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Title Knowledge generation between design, data and theory:
Argumentation in design-based research

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Abstract Design-based research (DBR) is a diversified research genre: The combination of two worlds – that of research and that of education – and the different backgrounds and intentions of those involved entail different emphases, epistemological ideas, ideas on valuable outcomes and normative claims. This becomes visible in very different kinds of reasoning: No uniform structure of argumentation can be discerned, and so far, a differentiation into clear DBR types has not been convincingly achieved. This is a challenge for the orientation of DBR novices, the quality review of DBR studies, and the legitimation of DBR in the field of educational research. This article provides an empirical contribution to the discussion on argumentation: In a literature review, DBR studies are examined regarding their outcomes, the rationales authors use to justify their outcomes and indications for specific challenges in DBR reasoning. The analysis confirms for the sample that preliminary, prescriptive theory is most common alongside diverse practical outcomes. Authors often justify them with emphasis on variation, iteration, cooperation, and data triangulation. Different (standard) orientations, multi-level reasoning, and sub-studies present challenges for authors

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and readers, going back to the complexity of DBR projects. To justify their results in a comprehensible way, authors are confronted with the task to actively select an argumentation strategy.

Keywords design-based research, literature review, research outcomes, reasoning, argumentation

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Knowledge generation between design, data and theory: Argumentation in design-based research

Alexa Brase

1.0 Introduction

Design-based research (DBR)¹ projects share some basic characteristics, namely the situatedness in real educational contexts, the focus on the design and testing of a significant intervention, the openness for different methods, the iterative process, the collaboration between research and practice and the interplay of design and theory (Anderson & Shattuck, 2012). Underneath the supposed consent, many differences arise: Bell (2004) describes them as “differences of opinion, orientation, and purpose—as a manifestation of research pluralism” (p. 244), tracing them back to differences in scholarly grounding, research contexts and the complexity of education itself. Kali and Hoadley (2021) see a major cause of inconsistency within DBR itself, namely the dual goal, striving for abstraction (theory) and particularization (design). Some authors have made differences transparent, e.g. by distinguishing different types of DBR (Bell, 2004; Christensen & West, 2018), but so far, no typology for (self-)classifying DBR projects has become very common.

While researchers and their project partners working in education could embrace the variety, using DBR as a flexible frame to adjust principles and models to their aims and educational contexts, it can also be problematized. The lack of a single argumentative grammar (Kelly, 2004), the different emphases, epistemological ideas and normative claims pose a challenge to DBR novices, the discussion on how to evaluate the quality of DBR studies, and the legitimation of DBR in the field of educational research. In a German-language discussion on DBR standards (EDeR Special Issue edited by Jenert, 2022), Reinmann (2022) advocates for DBR’s own standards. However, she criticizes a possible dichotomous understanding of research and practice with regard to quality in DBR, accompanied by a tendency to prefer rigor over relevance. She emphasizes that design is supposed to be the focal point of the research, not a threat to rigor (Reinmann, 2022). But does such a dichotomous understanding really dominate DBR studies? What do researchers in DBR base their arguments on?

¹ Due to different traditions that have led to similar approaches, there are different terms for what I call DBR and closely related approaches, e.g., educational design research, design experiments or development research. As other authors do, I take up impulses working with different terms, assuming that the considerations are relevant for the “family of approaches” (McKenney & Reeves, 2019, p. 18).

Different ways of argumentation can be seen as an important differentiation within DBR. Finally, such differences affect the recognition of arguments as valid, the possibility or impossibility of common standards or a need for differentiation in quality appraisal. This article aims to take up the theoretical discussion on knowledge generation and reasoning in DBR to inform an empirical study. While normative and theoretical discussions are undoubtedly important for orientation and guidance in DBR, empirical insights into publications as a showcase for arguments can provide an overview of reasoning practices and problems as a base for further considerations. The questions guiding the study are:

- What outcomes do DBR studies report?
- What rationales do researchers use to justify their outcomes?
- What are the specific challenges for argumentation in DBR?

The review is supposed to make differences and shared arguments visible, provide orientation in (a small part of) the research landscape as well as impulses for further theoretical and normative considerations. At first, the discussion on outcomes in DBR, considerations on epistemological challenges of design research, an argumentative grammar and design narratives are taken up to prepare the review (section 2). Section 3 introduces the review methodology. The findings are presented (section 4) and discussed with a focus on its implications for further research and DBR practice (section 5).

2.0 Outcomes and argumentation in design-based research

2.1 Outcomes

Before asking what rationales (in the sense of a fundamental argumentation) underlie DBR studies, it is reasonable to clarify the nature of the knowledge or – in a broader sense – outcomes that they are intended to legitimize. While there is widespread consensus that interventions and theory result from DBR, the mention of theory needs specification. Design principles as a prescriptive kind of theory is often seen as a common, but heterogeneous type of DBR outcomes (Bell, Hoadley & Linn, 2004; Bakker, 2018). Moreover, they are not the only theoretical outcomes resulting from DBR, and outcomes may even go beyond interventions and theory: Table 1 (see Appendix) shows types of outcomes that different authors consider in their writing on DBR. Picking up ideas from previous texts, Hoadley and Campos (2022) distinguish six types of outcomes that go beyond the intervention itself: *domain theories* as domain-specific hypotheses in the sense of “tentative understandings” (Hoadley & Campos, 2022, p. 8), *design principles* or *patterns* as (limited) generalized recommendations for the solution of particular problems, *design processes* as recommendations for the design/DBR procedure, *ontological innovations* as new concepts needed for explaining how a design works, *new hypotheses* noting that research raises new questions, and *design researcher transformative learning* as professional development of persons involved. Here it becomes clear that DBR does not only aim at the generation of different

forms of explicit knowledge, but that the process of knowing as well as its relation to action (Neuweg, 2020, pp. 133-138, 299-323; 2002) are taken into account.

