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Transdisciplinary Collaboration in Teacher Education

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Theoretical Foundations, Guiding Principles & Empirical Insights

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This doctoral thesis is dedicated to Nono,
for reminding me what true curiosity, awe, and wonder are.



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Abstract

This doctoral thesis contributes to the vibrant discourse on boundary-crossing collaboration in the German teacher education system. It offers theoretical advancements, programmatic guidelines, and empirical findings which advocate for a transdisciplinary perspective. In order to do so, the framing paper critically links persistent challenges and current reform processes in the teacher education system with theoretical foundations and conceptual positions of transdisciplinarity. Against this backdrop, four articles provide further insights on: a) how to expand the prevalent systematic of innovation and transfer approaches (top-down, bottom-up, cooperative) by a transdisciplinary perspective, b) outlining guiding principles for the realization of transdisciplinary collaboration in the context of a boundary-crossing research and development project, c) providing empirical findings on effect relationships between transdisciplinary dimensions of integration characteristics, and d) identifying empirical types of actors based on specific assessment patterns towards these characteristics.

Keywords

Boundary-Crossing Collaboration; Innovation and Transfer Strategies; Integration; Teacher Education; Theory-Practice Interrelation; Transdisciplinarity



Kurzzusammenfassung

Die vorliegende Promotionsschrift trägt zur theoretischen Weiterentwicklung, programmatischen Gestaltung und empirischen Erforschung institutionen- und phasenübergreifender Kooperationen in der Lehrkräftebildung in Deutschland aus einer transdisziplinären Perspektive bei. Den Ausgangspunkt der Arbeit bildet eine kritische Auseinandersetzung mit persistenten Problemlagen sowie aktuellen Reformansätzen in der Lehrkräftebildung einerseits und zentralen Positionen des Transdisziplinaritätsdiskurses andererseits. Darauf aufbauend wurden vier Teilstudien zu folgenden Schwerpunkten durchgeführt: a) Erweiterung der gegenwärtigen Systematik zu Innovations- und Transferansätzen (top-down, bottom-up, kooperative) durch eine transdisziplinäre Perspektive, b) Ausarbeitung konzeptioneller Gestaltungsprinzipien für die Realisierung transdisziplinärer Zusammenarbeit im Kontext eines institutionen- und phasenübergreifenden Forschungs- und Entwicklungsprojekts, c) empirische Analysen zu Effektbeziehungen zwischen transdisziplinären Integrationsdimensionen sowie d) Identifikation von Akteurstypen auf Basis spezifischer Beurteilungsmuster der zugrundeliegenden Integrationsdimensionen.

Stichwörter

Innovations- und Transferstrategien; Institutionen- und phasenübergreifende Zusammenarbeit; Integration; Lehrkräftebildung; Theorie-Praxis-Verzahnung; Transdisziplinarität



Summary

Boundary-crossing collaboration has been increasingly discussed as a promising pathway for generating and establishing pedagogical innovations in teaching and teacher education. The present doctoral thesis contributes to this vibrant discourse by providing theoretical advancements, programmatic guidelines, and empirical findings highlighting a transdisciplinary perspective. Transdisciplinarity is an integrative mode of research and development which advocates for the co-constructive interrelation of various bodies of knowledge across professional, institutional, and organizational boundaries. In doing so, transdisciplinarity also promotes advancements for both, the academic and the practical field.

The framing paper provides a general outline which links key challenges in teacher education calling for boundary-crossing collaboration on the one hand with theoretical foundations of transdisciplinarity on the other hand. This lays the wider background for the four studies comprised in this doctoral thesis. These studies have been conducted in the context of so-called “Transdisciplinary Development Teams” (TDTs). TDTs refer to a collaborative format, which has been established at the “ZZL-Netzwerk”, a research and development project at the Leuphana University of Lüneburg, Germany.

Study A offers a critical systematization of three ideal-typical perspectives for educational change in teacher education, namely top-down, bottom-up, and cooperative approaches. Against this backdrop, a transdisciplinary perspective is analyzed, which extends previous positions by advocating for a more systemic and integrative interrelation between educational research and practice.

Study B proposes guiding principles for transdisciplinary collaboration in teacher education, which highlight in particular “Problem-Solving Orientation”, “Multi-Perspectivity”, “Participation”, and “Re-Integration”. These guiding principles have been developed with critical reference to three alternative concepts prominently discussed with regards to boundary-crossing cooperation in teacher education, namely “Third Spaces”, “Community of Practice”, and “Research-Practice Partnerships”.

Moreover, it is assumed that transdisciplinarity allows for in-depth integration among different stakeholder groups such as school practitioners, educational researchers, and students. In order to substantiate this assumption, study C offers empirical insights on effect relationships between transdisciplinary Dimensions of Integration Characteristics. The study comprises $n = 62$ TDT members. These dimensions of integration characteristics are operationalized as follows: *mutual learning* and *knowledge integration* comprise the epistemic core, while *perceived*



trustworthiness and *appreciation within the team* cover social facets. Finally, *collective ownership of goals* reflects organizational conditions of integrative boundary-crossing collaboration.

In addition, study D utilizes a mixed-methods analysis on semi-standardized data in order to provide complementary findings to study C. On the one hand, this allows for further differentiation of the TDT Team members' perception of Dimensions of Integration Characteristics. On the other hand, article D further develops the theoretical foundation of TDTs in teacher education by applying a social-organizational innovation perspective and in doing so further substantiates the theoretical proposition made in study A.

