes sometimes address superficial problems, which are easy to solve. Not much can be learned from such projects, whereas engaging in difficult problems is likely to contribute to more learning, even though their solution might seem a bit distant.

The three articles of this special issue all encourage readers to linger on the DBR process: first on the exploration of the problem-setting and context, second on the messiness generated by the DBR process and third on how the process aims to impact practice beyond project foci. While not contributing to making DBR any less complex, the articles aim to improve the outcome of DBR, by encouraging researchers and practitioners to address pressing practical issues in-depth, to develop more nuanced understandings of the meetings between design and practice, and to implement ideas and designs on a broader scale.

The first article of this special issue aims to revitalise the problem-setting phase of DBR, and reconstitute the action-based approach to conducting DBR. In contrast to a widespread hit-and-run style of applying quick fixes to superficial problems, the authors illustrate how focusing on problem determination, and engaging with deeply held practitioner knowledge, can act as a phenomenological instrument for bringing forth real problems. Using three paradigmatic cases, the article illustrates the importance of extending the problem phase, as well as readdressing it in an iterative manner.

The second article addresses the emergence of messy practices that occur as DBR processes unfold, but fail to align with the planned course of specific design principles. Through two cases, the authors explore this mess and its emergence, unpredictability and sideshows, in order to better our understanding of what happens when design meets practice. Instead

of trying to harness the process, and forcing it to comply with the course of a planned intervention, the article shows what happens when such a mess is allowed to unfold, and is explored in order to develop a more detailed and nuanced understanding of what actually happens when an educational practice is subjected to a particular design and its subsequent iterations. This kind of exploration of messiness provides valuable data on the viability of a given design, not just according to some predefined plan, but also towards the practice it intends to impact upon.

The third article expresses a concern regarding the impact of current DBR, which often employs a project focus with less regard for sustaining effects beyond project termination or expanding its impact to parties beyond the project participants. Based on a scoping review of current literature, the authors present a set of implementation strategies that aim to improve the impact of future DBR projects. By identifying strategies for sustaining DBR projects beyond their time frame and budget, as well as for expanding its design and ideas beyond the project group, the article provides a tangible model for developing strategies for such efforts.

As editors, we encourage DBR researchers and practitioners to engage with problem-setting, its practitioners, and their deep understanding of practice, to better our understanding of what problems should be addressed. We also encourage practitioners to embrace the messiness of experiments that do not go according to plan, and to use it to explore the meeting between design and practice. Finally, we encourage DBR researchers to integrate expansive project implementation strategies and beyond in their DBR project planning.

We invite you to dive into the three articles, and engage with, embrace and expand the DBR methodology, to bring the field forward together with us.

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