The variety of possible outcomes not only indicates the diversity of DBR studies, but may also demonstrate the richness of single projects: Every DBR project is a multi-stage journey through design, data and theory with many different questions to be answered (see Bakker, 2018, p. 82) and thus also many (interim) results. In their analysis of doctoral dissertations on mathematics, science and technology education, Lehtonen et al. (2019) found that much of the work reported theoretical outcomes of various kinds, though not all thoroughly. In the interest of intersubjective comprehensibility on only a few pages, it would be reasonable if journal articles focused on the presentation of parts of a project, even though Bakker emphasizes that a paper should reflect the project's logic (Bakker, 2018, p. 114). A focus could be, e.g., on a design idea with its theoretical background and first design conjectures, a redesign suggested by formative evaluation, the final design and results on its impact or an overview of the research process with recommendations for the collaboration of different stakeholders. Outcomes described in a single article must therefore not be confused with outcomes of a DBR project. Articles could provide a basis for analyzing the focus on particular outcomes.

The rationale, however, is not yet given with the outcome. To better understand the possible rationales of DBR studies, I will consider the role of design in DBR.

2.2 Design-based research as design research

As Reinmann (2022) points out, design plays a central role in DBR; she promotes an understanding of DBR as *research through design*. This term goes back to a categorization from design research (not focused on education) that distinguishes research into/about, for, and through/by design (Frayling, 1993; Jonas, 2007). Following Jonas (2007), *research about design* approaches design as a research object, *research for design* supports the design process by providing (temporarily) relevant knowledge, and *research through design* locates research within design, thus linking the two into one process. Jonas elaborates epistemological challenges of the latter type, referring to “delicate hybrid systems” (Jonas, 2007, p. 193) and wicked problems: The natural and the artificial cannot be separated more than research and design processes can, and the negotiation between stakeholders already belongs to the problem definition. He describes the epistemic nature of design as a learning process (Jonas, 2007).

If the design research categories are to be applied to DBR, this works less for entire DBR projects than for parts of projects, which pursue different sub-questions. Relating it to the possible DBR outcomes (see 2.1), one could assume that outcomes of *research for design* are primarily inscribed in early design conjectures and the intervention itself, thus also influencing all other types of outcomes indirectly. *Research*

about design could deal with methodological questions and design processes. *Research through design* could ground domain theories and design principles, generate ontological innovations, and enable design researcher transformative learning. This could be made possible precisely because it takes place in a hybrid system, intertwining context, design and research. Knowledge is gained through participation in the dynamic design process. But substantiating this knowledge appears to be a great effort: If, for example, problem definition is a matter of negotiation, knowledge about this negotiation is a prerequisite for understanding the outcomes, which ultimately have their origin in it. Research processes, which are characterized as learning processes, can hardly be documented comprehensively. With such a complex process, how can outcomes from DBR studies be justified and thus legitimized as scientific knowledge?

2.3 Argumentative grammar and design narratives

In 2004, Kelly expresses the need for an “argumentative grammar” (Kelly, 2004, p. 118) in design research, a structure guiding methodical decisions and helping to scientifically substantiate a claim (Kelly, 2004). Bakker (2018) responds to Kelly’s demands and devotes a chapter of his book to argumentative grammar in design research (chapter 6, pp. 96-112). However, he rejects the idea that there could be a guiding structure that is independent of content. Rather, content and context should also be considered in argumentative grammars (Bakker, 2018, p. 109).

Bakker sketches several options of argumentative grammars by using the pattern of an argument proposed by philosopher Toulmin (1958), connecting data and claims, backed up by argumentative elements called warrants (Toulmin, 1958, pp. 87-100). Bakker describes five different argumentative grammars for DBR: proof of principle that something is possible, small changes per iteration, experience of the design community, conjecture mapping, and answering the how-question. The application of the pattern again indicates the variety in the field, although Bakker remains at a structural level. He reports that the formulation “felt like a reduction that does not do justice to the richness of the argumentation behind the proposed approach” (Bakker, 2018, p. 107).

The richness of DBR studies has already led Bell et al. (2004) to advocate for a variant of thick descriptions, precisely in the interest of persuading readers. They call these descriptions design narratives and name many aspects to be described (e.g. design, learning context, how the design is used in the context, evolution of context and design over time, critical reflection, compelling comparisons, informal research). They distinguish it from a design rationale:

“It is broader than a design rationale, which provides only the reasons for the current state of the design; a good design narrative should describe failed design elements as well as successful ones and should re-

late the warrants used for making changes to design over time. By relating the design changes over time, a design narrative can help make explicit some of the implicit knowledge the designer or research partnerships used to understand and implement in the intervention.” (Bell et al., 2004, p. 79)

Their open-ended questions about the use of design knowledge (p. 85) indicate that their primary concern is to inform designers and teachers who want to work with knowledge from DBR not to persuade potential critics as Kelly suggests (Kelly, 2004, p. 123). However, addressing the two groups need not be mutually exclusive: A narrative is not arbitrary and, given the complexity of educational contexts and the innovative nature of DBR, can include strong arguments that are framed and supported by the broader narrative.

In this article, I analyze how authors find their ways of justifying their findings. The discovery of rationales will be exploratory, but informed by the concepts and distinctions described. The following chapter describes the methodological approach.

3.0 Literature review methodology

As in-depth analysis of descriptions and results from individual DBR projects is needed to answer the research question, a small, but focused sample of DBR articles is composed. Due to the inconsistent terminology (see Footnote 1) and the use of the same terms in non-educational contexts, it makes sense to focus on a relevant journal instead of searching literature databases. Articles published in the journal *EDeR. Educational Design Research* are suitable for this purpose: EDeR is a peer-reviewed, open access journal with a focus on DBR, hosted in Germany and published since 2017. The possibility of an extensive peer mentoring and review process (EDeR, n. d.^a) as well as review criteria (EDeR, n. d.^b) suggest that EDeR publishes articles that are particularly well suited to DBR. In addition, a wide variety of studies are represented in the journal: The authors publishing their work in EDeR between 2017 and 2022 are working in 15 countries, showing some diversity of national contexts, although there is a European and especially German focus (25 publications with German (co-)authors, 26 with (co-)authors from other European countries, 11 with (co-)authors from other continents). Educational contexts are also diverse: Studies are set in higher, vocational, school and teacher education as well as in other areas like open educational resources.