Based on the theoretical advancements, programmatic guidelines and empirical findings presented in studies A, B, C, and D further implications for educational research and practice in boundary-crossing collaborations in teacher education will be drawn, limitations of the presented studies discussed as well as an outlook for further research and development provided.



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1 Introduction

Educational systems in contemporary societies are subject to increasing expectations according to performance and innovation capacity. At the micro level, academic achievement is understood as a major predictor for personal development, privileged socio-economic status as well as political and societal participation (Klieme et al., 2007), while well-performing educational systems lay the foundation for sustainable economic growth, political stability, and international competitiveness (OECD, 2003, p. 14).

However, due to comprehensive socio-economic, demographic, technological, and ecological transformations, educational requirements increased rapidly during the past decades and thus require new ways of knowledge production and learning (Barth, 2015; Nowotny, Scott, & Gibbons, 2001; Välimaa & Hoffman, 2008). The introduction of new information and communication technologies (ICT), for instance, led to a growing demand for expert thinking and complex communication abilities, while routinized cognitive and manual tasks will most probably decline (Levy & Murnane, 2003). Against this background, formal school education as well as teacher education face two overarching challenges. First, teaching and teacher education has to foster fundamental competencies, which allow learners to harness achieved knowledge for practical problem-solving (Klieme et al., 2007). Second, in order to do so, schools and university-based teacher education have to become learning organizations (Boer, Fahrenwald, & Spies, 2018), which promote innovative capacities (Fullan, 2016).

The German teacher education system, however, has been subject to constant critique from different stakeholder groups ranging from scholars, practitioners, students, and parents as well as political decision-makers. Not least since the year 2000, the disillusioning results in the context of large scale student assessments and the commonly debated ‘PISA-Shock’ have triggered comprehensive educational policies and a cascade of nationwide reforms. However, the genuine three-phased consecutive teacher education model was never seriously called into question (Hericks, 2004). In consequence, structural obstacles for establishing high-performance standards and innovation capacities inherent to the German teacher education system remain persistent. Such obstacles refer among others to disciplinary and institutional fragmentation, the so-called theory-practice dilemma and heterogeneous and in part conflicting demands from various stakeholder groups (see chapter 2.1).

Against this background, the call for boundary-crossing collaboration in teacher education gained increasing momentum (Gorodetsky & Barak, 2008; Hericks, 2004; Zeichner, 2010). Such collaborative arrangements are located, for instance, at the intersection of universities,



teacher education colleges, schools as well as extra-curricular partners such as youth welfare, educational foundations, and public authorities (Boer et al., 2018; Kleemann, Jennek, & Vock, 2019; Pilypaitytė & Siller, 2018). According to its advocates, the pooling, coordination, and co-constructive interrelation of intellectual resources provide various opportunities for a) co-creation of innovative teaching and learning arrangements as well as teaching practices (Gräsel, 2011; Sewell, Cody, Weir, & Hansen, 2018), b) fostering professional development (Boer et al., 2018; Korthagen, 2016), and c) allowing for collective capacity building (Fullan, 2016; Hartmann & Decristan, 2018).

However, despite a rich body of literature within the international scientific community, further research and development efforts are needed which take on a more systemic and integrative perspective in order to face structural obstacles inherent to the German teacher education. The present dissertation contributes to the vibrant discourse on boundary-crossing collaboration by providing theoretical advancements, programmatic guidelines, and empirical findings which advocate a transdisciplinary perspective. Transdisciplinarity refers to an integrative mode of research and development that highlights the interrelation of various bodies of knowledge and expertise across professional, institutional, and organizational boundaries (Hirsch-Hadorn, Hoffmann-Riem et al., 2008; Klein, 2014; Scholz & Steiner, 2015). In addition, transdisciplinarity aims in particular at the co-construction of advancements for the academic as well as the practical field.

In order to substantiate the call for transdisciplinary collaboration in teacher education, the dissertation is structured as follows: chapter 2 provides the wider research rationale for this dissertation by linking the discourses of teacher education and transdisciplinarity. In this regard, chapter 2.1 elaborates on overarching challenges and propositions for boundary-crossing teacher education, while chapter 2.2 outlines theoretical foundations and guiding principles of transdisciplinarity. Subsequently, subchapter 2.3 points out essential convergences between both discourses and introduces a research and development project which serves as a wider research context for this dissertation. In addition, an interim discussion will be provided. Against this backdrop, chapter 3 presents focal research desiderata, which will be addressed throughout the studies A, B, C, and D. Thereafter, chapter 4 provides a synopsis of the four studies, which comprises a general study outline as well as compact summaries for each study. Finally, chapter 5 presents focal outcomes for the scientific community, practical implications, and reflects on limitations of the present dissertation.