All 57 articles published between 2017 and 2022 are imported to the literature management program Citavi and categorized, based on title pages and abstracts, according to the articles' contributions (EDeR publication categories) and main focuses. 30 articles can be excluded from the analysis because they are editorials (n=2), practice illustrations (n=4), book reviews (n=1), discussion articles referring to other articles (n=7) or have a theoretical or methodological focus without relation to one illustrating case study (n=16). 27 texts are academic articles relating to DBR projects and form the selection for the full text

review. They might address methodological questions, too, even primarily. However, they are still included because DBR articles often combine substantive and methodological questions and such articles' relevance to the underlying research question cannot be determined from the abstract.

Full texts are read, relevant passages coded and analyzed using the data analysis software MAXQDA (Kuckartz & Rädiker, 2019) and a simple table with the indication of author, year and title as well as displayable categories of the analysis (Table 2, see Appendix). The main categories guiding the analysis in MAXQDA and the ideas behind their use are:

- *Formal article structure*: Are the article's subchapters named following a nomothetic (general categories like "theoretical background", "method", "findings", beyond introduction and conclusion), idiographic (content-driven, following an inherent logic) or mixed logic? The structure may give indications of a more narrative or more systematic reasoning.
- *Study's purpose/contribution*: What do authors write about their study's purpose or the contribution they wish to make? Such statements could directly explain the argument.
- *Question(s)*: What guiding or research question(s) do the authors formulate? The questions may reveal what outcomes the authors are seeking in DBR.
- *Design*: What is (primarily) designed in the DBR project to which the study refers? In multi-layered projects, the design shows which layer is the focus of the project. The project focus may be different from the focus of the article, as could be determined in comparison with the purpose and research questions.
- *Outcome(s)*: What outcomes (categorized following Hoadley & Campos, 2022, or the authors' own designation, if available; complemented by practical results) do the authors report? These are the outcomes that are substantiated in the argumentation.
- *Design – research relation*: Do the authors report *research for, through, and/or about design*? The relation between design and research helps to identify sub-studies whose reasoning is likely to differ from typical design-based studies.
- *Key argument(s)*: How do authors describe their argumentation, e.g. in the conclusion? Authors can explain their reasoning themselves. Instead of a comprehensive analysis according to argumentation theory, which is beyond this review, the authors' own emphases are explored as indications for their rationales.
- *Standards*: Do authors mention their orientation towards methodological standards or requirements? Such references

may provide insights into the authors' scientific legitimization strategy and may be related to the rationale.

- *Narrative sections*: Are there narrative sections that span a subchapter or more? Narrative sections may indicate that authors intend to portray the richness of their projects.

Not all categories can be meaningfully analyzed individually. Articles are also analyzed across categories, which contribute to the overall understanding, especially regarding the rationale and challenges. Table 2 (see Appendix) provides an overview of the studies. The findings of the analysis are structured along the research questions. The presentation in the following chapter focuses on outcomes (first question), article structure, narratives and key arguments, as well as orientation to standards for exploring authors' rationales (second question), and identified challenges (third question).

4.0 Findings

4.1 Outcomes

To avoid losing sight of practical outcomes, I coded interventions as outcomes as well. The only study out of all 27 not reporting on an intervention (or at least referring to an already existing one to discuss a methodological question) reports on *research for design*: Den Heijer et al. (2022) perform a qualitative study to inform the design of a future intervention. Next to the report on an intervention, theoretical outcome types can be found in most studies, although they are presented in a sometimes more, sometimes less explicit way. Design principles can be found in more than half of the articles. They are frequently named as such and are often the focus of effort and thorough argumentation in *research through design* studies. For example, authors use a diverse and extensive mix of empirical methods to develop and evaluate the design which is the principles' local foundation (Collenberg, 2020; Delius, 2022; Di Biase, 2020; Euler & Collenberg, 2018; Gössling & Grunau, 2020; Lehtonen, 2021; Raatz & Euler, 2017). Design processes as an outcome occur frequently, but are rarely the focus of attention. When they do, they are derived in different ways: Studer (2021) reflects on experiences and presents them in a design narrative, while Grunau and Gössling (2020) conduct a theory-based cooperation analysis. With this approach, the latter are an exception: The study can be categorized as *research about design*. However, most of the articles report more than one type of theoretical outcome. It is not always determinable which of multiple outcomes is supposed to be the central one, e.g. when the justification of design principles is additionally framed by a process analysis (Delius, 2022; Euler & Collenberg, 2018).

As descriptive theories closely related to design principles, domain theories are often difficult to identify. They are only rarely presented in detail as a separate result. However, there are exceptions showing that DBR can also yield valuable theoretical results beyond design principles. Especially Hanke et al. (2021) devote subchapters to domain

theories. They also explain the different kinds of outcomes of their study and how they relate to each other, thus giving an individual answer to the question concerning design principles and their relation to theory. Furthermore, the abstraction from the design cases is very clear and the theoretical scope is reflected (Hanke et al., 2021). New questions and hypotheses are rather by-products of any research, shall therefore not be considered further, and ontological innovations could hardly be identified. Design researcher transformative learning, on the other hand, is not the focus in any of the studies analyzed; nevertheless, learning and professionalization aspects are frequently mentioned (Augustsson, 2021; Bogaerds-Hazenberg et al., 2020; Gössling & Daniel, 2018; Gössling & Grunau, 2020; Kidron & Kali, 2017; Lehtonen, 2021; Sloane & Krakau, 2021).

Beyond the categories by Hoadley & Campos, it becomes clear that it is not only the intervention itself that emerges as a practical outcome, but also specific materials that can be used in related contexts (Adams et al. 2020; Brahm, 2017; Euler & Collenberg, 2018; Hanke et al., 2021; Sloane & Krakau, 2021). Sloane (2017) points out that knowledge of situations is not only codified in principles, but also “incorporated in the material developed in the design process” (Sloane, 2017, p. 18). Theoretical results can also go beyond the named categories: The key components of responsible leadership reported by Raatz and Euler (2017) are not explanatory theses or descriptions, but rather a normative concept. A few studies cannot yet present typical final outcomes, but are limited to pre-implementation evaluation results (Hanna et al., 2022) or initial design conjectures (den Heijer et al., 2022).

The articles analyzed show that design principles are the most common, but the overall outcomes are diverse. When it comes to reasoning in DBR, it is important to keep this in mind: Justifying a design principle might follow a different logic than justifying design processes.