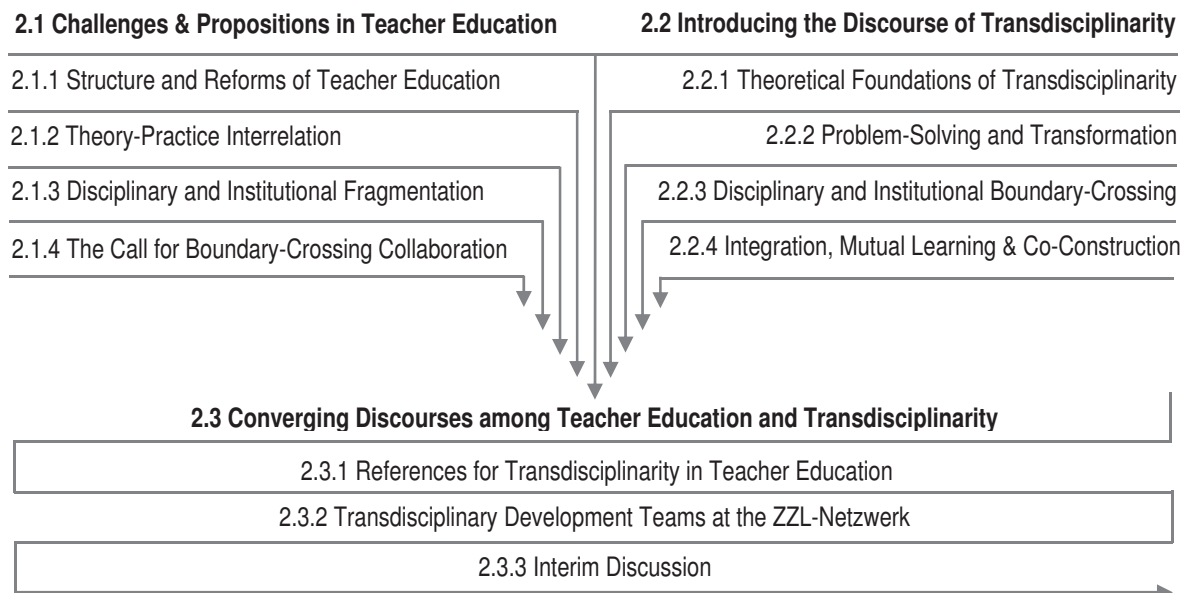


2 Towards Transdisciplinary Cooperation in Teacher Education

The research rationale of this dissertation thesis bases on the assumption that transdisciplinarity provides a fruitful research and development framework in order to contribute further theoretical considerations, conceptual propositions, and empirical insights within the discourse of boundary-crossing collaborations. This assumption is supported by *structural analogies* between the discourse on boundary-crossing collaboration in teacher education and the discourse of transdisciplinarity. Chapter 2 is dedicated to carving out these *structural analogies*. In doing so, chapter 2 is structured as shown in Figure 1.

Figure 1

Structural Analogies btw. boundary-crossing Teacher Education & Transdisciplinarity



Subchapter 2.1 provides a compact overview of challenges and propositions for boundary-crossing teacher education, while subchapter 2.2 is dedicated to introducing a transdisciplinary perspective highlighting theoretical backgrounds and basic principles. In order to highlight these analogies, both subchapters follow a corresponding structure. The first subsections (2.1.1 and 2.2.1) offer a general background on the respective discourse, while the following subsections provide in-depth discussions on respective challenges as well as approaches to overcome these challenges. So far, both subchapters 2.1 and 2.2 are not yet interrelated through mutual references. Therefore subchapter 2.3 is dedicated to outlining convergences between both discourses, boundary-crossing teacher education and transdisciplinarity. In order to do so, subsec-



tion 2.3.1 briefly discusses the tentatively emerging body of literature on transdisciplinary collaboration in teacher education. Against this backdrop, so-called Development Teams at the ZZL-Netzwerk will be introduced in subsection 2.3.2. These Development Teams represent a collaborative format for boundary-crossing research and development in teacher education and thus provides the wider research context for further investigation (studies A, B, C, and D). Finally, subsection 2.3.3 offers an interim discussion of chapter 2, which again provides the foundation.

2.1 *Challenges & Propositions for Boundary-Crossing Teacher Education*

This chapter aims to outline focal challenges and propositions for boundary-crossing teacher education. In order to do so, a brief outline of the contemporary structure and prevalent reform discourses in teacher education provides the general framework (section 2.1.1). On this basis, two overarching challenges will be discussed in further detail, namely the so-called *theory-practice interrelation* (section 2.1.2) and disciplinary and institutional fragmentation (section 2.1.3). Subsequently, the call for boundary-crossing cooperation in teacher education will be outlined (section 2.1.4).

2.1.1 Structure and Reforms within Teacher Education in Germany

Due to the federal-state system and the Länder's political independence in cultural and educational affairs, teacher education in Germany is embedded in a multilayered and heterogeneous governance structure (Altrichter, Durdel, & Fischer-Münnich, 2017; Tulowitzki, Krüger, & Roller, 2018). Moreover, teacher education in Germany, characterized by its consecutive three-phased model, is understood as functionally specialized but also as disciplinarily and institutionally fragmented by international comparison (Blömeke, 2006; European Commission/EACEA/Eurydice, 2015; Hericks, 2004; Terhart, 2004, pp. 45–46). The first phase, university-based teacher education, aims at the development of academic expertise across various disciplines. Besides the subject matter, subject matter didactics and pedagogies, educational science, and psychology constitute major parts in the curriculum. Despite the recent expansion of practical studies in the study curriculum (Rothland & Biederbeck, 2018; Weyland, 2012), the development of practical teaching competencies remains formally within the responsibility of the second phase involving schools and teacher trainer colleges ('Studienseminare' in German; Lenhard, 2004). While the first two phases aiming at initial teacher education are widely institutionalized, the third phase, aiming at advanced teacher training, is less standardized and



usually not mandatory. Therefore, advanced training might be conducted at training institutes affiliated at universities, as it is the case for Lower Saxony, or otherwise at educational administration institutes (KMK, 2017).