4.2 Rationale

4.2.1 Article structure

An initial assumption of the analysis was that the structure provides indications of whether a more narrative or systematic argumentation prevails. A rather idiographic chapter heading use is rare (Gössling & Daniel, 2018; Segerby & Chronaki, 2018; Sloane, 2017). There are articles (n=6) whose chapter headings initially appear nomothetic because they use general categories. However, these article structures are not the same; a shared pattern is not visible. Most articles (n=18) have a mixed structure, combining general categories with project-specific subchapters. Thus, it turns out that the structure is of limited help for analyzing the authors’ orientations or rationales directly, but it provides some clues on the way of presenting DBR, revealing inconsistent orientations.

Figure 1 shows the structures of three exemplary articles, all of them reporting entire DBR projects: Delius (2022) reflects on a project for

which a comprehensive report already exists. In her reflective article, she focuses on research-practice cooperation, evaluation, the documentation as a design narrative and outcomes, thereby setting priorities for an overall presentation. She comments her choice to write a design narrative methodologically. Hanke et al. (2021) focus on thoroughly justifying a design principle and domain theories, starting with a theoretically informed problem statement, followed by design descriptions, theoretical foundations and method descriptions. The presentation of results is focused on three outcomes: the design principle, a condition model, and ideal types of strategies used by the students. Lehtonen (2021) follows different lines of argumentation, making them visible in the sub-chapter of chapter 4 “Conducting EDR”.

Reflecting the design narrative: Delius, 2022	Elaborating design principle and domain theories: Hanke et al., 2021 (without third level)	Multiple visible rationales: Lehtonen, 2021 (without third level)
<ul style="list-style-type: none"> 1 Initial situation 2 The research project <ul style="list-style-type: none"> 2.1 Epistemological interest and reasoning for the selection of the research approach 2.2 Overall structure of the DBR study 2.3 Section I: The preparation 2.4 Section II: The three cycles of the main trial 2.5 Documentation of the research process: The design narrative 2.6 Section III: Conclusion 3 Reflection <ul style="list-style-type: none"> 3.1 The research-practice cooperation 3.2 Reflection of the evaluation concept (data collection and evaluation methods) 3.3 Reflection of the documentation (design narrative) 3.4 Reflection of the results and their transfer value 4 Conclusion and outlook 	<ul style="list-style-type: none"> 1 Introduction 2 Problem Statement: Fragmentation in University Teacher Education Programmes 3 Project Characteristics and Design <ul style="list-style-type: none"> 3.1 Dovetailing and Interlinking 3.2 "Spotlight-Y" in mathematics 3.3 Varieties of English in Foreign Language Teacher Education 4 Theoretical foundations <ul style="list-style-type: none"> 4.1 Boundary Crossing 4.2 Dovetailing and Interlinking Through Boundary Crossing 5 Methods of Data Collection and Analysis 6 Results on Design Level: The Final Design Principle Boundary Crossing by Design(ing) 7 Results on Conditions for Dovetailing and Interlinking <ul style="list-style-type: none"> 7.1 Curricular Factors 7.2 Personal Factors 8 Results on Interlinking Strategies <ul style="list-style-type: none"> 8.1 Sensitising Through Analogy 8.2 Epistemic Pervasion 8.3 Using Templates 9 Discussion and Conclusion 	<ul style="list-style-type: none"> 1 Introduction 2 EDR on educational technologies for learning linear equations <ul style="list-style-type: none"> 2.1 Educational problem 2.2 Study overview 2.3 Research phases 3 Developing a design solution <ul style="list-style-type: none"> 3.1 Design principle construction 3.2 Concept design 3.3 Concept evaluation 3.4 Solution design and development 4 Conducting EDR <ul style="list-style-type: none"> 4.1 Iterations 4.2 Data triangulation 4.3 Various participants 4.4 Multidisciplinary collaboration 4.5 Technological innovations 4.6 Alternative designs 4.7 Solitary researcher 5 Looking back and moving forward <ul style="list-style-type: none"> 5.1 Design Framework for developing real-world educational technologies 5.2 Guidelines for conducting EDR

Figure 1: Article structure examples, own translation

A comparison shows that there are a few chapter-defining topics shared by the articles, but the three structures differ considerably. Thus, evidence of a standardized article structure in DBR does not emerge from the analysis.

4.2.2 Narratives and key arguments

There can be made no clear distinctions between design narratives and systematic argumentations providing a consistent rationale; boundaries are fluid, the arguments manifold and design narratives can be combined with an emphasis on certain arguments. Many studies have narrative parts with detailed descriptions, e.g. the description of concept development (Lehtonen, 2021), of an integrated implementation/formative evaluation/redesign process (Segeberby & Chronaki, 2018), of the use of digital technologies in design, implementation and

evaluation processes (Gerholz et al. 2020), of how participants interact with the design (Brown et al. 2021) or of how pedagogical, practical and feasible factors had to be balanced (Lehtonen, 2021).

Delius (2022) relates explicitly to an already published comprehensive design narrative in which she distinguishes research and practice levels. In some studies, the narrative part focuses even more on research-practice cooperation or communication (Grunau & Gössling, 2020; Studer, 2021). One is tempted to speak of a cooperation or collaboration narrative rather than a design narrative. Narratives can be supported by comprehensive tables and detailed graphical representations of the process (Studer, 2021, p. 9; Tammeleht, 2022, pp. 8-11).

In many cases, authors emphasize key arguments themselves, e.g. by naming them in the introduction or conclusion, by directing their research questions towards them or by dedicating article chapters to them. Some arguments could be found only once, others more often:

- Cross-situational findings, or robustness by variation (Collenberg, 2020; Euler & Collenberg, 2018; Hanke et al., 2021; Raatz & Euler, 2017; Stokhof et al., 2018; Tammeleht, 2022): Principles that have proven themselves in various situations are robust.
- Appropriate design by collaboration and dialogue (Gössling & Daniel, 2018; Kidron & Kali, 2017; Lambert & Jacobsen, 2020; Moreno & Kilpatrick, 2018; Sloane & Krakau, 2021): Design is working and implemented well because project partners from educational practice are involved in research (e.g. joint data analysis) and dialogue.
- Conjecturing, or refinement of design/design principles by iteration (Bogaerds-Hazenbergh et al., 2020; Brahm, 2017; Euler & Collenberg, 2018; Lehtonen, 2021): Design principles are based on (theory-based) design conjectures which are refined through iterations.
- Objectivity, reliability and/or validity by data triangulation (Delius, 2021; Lambert & Jacobsen, 2020; Lehtonen, 2021): The triangulation of multiple methods and data sources increases objectivity, reliability and validity of the results.
- Appropriate design by integration of perspectives (Gössling & Grunau, 2020; Lehtonen, 2021): The design is working because all stakeholders, including participants, got involved.
- Theoretical understanding by iteration (Lehtonen, 2021): Theoretical understanding of the educational context and on how the design enhances learning is based on multiple iterations.

- Theoretical understanding by integration of perspectives (Lehtonen, 2021): Broad participation increases the theoretical understanding of how participants deal with the design.
- Confident design decisions by evaluating alternative designs (Lehtonen, 2021): When alternative designs are evaluated with practitioners, the possibility of developing not the best solution is reduced.

The arguments appear more or less prominently placed and deliberately used. A few authors address the creation of knowledge in their projects very explicitly: Sloane and Krakau convey the central function of dialogue in their study, writing that “didactic theory is not merely a product of research for practice, but is developed through a dialogue between them” (Sloane & Krakau, 2021, p. 24). The different arguments are not mutually exclusive; some can be closely connected as the multiple mentions of some articles shows. Especially Lehtonen (2021) develops very differentiated arguments, distinguishing, for example, theoretical understanding from refinement of the design, presenting both as outcomes of iteration and integration of multiple perspectives.

4.2.3 Orientation towards methodological standards or requirements

In the sample, some authors mention methodological standards or explain the requirements and use of individual empirical methods comprehensively (Brahm, 2017; Collenberg, 2020; Gössling & Daniel, 2018; Hanke et al., 2021). Gössling and Daniel (2018) show how the orientation towards a specific method’s requirements and the justification and use of methods in the project context can match, but also collide: They explain the decision to use video data and the documentary method to elucidate the cause of implementation difficulties. They also address challenges in dealing with standards:

“For DBR, we find it relevant that practitioners and researchers apply different standards to the analysis of videos. In the case study, it was shown how scientific standards can be met in the process of generating insights from video data by applying the documentary method. Yet, for research results like this to be fruitful in DBR, they must not just be recognised by the researchers but also by the practitioners participating in the design process.” (Gössling & Daniel, 2018, p. 23)

Thus, the authors show that methods in DBR cannot always be applied as they are used in their original context of application – at least not if they are to be effective formatively.

However, instead of justifying individual methods or adapting them to the project’s aims, many authors give an overview of their methodological choices in general, and often not very detailed: Some studies use a table or figure format to present and partially justify the empirical methods used in the reported projects (Delius, 2022; Di Biase,

2020; Lehtonen, 2021; Studer, 2021). In doing so, the authors embed the respective use of methods in the overall DBR projects. In one aspect, DBR-typical procedures and references to standards come together: Some authors emphasize that data triangulation increases validity (Collenberg, 2020; Lehtonen, 2021), reliability (Lambert & Jacobsen, 2020; Lehtonen, 2021) and objectivity (Lambert & Jacobsen, 2020). Others see limitations of their study in unused mixed-method potential: Tammeleht (2022) mentions in the limitations chapter that mainly qualitative methods were used and learning analytics and quantitative data and analysis methods should be used more in the future. However, the exact potentials of these data and methods were not elaborated. Brahm (2017) tested such a diverse method mix: She connected formative and summative evaluations, referring to standards of quantitative empirical research. She used a pre-post-transfer-measurement with experimental and control groups in her summative evaluation, using reliability-tested instruments. However, the mixed results, which were positive in some dimensions, did not seem to have played a major role in the further development of the intervention: For future DBR projects, she recommends “to have concrete strategies on how to use the results of (quantitative) competence measurements for the further development of the interventions” (Brahm, 2017, p. 13). The methods used are not the focus of this paper, but the orientation to mixed methods in the sense of using diverse qualitative and quantitative methods and triangulating data emerges as a (challenging) orientation for some researchers.

4.3 Challenges for argumentation

4.3.1 Multi-level design and combination of research reports with methodological studies

Other challenges arise from the complexity of design and implementation processes: In several of the studies, the underlying projects follow design cycles on different levels. For example, there are two studies on Teacher Design Teams (TDT) supported by events, instructions or cooperation with researchers (Adams et al., 2020; Bogaerds-Hazenberg et al., 2020). While in one study, the TDT design itself is the focus, in the other, the focus is on artefacts designed by the TDTs. Hanke et al. (2021) present nested design cycles in their project on the reduction of fragmentation in pre-service teacher education with an explanatory illustration (Hanke et al., 2021, p. 15). With the illustration, they meet the challenge succinctly.

Some other articles combine research reports with methodological reflection and studies, focusing on design processes and methods next to the reasoning of project outcomes. Sloane and Krakau, for example, explicitly introduce their paper as one with two levels of argumentation: the methodological level where they trace the emergence of knowledge in design projects, and the project implementation level (Sloane & Krakau, 2021, pp. 2-3). Delius (2022) reflects on an entire project (see 4.2.1), viewing the narrative format she uses as an experiment to be discussed, pointing out the length of such a format, but

also the diverse audiences that can benefit from elaboration (Delius, 2022, pp. 18, 29-30). Di Biase (2020) dedicates a chapter of her article to “A rationale for Design-based Research”, outlining how the essential characteristics of DBR which “feature the interplay of theory and practice (...) were embedded in the research design” (Di Biase, 2020, p. 10). There are more articles using single DBR projects to illustrate methodological considerations (Euler & Collenberg, 2018; Gerholz et al., 2020; Gössling & Daniel, 2018).

There are different ways of mixing levels of reasoning and outcomes that are justified with it. In some cases, multi-level communication is explicitly introduced and explained (graphically or in words), which promotes understanding and thus enables recognition of the arguments in the first place.

4.3.2 Work in progress and sub-studies

DBR projects are often long-term projects; publications are based on many years of research. However, there are also publications providing insights into work in progress or sub-studies. In terms of argumentation, such publications differ from the ones reporting entire projects.