In part, this overspecialization is assumed to intensify major points of critique against the German teacher education system: incoherent structures and objectives, lack of effectivity, and insufficient outcomes. In particular, since 2000, disillusioning results in the course of Germany's participation at large scale assessments, such as PISA, TIMSS, and PIRLS¹ led to intensive debates among educational scientists, political decision-makers, and the general public, commonly referred to as "PISA-Shock".

Moreover, these debates fueled an "empirical turn" in educational science and a paradigm shift in educational policy towards "evidence-based governance" (Bormann & John, 2014, p. 5; KMK, 2006, 2016). In alignment with that, comprehensive reform agendas have been triggered which aim at the professionalization of teacher education through competency orientation, aptitude diagnostics as well as evidence-based quality assessment (Bosse, 2012). A central aspect of these still ongoing reform processes refers to the introduction of educational standards and underlying competency models in combination with core curricula at schools (Klieme et al., 2007). Particularly, these competency models provide a comprehensive framework for the diagnostic and development of discipline-specific skills and abilities. Competencies are understood as capabilities or skills to solve certain problems or fulfill a certain task while activating previously acquired a relevant knowledge base. The concept highlights not only the acquisition of knowledge but also its proficient exercise and practice in authentic settings (Klieme et al., 2007, p. 78). In this way, it aims to overcome the phenomenon referred to as 'dull knowledge', where learners might possess all necessary intellectual requirements but are still not able to apply it sufficiently. Alongside educational standards, also standards for teacher education have been enacted. They outline general training objectives according to both initial teacher training phases, academic studies at universities, and teacher trainings at teacher training colleges (KMK, 2014). Despite the fact that the debate on competency models vary considerably with

1 Dating twenty years back, in 1997 the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK 1997) enacted Germany's participation at international large scale student assessments, most notably the OECD Study PISA (Programme for International Student Assessment), TIMSS (Trends in International Mathematics and Science Studies) and PIRLS (Progress in International Reading Literacy Study).



respect to different disciplines, the standards for teacher education remain even less elaborated in comparison.

At the same time, there is another reform strand gaining increasing attention, expressing the demand for an increase of practical parts during the academic studies. In the aftermath of the transition to bachelor and master programs and the KMK resolution in 2005 (KMK, 2005), study curriculums have been changed in advantage of staged short and long-term internships (Weyland, 2012). School internships or practical semesters, which are embedded in the study curriculum through theoretical enriched accompanying academic courses, are understood as a vital mechanism for better integration of the theory-practice interrelation and component of the professional development for future teachers.

The outlined structure and reform agendas in Germany's teacher education system provide the general background against which the following challenges for collaborative and boundary-crossing teacher education will be further elaborated: a) balancing the relation between academic expertise and professional action, b) cultivating multi-professional relations across disciplines and institutions, c) negotiating an epistemic shift which highlights integration instead of differences, and d) establishing boundary-crossing integration through collaboration. These challenges are understood to be closely interrelated and inherent to the contemporary teacher education system and thus call for systemic and integrative transformation in order to be overcome.

2.1.2 Theory-Practice Interrelation: from Difference to Integration?

Teacher education is characterized by a persistent debate on the interrelation of academic studies and practical teaching requirements, which is commonly referred to as "theory-practice-interrelation" (Korthagen, 2007; Rothland, 2020; Villiger, 2015). On the one hand, this debate is fueled by practitioners, including teacher students, pre-service teachers, and established teachers, seemingly insatiable desire for "more practice" (Hedtke, 2000; Makrinus, 2013). On the other hand, while scholarly disputes on the compatibility or incompatibility of academic and practical aspects of teacher education are far from settled, expert commissions and political reform agendas alike call for an intensified interrelation (Terhart, 2000, p. 107; Weyland, 2012). In alignment with Stadelmann (2006), the scientific discourse on the interrelation of theory and practice over the past two decades can be roughly subsumed under two opposing positions: the thesis of difference and thesis of integration (for more recent and comprehensive elaborations see among others Neuweg, 2014; Rothland, 2020; Villiger, 2015). Both positions acknowledge



at least to some extent that knowledge and action, more precisely, explicit scientific knowledge and professional practice, are genuine different phenomena (Kolbe, 2004). At the heart of the dispute, however, remains the question to what extent the challenge of becoming a proficient teacher is accessible to instrumental learning and instruction and, thus, which relevance explicit and tacit knowledge have in teacher education.

Main arguments linked with the thesis of difference base on contributions made within the “knowledge application research” (German: “Wissensverwendungsforschung”) (Keiner, 2002; Radtke, 2004; Stadelmann, 2006) and the “structural profession approach” (German: “Strukturtheoretischer Professionsansatz”, Helsper, 2014; Oevermann, 1997). The former refers to disillusioning research findings which indicate that practitioners rely predominantly on experience-based routines and convictions instead of utilizing scientific findings in order to cope with tasks and challenges in educational practice (Heid, 1989; Keiner, 2002). Moreover, scientific knowledge is only referred to when it is considered compatible with one’s own positions and instrumental useful. Scientific knowledge, however, can usually not be applied as such but has to be adapted and appropriated with regards to certain context conditions and requirements at hand (Broekkamp & van Hout-Wolters, 2007; Stadelmann, 2006, p. 57).