Hanna et al. (2022) present an early-stage DBR project, focusing on design, a first pre-implementation refinement, implementation and evaluation plans. While this is *research by design*, the design has not yet proven itself practically. Den Heijer et al. (2022) present a qualitative study informing the problem statement of a DBR project. Although results are not yet far advanced and some typical DBR characteristics are not yet pronounced, the detailed description of an early redesign or problem analysis provides valuable insights into a process phase that is rarely reported. In the latter case, there is a *research for design* logic: The reasoning is comparable to an empirical, not design-based study, which makes argumentation even easier. Other studies build on the results of previously published studies and report only on a sub-project. Kidron and Kali (2017) focus on the implementation of an intervention that they had previously (co-)designed in a different context. They focus on research-practice partnerships as a fundamental argument. Stokhof et al. (2018) are conducting an implementation study, in which they test the adoptability and adaptability of a design principle-based scenario for scaling up. They do not report a design-based approach, but focus on a survey study in the context of a DBR project. Since they embed the study in the overall project, the DBR-typical argument “robustness by variation” can still be found. Thus, the transfer and dissemination of an intervention can be associated with DBR-typical arguments. What these are depends on the objective of the particular study.

5.0 Discussion

5.1 Addressing or enduring challenges

The analysis reveals typical outcomes and key arguments, but also challenges. The differences in orientation towards standards and method requirements (as a side result of the standard analysis, 4.2.3), the multilevel argumentation (4.3.1), and sub-studies with different rationales (4.3.2) can challenge both writers and readers.

With regard to *standards*, it is important to be aware of what they are supposed to refer to. General standards like the standards of good scientific practice by the German Research Foundation (Deutsche Forschungsgemeinschaft, 2019) or the American Educational Research Association's reporting standards (2006) can, at least in parts, also provide valuable guidance for DBR studies. Problems remain in the required comprehensiveness of the presentation of methods and analyses. Exemplary insights or references to further publications can be helpful and do not take the focus away from what is important. As Hoadley (2004) notes, DBR calls for a different kind of rigor, basing it on "methodological alignment" between theories, interventions, empirical methods, interpretations and applications (Hoadley, 2004, p. 211). The review confirms that it is not useful to apply rigor primarily to the use of individual methods within more complex DBR studies. In justifying DBR findings, the authors, depending on the focus of their studies, place particular emphasis on iterations, research-practice-cooperation and data triangulation. To use these kinds of rationales convincingly, authors need more than rigor in the use of a single empirical method, e.g. the reasons for small changes in the design, spotlights on the interface of design, data and theory, insights into contributions by researchers and other members of the design team or a balanced set of methods, linking different perspectives on the design. However, when it comes to method-specific standards, these should be reflected in the respective project context. Dilemmas in dealing with standards should be made transparent, as Gössling and Daniel (2018) have done.

For the present sample, what Lehtonen et al. (2019) found for Finnish doctoral theses is confirmed: DBR studies report different results, but do not justify them equally thoroughly. Not all results can be in focus at the same time, but it would be helpful if authors made transparent what kinds of outcomes they want to systematically justify and how. *Multi-level argumentation* is difficult to be captured in a linear text. Different lines of argumentation are related to each other, interlaced with each other. Such relationships are comprehensible if the different levels are explicitly explained or represented graphically. While the report on parallel design cycles can be challenging for the clarity of the argumentation, meta-commentaries are helpful for tracing the underlying rationale. However, they also take up space that might be lacking for a more detailed account of design processes or substantive theoretical reflections. It turns out once again that authors of DBR studies have to make difficult decisions about what to present.

Sub-studies need different rationales depending on whether they report research *about*, *for* or *through* design. Research *for* design can use more "usual" research designs, aiming for descriptive theory about local contexts. However, the aim of informing the design can transform

the studies: Researchers preparing design are well advised to be oriented towards triangulation of perspectives as the foundation of a viable design. Purely methodological studies were not the focus of this contribution, which is why no statement is made about research about design.

From the overall view, the often-reported richness of DBR projects proves to be a curse and a blessing. The studies demonstrate the value that DBR studies bring beyond generalized, but hardly applicable research results. At the same time, not all studies would convince critics: Some descriptions may seem too brief, some data not sufficient, some results too preliminary. The complexity of educational practice, the design iterations, cross-situational comparisons, the cooperation of science and practice, the theoretical backgrounds, the abundance of data and the dynamics that arise from the interplay of these aspects – all of this offers multiple arguments and narratives. The rich DBR projects require an active selection of an argumentation strategy, which is a special requirement for authors of DBR studies.

5.2 Limitations

This study is not meant to be a systematic review giving an overview over all relevant research, but rather an exemplary exploration of DBR articles published in one relevant journal. I performed the analysis alone; thus, there were no intercoder comparisons or collegial validation. The categorizations, especially those that required more interpretive effort, have a tentative character: Not all outcomes and arguments can be identified equally well, which might introduce imprecision into the analysis of these categories, despite all care and double-checking. Also, as noted before, there is a European/German bias in the article selection. The results must be read as mirroring mostly European perspectives on DBR. Furthermore, the observation that article structures rarely have a nomothetic appearance and methodical standards are mentioned rather rarely could be due to the fact that the EDeR Journal is specialized in DBR; authors who publish in other journals might adapt their articles more closely to the practices that are widespread in the respective community.

Another limitation of this study lies in the nature of a published article: Publications do not reflect whole projects with the thought processes of the researchers, but are constructed according to different considerations, e.g. conventions of the research community considered relevant, specifications of the journal, reviewer's opinions or the inclusion in a doctoral thesis. As a special mode of communication, it can only give clues on what is considered appropriate by authors and reviewers. The focus on sub-studies of projects also meant that in a few cases it was not possible to clearly identify whether the project was a DBR project at all. In addition, the restriction to one journal goes along with a small number of articles that were analyzed in the end. Still, such a review proves and demonstrates the variety of modes of argumentation and knowledge generation in DBR.

6.0 Conclusion

Outcomes of DBR studies are various: Design principles and similar prescriptive outcomes are common and often the focus of reasoning efforts. But design processes and domain theories can also be identified frequently. One aspect that makes DBR special is the diversity of practical outcomes: In addition to locally implemented interventions, a wide variety of materials have emerged from the DBR projects that can be used in comparable contexts. The rationale authors use to justify outcomes cannot be well grasped by analyzing article structures, but many authors emphasize key arguments in their studies. The observation that some authors use several of these arguments prominently demonstrates that the one rationale does not always exist. Among others, they refer to robustness by variation, appropriate design by collaboration and dialogue, refinement by iteration and validity by data triangulation. Thus, DBR-specific reasoning appears predominant, even though there are references to standards of empirical methods in some studies. These studies not only, but also show that researchers in DBR do not simply use educational research methods and switch design processes in between. They are linking theory, design, and empirical methods so closely that it transforms all activities. This also manifests itself in the variety of arguments.

For authors, it is advisable to disclose the outcomes and rationale of one's article, not only implicitly through the nested presentation of design, data and theory, but explicitly. A selection of narrative parts, empirical findings and theory that fits the arguments can help readers to understand the significance of the (theoretical and practical) outcomes and the various contributions that DBR studies can make.

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7.0 References

- American Educational Research Association (2006). Standards for Reporting on Empirical Social Science Research in AERA Publications. *Educational Researcher*, 35(6), 33–40. <https://doi.org/10.3102/0013189x035006033>
- Anderson, T. & Shattuck, J. (2012). Design-Based Research: A Decade of Progress in Education Research? *Educational Researcher*, 41(1), 16–25. <https://doi.org/10.3102/0013189X11428813>
- Bakker, A. (2018). *Design Research in Education: A practical guide for early career researchers*. Routledge.

- Bell, P. (2004). On the Theoretical Breadth of Design-Based Research in Education. *Educational Psychologist*, 39(4), 243–253. https://doi.org/10.1207/s15326985ep3904_6
- Bell, P., Hoadley, C. M. & Linn, M. C. (2004). Design-Based Research in Education. In M. C. Linn, E. A. Davis & P. Bell (Eds.), *Internet environments for science education* (pp. 73–85). Lawrence Erlbaum.
- Christensen, K. D. N. & West, R. E. (2018). The Development of Design-Based Research. In R. E. West (ed.), *Foundations of Learning and Instructional Design Technology: The Past, Present, and Future of Learning and Instructional Design Technology*. EdTech Books. https://edtechbooks.org/lidtfoundations/development_of_design-based_research
- Deutsche Forschungsgemeinschaft/German Research Foundation (2019). Guidelines for Safeguarding Good Research Practice: Code of Conduct. DFG. https://www.dfg.de/download/pdf/foerderung/rechtliche_rahmenbedingungen/gute_wissenschaftliche_praxis/kodex_gwp_en.pdf
- EDeR (n. d.^a). Review process and workflow. <https://journals.sub.uni-hamburg.de/EDeR/about>
- EDeR (n. d.^b). Evaluator Guidelines. <https://journals.sub.uni-hamburg.de/EDeR/Guidelines#evaluatorguidelines>
- Frayling, C. (1993). *Research in Art and Design* (Royal College of Art Research Papers Nr. 1). London. Royal College of Art.
- Hoadley, C. M. (2004). Methodological Alignment in Design-Based Research. *Educational Psychologist*, 39(4), 203–212. https://doi.org/10.1207/s15326985ep3904_2
- Hoadley, C. M. & Campos, F. C. (2022). Design-based research: What it is and why it matters to studying online learning. *Educational Psychologist*, 1–14. <https://doi.org/10.1080/00461520.2022.2079128>
- Jenert, T. (Ed.). (2022). Standards für DBR?! Eine Diskussion. *EDeR. Educational Design Research*, 6(2). <https://doi.org/10.15460/eder.6.2>
- Jonas, W. (2007). Design Research and its Meaning to the Methodological Development of the Discipline. In R. Michel (Eds.), *Design Research Now* (pp. 187–206). De Gruyter. https://doi.org/10.1007/978-3-7643-8472-2_11
- Kali, Y. & Hoadley, C. (2021). Design-Based Research Methods in CSCL: Calibrating our Epistemologies and Ontologies. In U. Cress, C. Rosé, A. F. Wise & J. Oshima (Hrsg.), *International Handbook of Computer-Supported Collaborative Learning* (pp. 479–496). Springer International Publishing. https://doi.org/10.1007/978-3-030-65291-3_26
- Kelly, A. (2004). Design Research in Education: Yes, but is it Methodological? *Journal of the Learning Sciences*, 13(1), 115–128. https://doi.org/10.1207/s15327809jls1301_6
- Kuckartz, U. & Rädiker, S. (2019). *Analyzing Qualitative Data with MAXQDA*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-15671-8>
- Lehtonen, D., Jyrkiäinen, A. & Joutsenlahti, J. (2019). A Systematic Review of Educational Design Research in Finnish Doctoral Dissertations on Mathematics, Science, and Technology Education. *LUMAT: International Journal on Math, Science and Technology*

Education, 7(3), 140–165. <https://doi.org/10.31129/LU-MAT.7.3.399>

- McKenney, S. E. & Reeves, T. C. (2019). *Conducting educational design research* (2nd edition). Routledge.
- Neuweg, G. H. (2002). On Knowing and Learning: Lessons from Michael Polanyi and Gilbert Ryle. *Appraisal*, 4(1), 41–48.
- Neuweg, G. H. (2020). *Könnerschaft und implizites Wissen: Zur lehrerlernetheoretischen Bedeutung der Erkenntnis- und Wissenstheorie Michael Polanyis* (4th edition). Waxmann.
- Reinmann, G. (2022). Was macht Design-Based Research zu Forschung? *EDeR. Educational Design Research*, 6(2). <https://doi.org/10.15460/eder.6.2.1909>
- Toulmin, S. E. (1958). *The Uses of Argument*. Cambridge University Press.