Based on this, representatives of the thesis of difference argue that scientific knowledge and professional practice are genuine different epistemic entities which prevent an instrumental interrelation. In alignment with that argument, representatives of the structural profession approach declare that researchers and practitioners are embedded in specific sub-systems, scientific research versus professional practice, characterized by different objectives, relevance criteria, and habitual logics (Helsper, 2014; Oevermann, 1997). The research aims at the generation of scientific knowledge, which hence meets general quality criteria of being at least to some extent systematic, generalizable, and related to the wider scientific community. Teaching, however, has to be understood as a performative practice which is conducted under dynamic and complex interaction situations accompanied by an immediate need for action. In order to perform under these conditions, experience-based, embodied action patterns are activated instead of abstract knowledge. Based on this, more recent propositions for instance elaborated by Neuweg (2011, 2015) advocate a twofold teacher education system that promotes independent opportunities for explicit learning (“culture of distance” fostering declarative knowledge acquisition and analytical skills) as well as for tacit learning (“culture of engagement” allowing for an agency). Tacit learning, however, requires encounter and reflective engagement with authentic situations.



In contrast to the thesis of difference, positions subsumed under the thesis of integration argue that teacher education should be rooted in evidence-based, criteria-driven as well as theoretical and conceptually structured knowledge base (Baumert & Kunter, 2006). These perspectives are anchored in particular within the so-called expert paradigm for teacher professionalism (Bromme, 2008; Krauss & Bruckmaier, 2014) and the discourse of competency models (Baumert & Kunter, 2011; Krauss, Lindl, Schilcher, & Tepner, 2017; Oser, 2013). Despite some conceptual differences, these approaches, refer to Schulman's seminal work on teachers' professional knowledge, whereas the following three are most prominently cited: content knowledge, pedagogical content knowledge, and pedagogical knowledge (Shulman, 1987).

Furthermore, these knowledge domains are understood to be operationalizable, which allows, firstly, the distinction of ordinal levels and, secondly, its application for performance diagnostic and support, respectively. However, as already outlined in subchapter 2.1, competency models also highlight the role of experience as essential for practical capability (Krauss, Lindl, Schilcher, Fricke et al., 2017). Subsequently, from this perspective professional expertise expresses itself by the ability to analytically describe, explain, and perform certain tasks (Klieme et al., 2007, pp. 78–79). Finally, representatives of the thesis of integration argue, that the aim of university-based initial teacher education should focus on providing the academic foundation for becoming proficient teachers (Krauss, Lindl, Schilcher, Fricke et al., 2017, p. 39).

More recently, representatives of both perspectives have also integrated essential arguments of their opponents in their contributions, without reaching a consensus. However, despite the fact that this scholar dispute is not settled yet, overarching reform agendas and recent didactical advancements correspond with the manifold call for 'more' and more importantly better integrated practice in teacher education. Among others, the KMK (2014, p. 6) highlights, in particular, didactical concepts such as situational learning (Lave & Wenger, 2011), problem-based learning (Reusser, 2005), and experiential learning (Altrichter & Mayr, 2004; Fichten, 2017). These approaches share basic assumptions that learning becomes more effective if it is tangibly embedded in authentic contexts and linked to concrete issues or problems related to the future professional context. In alignment with that, the potentials of teaching formats like role plays, work shadowing, school internships, and more recently video-based teaching lie in what Grossman et al. (2009) term "approximations of practice": the opportunity to observe, engage, and experience practice in a structured learning environment. These approaches highlight that the acquisition of accessible (in contrast to 'dull') knowledge requires its active appropriation within authentic contexts. Moreover, Korthagen (2016) concludes that the discourse



on theory-practice interrelation has to be sensitive for the actual learners (e. g. students, pre-service teachers) by allowing for a) explicit and unconscious learning, b) multi-dimensional learning comprising cognitive as well as emotional and motivational aspects, and c) multi-level learning across personal dispositions (identity and beliefs), competencies (knowledge and behavior), and their professional environment (classroom and school settings).

2.1.3 Disciplinary and Institutional Fragmentation

Due to the three-staged teacher education system in Germany, the relationship between universities, teacher education colleges, and schools may be described in accordance with Weick (1976) as “loosely coupled”. Each institution is quite independent of the other with regards to curriculum development, recruitment, and training of personnel as well as the definition of internal structures. Blömeke (2006, 2014) describes the German teacher education system by international comparison even as disciplinary and institutionally fragmented. In addition to this formal organizational differentiation, the factual relation between these institutions has been commonly characterized as rather co-existing or even worse by mutual demarcation (Döbrich, Klemm, Knauss, & Lange, 2003, p. 24; Patry, 2005; Terhart, 2000, p. 120; Wissenschaftsrat, 2001, p. 14, 2008, pp. 57–58). Pointedly formulated, allegations of practical irrelevance of research and academic teacher education for the factual teaching profession, on the one hand, are opposed by accusations of reproducing obsolete teaching behavior and the lack of innovation readiness on the other hand.