Reviewed Articles

- Adams, B., Rotsaert, T., Schellens, T. & Valcke, M. (2020). Pre-service teachers as designers in the context of advertising literacy education. *EDeR. Educational Design Research*, 3(1). <https://doi.org/10.15460/eder.3.1.1412>
- Augustsson, D. (2021). Expansive Design for Teachers. *EDeR. Educational Design Research*, 5(1). <https://doi.org/10.15460/eder.5.1.1553>
- Bogaerds-Hazenberg, S., Evers-Vermeul, J. & van den Bergh, H. (2020). Teachers and researchers as co-designers? A design-based research on reading comprehension instruction in primary education. *EDeR. Educational Design Research*, 3(1). <https://doi.org/10.15460/eder.3.1.1399>
- Brahm, T. (2017). Design-based research in the context of transitioning to VET: Developing interventions through research-practice collaboration. *EDeR. Educational Design Research*, 1(2). <https://doi.org/10.15460/eder.1.2.1163>
- Brown, B., Friesen, S., Mosher, R., Chu, M.-W. & Linton, K. (2021). Adapting to a Design-Based Professional Learning Intervention. *EDeR. Educational Design Research*, 5(2). <https://doi.org/10.15460/eder.5.2.1658>
- Collenberg, M. (2020). Entwicklung von Gestaltungsprinzipien zur Förderung interkultureller Lehrkompetenz. *EDeR. Educational Design Research*, 4(2). <https://doi.org/10.15460/eder.4.2.1458>
- Delius, K. (2022). Wie Wissenschaft und Praxis Fachunterricht gemeinsam weiterentwickeln können: Eine Design-Based Research-Studie zur Förderung der Sprechkompetenz im Englischunterricht. *EDeR. Educational Design Research*, 6(3). <https://doi.org/10.15460/eder.6.3.1704>
- den Heijer, P., Zondervan, T. & Voogt, J. (2022). Shifting Higher Vocational Education Teachers' Response Toward Inward Affective Involvement in Ethical Dilemmas: Perspectives on the Design of Affective Learning Experiences to Inform Students' Attitude Toward an Ethical Dilemma. *EDeR. Educational Design Research*, 6(3). <https://doi.org/10.15460/eder.6.3.1660>

- Di Biase, R. (2020). Using design-based research to explore the influence of context in promoting pedagogical reform. *EDeR. Educational Design Research*, 4(2). <https://doi.org/10.15460/eder.4.2.1427>
- Euler, D. & Collenberg, M. (2018). Design-based research in economic education. *EDeR. Educational Design Research*, 2(2). <https://doi.org/10.15460/eder.2.2.1271>
- Gerholz, K.-H., Ciolek, S. & Wagner, A. C. (2020). Digital design of design processes – A case study of a design research study in vocational education. *EDeR. Educational Design Research*, 4(1). <https://doi.org/10.15460/eder.4.1.1452>
- Gössling, B. & Daniel, D. (2018). Video analysis in Design-Based Research – Findings of a project on self-organised learning at a vocational school. *EDeR. Educational Design Research*, 2(2). <https://doi.org/10.15460/eder.2.2.1270>
- Gössling, B. & Grunau, J. (2020). Validation arrangements for formally low-qualified staff in geriatric care: The Design-based Research project KomBiA. *EDeR. Educational Design Research*, 4(2). <https://doi.org/10.15460/eder.4.2.1455>
- Grunau, J. & Gössling, B. (2020). Cooperation between research and practice for the development of innovations in an educational design project. *EDeR. Educational Design Research*, 4(1). <https://doi.org/10.15460/eder.4.1.1513>
- Hanke, E., Hehner, S. & Bikner-Ahsbahr, A. (2021). Reducing Fragmentation in University Pre-Service Teacher Education. *EDeR. Educational Design Research*, 5(2). <https://doi.org/10.15460/eder.5.2.1613>
- Hanna, A., Conner, L. & Sweeney, T.-A. (2022). Conducting online design-based research: START e-business training as an educational intervention. *EDeR. Educational Design Research*, 6(3). <https://doi.org/10.15460/eder.6.3.1812>
- Kidron, A. & Kali, Y. (2017). Extending the applicability of design-based research through research-practice partnerships. *EDeR. Educational Design Research*, 1(2). <https://doi.org/10.15460/eder.1.2.1157>
- Lambert, D. & Jacobsen, M. (2020). Implementing an Intervention into a Grade Six Learning Environment: A Design-Based Research Framework. *EDeR. Educational Design Research*, 3(1). <https://doi.org/10.15460/eder.3.1.1388>
- Lehtonen, D. (2021). Constructing a design framework and design methodology from educational design research on real-world educational technology development. *EDeR. Educational Design Research*, 5(2). <https://doi.org/10.15460/eder.5.2.1680>
- Moreno, R. & Kilpatrick, J. (2018). Student perceptions of self-efficacy in the foreign language classroom: A design-based research study. *EDeR. Educational Design Research*, 2(1). <https://doi.org/10.15460/eder.2.1.1214>
- Raatz, S. & Euler, D. (2017). Responsible leadership in management education: A design-based research study. *EDeR. Educational Design Research*, 1(1). <https://doi.org/10.15460/eder.1.1.1028>
- Segeber, C. & Chronaki, A. (2018). Primary students' participation in school based mathematical reasoning practices: Coordinating

- reciprocal teaching and systemic functional linguistics to support reasoning in the Swedish context. *EDeR. Educational Design Research*, 2(1). <https://doi.org/10.15460/eder.2.1.1150>
- Sloane, P. F. E. (2017). 'Where no man has gone before!' – Exploring new knowledge in design-based research projects: A treatise on phenomenology in design studies. *EDeR. Educational Design Research*, 1(1). <https://doi.org/10.15460/eder.1.1.1026>
- Sloane, P. F. E. & Krakau, U. (2021). How does didactic knowledge develop? Experiences from a design project. *EDeR. Educational Design Research*, 5(1). <https://doi.org/10.15460/eder.5.1.1511>
- Stokhof, H., Vries, B. de, Bastiaens, T. & Martens, R. (2018). To adopt or reject? Testing the robustness of a principle-based scenario for guiding effective student questioning. *EDeR. Educational Design Research*, 2(1). <https://doi.org/10.15460/eder.2.1.1221>
- Studer, J. (2021). Gemeinsam verschieden unterwegs. *EDeR. Educational Design Research*, 5(1). <https://doi.org/10.15460/eder.5.1.1541>
- Tammeleht, A. (2022). Design principles for developing online ethics resources – the outcome of holistic DBR process. *EDeR. Educational Design Research*, 6(1). <https://doi.org/10.15460/eder.6.1.1713>

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