Despite the persistent critique, the three-phased teacher education system itself has never been seriously called into question (Döbrich et al., 2003, p. 26; Hericks, 2004, pp. 301–302). Instead, comprehensive reform agendas and various sets of measurements have been enacted which point at the increase of institutionalized and collaborative transgression of institutional, organizational, disciplinary, and professional boundaries. In the following, three major reform agendas will be outlined, which point at

- the increase of mandatory school internships and practical phases during studies,
- the establishment of centers for teacher education and schools of education, and
- the involvement of experienced teachers as teaching staff at universities.

First, in 2005 the KMK (2005) recommended a quantitative increase of practical studies within the university-based teacher education curriculum which should also be embedded within the bachelor’s program. The main objective of this reform was to foster students’ continuous com-



petence development by stepwise increasing engagement with factual teaching practice. Typically, students' initial involvement starts with (non-)participating observations in classes. In the following, students develop and reflect on their own teaching concepts. Finally, students engage in authentic teaching situations and analyze their teaching practice and experience from an inquiry-based learning stance (Terhart, 2000, pp. 107–109). New formats from practical studies, internships, and practical terms have been established, which vary with regards to duration, workload, scope, and curricular embeddedness (Weyland, 2012).

However, accompanying research results indicate that an increase in practical training itself contributes little to the professional development of pre-service teachers, unless it is framed and enriched by theoretical and conceptual classes that provide analytical orientation and stimulate deeper reflection (Gröschner, Schmitt, & Seidel, 2013; Schüssler, Keuffer, Günnewig, & Scharlau, 2012, pp. 143–144). Thus, future debates about school internships and practice semesters should aim at the curricular integration between the university and school practices instead of exhausting itself in organizational and structural issues (MIWFT, 2007, p. 29; Müller, 2010, pp. 67–68). In addition, Baumert et al. argue that practical studies should not only combine practical experience with scientific knowledge (theories, conceptual, and empirical knowledge) but foster the awareness of differences between scientific and practical training as a necessary means for an integrative understanding (MIWFT, 2007, p. 29).

Second, the comprehensive reform efforts over the past two decades triggered an almost unanimous diagnosis by various expert commissions that there is a lack of a single facility for teacher education within universities (Keuffer & Oelkers, 2001, p. 79; Messner, 2012, pp. 72–73; Terhart, 2005; Wissenschaftsrat, 2001, pp. 28–58). Its aim would be twofold, pointing at internal and external interrelations. On the one hand, such facilities should integrate administrative and coordinative capacities as well as decision-making power to align curricular issues across various disciplines. The underlying necessity for this lies in the character of teacher education as a multi-disciplinary field. Teacher education comprises general and special pedagogies, subject didactics, subject disciplines, educational science, and psychology. Depending on the size of the teacher educating facilities, more than 20 subject areas ranging from mathematics, natural sciences, humanities, and social sciences with various sub-disciplines are involved (Terhart, 2005, pp. 17–18). This number may rise especially with regards to technical disciplines as informatics, engineering, and economics when universities also offer teacher education for vocational training. On the other hand, a lack of institutionalized formats to foster a



better alignment, coordination, and cooperation according to study curricular and personal relations between representatives of the three phases in teacher education was pointed out (Messner, 2012; Terhart, 2005).

In order to tackle this challenge, during the past ten years overarching institutions have been formed that are especially dedicated to acting as coordinating interfaces between traditional departments and institutions at universities as well as institutional bridges between the phases (KMK, 2017; Monitor Lehrerbildung, 2017). 46 out of 69 universities in Germany which offer study programs for teacher training founded so-called ‘Centers for Teacher Training’. Another 13 Schools of Education following the American model have been created, which could be considered as the European equivalent for a faculty. In addition to that, the remaining ten institutions show similar characteristics, either in form of decentralized executive departments or in the case of universities of applied sciences by having already highly aligned internal structures that are dedicated to the needs of teacher education programs. The differentiation between Centers for Teacher Education and Schools of Education is not consistent, but depend on the pre-existing structure at universities and vary in form and function (Merkens, 2005, pp. 9–10).

Third, on the level of “Länder” various additional arrangements have been established (KMK, 2017). The involvement of experienced teachers at university seminars, for instance, allows for integrating practical aspects of teaching at schools in teacher education. These teachers are often also occupied at the teacher training colleges and benefit from a multi-professional perspective. The involvement of school practitioners is realized via teaching assignments or delegations.

In addition to these three types of collaboration, there is a wide range of cooperative arrangements, which aim at the establishment of working groups and councils among actor groups from universities, teacher training colleges, schools, Länder institutes, and administrations. These arrangements, however, are usually less institutionalized and not part of the mandatory study curriculum.

2.1.4 The Call for Boundary-Crossing Collaboration

The previously outlined collaborative arrangements between university-based and school-based practices imply certain efforts for coordination and cooperation. Various propositions have been made to conceptualize different qualities or intensities of cooperation. In the context of school-



based teacher collaboration research, various conceptualizations have been proposed distinguishing for instance between collaborative behavior such as ‘exchange’, ‘division of labor’, and ‘co-construction’ (Gräsel, Fussangel, & Pröbstel, 2006). Others differentiate further among ‘fragmentation’, ‘differentiation’, ‘coordination’, ‘interaction’, and ‘integration’ (Steinert, Klieme, & Maag Merki, 2006). These conceptualizations indicate an ordinal increase of collaborative quality in terms of interdependency, complexity, and institutionalization. In particular, it refers to the distribution of tasks, decision-making authority and responsibilities, degree of institutionalization, and temporal perspective as well as modes of knowledge (co-)production. With respect to boundary-crossing collaboration among different organizations and institutions, Akkerman and Bakker (2011) suggested the distinction between four learning mechanisms: ‘identification’, ‘coordination’, ‘reflection’ and ‘transformation’. This conceptualization implies also an ordinal increase of intensity, which ranges from readiness to engage oneself with others to the capacity for factual change.

Especially in the context of normative driven debates, there seems to be a general tendency to advocate in particular advanced levels of collaboration, which promise much-needed opportunities for in-depth exchange, co-construction, and knowledge integration. However, one has to realize that the potential benefit of more elaborated collaboration is also accompanied by increasing requirements and constraints. For instance, with regards to considerations by Spieß (2004), Gräsel et al. (2006) state that more elaborated forms of cooperation also require an increase in coordination efforts and shared understanding. This again implies sufficient mutual trust and at least in part limitations of individual autonomy (Gräsel et al., 2006). Finally, the establishment of elaborated forms of collaboration corresponds with increasing requirements towards temporal and financial resources as well as the willingness to engage in controversial debates and negotiation processes.

Another essential reference point within the discussion of boundary-crossing collaboration is closely linked to questions on how power relations and status hierarchies are framed between partner institutions. Even though there is an increasing amount of research and development programs as well as initiatives that aim at establishing more cooperative relations among involved actors in educational systems (Boer et al., 2018; Jennek et al., 2019; Pilypaitytė & Siller, 2018), the critique towards imbalanced decision-making and development opportunities is still of significance. In this sense, Gorodetsky and Barak critically declare the following interrelation as a widespread practice: university-based “teacher education programs hold the hegemony for the construction of knowledge and its dissemination while keeping the schools



in the position of merely serving as ‘practice fields’ for pre-service teachers” (2008, pp. 1907–1908). Therefore, it is considered necessary to rethink the top-down approach of innovation development and dissemination (Vanderlinde & van Braak, 2010, p. 303). More fundamentally, Zeichner declares the need for a “shift in the epistemology of teacher education from a situation where academic knowledge is seen as the authoritative source of knowledge about teaching to one where different aspects of expertise that exist in schools and communities are brought into teacher education and coexist on a more equal plane with academic knowledge” (2010, p. 95).

In accordance with the aforementioned call for boundary-crossing collaboration, a multitude of conceptional propositions and research and development projects have been discussed within the international scientific community over the past two decades. Without any claim to completeness, the following approaches received considerable attention: Research-Practice Partnerships (RPP) (Coburn & Penuel, 2016; Penuel, Allen, Coburn, & Farrell, 2015), Hybrid and Third Spaces (Fraefel, 2018; Zeichner, 2010), Action and Practitioner Research in teacher education (Altrichter & Posch, 2018). Other concepts, for instance, Professional Learning Communities (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Vescio, Ross, & Adams, 2008) and Communities of Practice (Jimenez-Silva & Olson, 2012; Sim, 2006) have been established within the school-based teacher collaboration research but are more recently adapted towards a boundary-crossing cooperation. In the German discourse, however, the attention towards elaborated research and development approaches on collaborative formats across different institutions in the teacher education system gain momentum in the 2010s. The primary focus of these debates aimed initially at innovation and transfer models in teacher education (Gogolin & Prenzel, 2010; Nickolaus, Abel, & Gräsel, 2006; Rürup & Bormann, 2013). As a result of this debate, collaborative approaches received increasing attention.

In particular, due to the focus of recent reform agendas, the field of practical studies and school-internships have become dominating topics within the scientific community (Knüppel, 2014; Rothland & Biederbeck, 2018; Weyland, 2012). However, despite the recent increase in endeavors tackling integrative cooperation across the teacher education system (Jennek et al., 2019; Pilypaitytė & Siller, 2018; Villiger & Trautwein, 2015), research on collaborative formats within less institutionalized contexts remain dominated by descriptive project reports, conceptual reflections, and self-evaluations. Hence, evidence-based contributions remain scarce. In this respect, the research on boundary-crossing collaboration remains underdeveloped in contrast with, for instance, research dedicated to school-based collaboration among teaching



staff and between schools (Fussangel, 2008; Gräsel et al., 2006; Richter & Pant, 2016; Steinert et al., 2006; Steinert & Maag Merki, 2009; Trumppa, Franz, & Greiten, 2016).

2.2 *Introducing the Discourse of Transdisciplinarity*

The following subchapter 2.2 is dedicated to providing a general introduction of the discourse of transdisciplinarity. In order to do so, section 2.2.1 discusses the theoretical foundations of transdisciplinarity. In addition to that, the following sections further elaborate on focal sub-discourses of transdisciplinarity, namely problem-solving and transformation (section 2.2.2), disciplinary and institutional boundary-crossing (section 2.2.3), and integration through mutual learning and co-construction (section 2.2.4).

2.2.1 Theoretical Foundations of Transdisciplinarity

Transdisciplinarity comprises a set of epistemic principles which advocate for an integrative mode of research and development (for a comprehensive overview of origins and emergence of transdisciplinarity see Bernstein, 2015; Hirsch Hadorn, Biber-Klemm et al., 2008; Klein, 2014). The following three definitions provide a compact outline of the programmatic features of transdisciplinarity:

- (1) Pohl and Hirsch Hadorn refer to transdisciplinarity as a means “(a) to grasp the relevant complexity of a problem, (b) to take into account the diversity of life-world and scientific perceptions of problems, (c) to link abstract and case-specific knowledge, and (d) develop knowledge and practices that promote what is perceived to be the common good” (Pohl & Hirsch Hadorn, 2007, p. 20).
- (2) In order to balance heterogeneous requirements at the science-society interface Jahn, Bergmann, and Keil frame transdisciplinary as “a critical and self-reflexive research approach that relates societal with scientific problems; it produces new knowledge by integrating different scientific and extra-scientific insights; its aim is to contribute to both societal and scientific progress” (2012, pp. 8–9). Hereby, they stress the need for critical reflexivity as a necessary research and development criterion under conditions of complexity and ambiguity (see also Edler & Kuhlmann, 2008).
- (3) In contrast, Lang et al. also stress the methodological underpinning of transdisciplinary processes: “Transdisciplinarity is a reflexive, integrative, method-driven scientific principle



aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge“ (2012, pp. 26–27).

These definitions resonate well with Klein’s systematization of transdisciplinarity (2010, 2014), which identifies three interrelated major points of reference: *problem-solving*, *transcendence of disciplines*, and *transgression of the scientific and practical boundaries*. In the context of the present dissertation, this conceptualization will be adapted and extended as follows:

(1) *Problem-solving and transformation*

Transdisciplinary processes aim at *problem-solving and transformation* with regards to challenges of scientific as well as practical importance.

(2) *Disciplinary and Institutional Boundary-Crossing*

The transcendence of disciplines and *transgression of scientific and practical boundaries* can be subsumed under the more general notion of (disciplinary and institutional) *boundary-crossing*. *Boundary-crossing* is understood as a focal requirement for *problem-solving and transformation*.

(3) *Integration through mutual learning and co-construction*

Successful *boundary-crossing* requires *integration through mutual learning and co-construction*.

In accordance with this, transdisciplinarity is understood as a powerful principle for engaging with challenges which lay across disciplinary and institutional boundaries in order to develop advancements for the scientific and the practical field. Therefore, transdisciplinarity is not confined to a specific discipline or a particular field of application. In alignment with that, transdisciplinarity comprises a heterogeneous and yet vibrantly expanding discourse, which has a firm stance within various research fields altogether characterized by interdisciplinary approaches and practical application. This applies, for instance, to environmental and sustainability science, public health and health care, nuclear- and biotechnology, housing and architecture, agriculture and land-use but also in a wider context of social science and cultural studies (Klein, 2004, p. 517, 2014; Lawrence & Després, 2004; Scholz & Steiner, 2015; Stokols, 2006). More recently the discourse of transdisciplinarity also entered the field of teacher education (for further detail see section 2.3.2).

From an epistemological viewpoint, transdisciplinarity also exceeds traditional logic of basic as well as applied sciences by constituting reciprocal and inter-connected relations between research and practical fields (Funtowicz & Ravetz, 1993; Scholz & Steiner, 2015,



p. 531). In this respect, transdisciplinarity resonates strongly with what Gibbons, Nowotny, and colleagues termed “Mode 2 knowledge production” (2007, pp. 3–8) and the concept of “Post-Normal”-Science by Funtowicz and Ravetz (1993). According to Gibbons et al. (2007) the traditional mode of research (Mode 1 Knowledge Production) is characterized by a strict separation between research and its application. This holds especially true for basic sciences but also for applied sciences. In contrast, Mode 2 Knowledge Production is characterized by its context-sensitivity with regards to requirements of a target field and accountability for desirable outcomes. Due to the complexity of real-world problems the explicit interconnection between academic research and practitioners’ expertise is assumed to be a core requirement (Nowotny, 2003). Mode 2 knowledge production complements and transgresses the traditional separation of research and practice (mode 1 knowledge production). In consequence, transdisciplinarity expresses a fundamental critique towards the prevalent scientific system and seeks to meet the challenges, limitations, and unintended effects of what are understood as consequences of an overly fragmented, de-contextualized, and reductionist disposition of the scientific system (Funtowicz & Ravetz, 1993; Gibbons et al., 2007). Instead, transdisciplinarity is supposed to facilitate the generation of *socially and culturally robust knowledge*, which is characterized by both scientific rigor and credibility as well as practical relevance, accountability, and feasibility (Lang et al., 2012; Nowotny et al., 2001; Vilsmaier et al., 2015). Therefore, traditional epistemic quality criteria as objectivity, reliability, and validity have to be complemented by aspects such as practicability and social acceptance. Subsequently, Nowotny argues that transdisciplinarity implies democratization of expertise comprising a whole range from scientific knowledge in a narrow sense, over practical or experienced based knowledge to normative claims (Nowotny, 2003).

Finally, as highlighted in previous definitions, transdisciplinarity is characterized as a self-reflexive mode of research and development. This refers to its capacity to balance requirements for scientific credibility and practical needs. In that way, transdisciplinarity embraces a broad variety of methodological approaches and methodologies and encourages their mindful interrelation in order to address the complexity of ‘real-world’ problems and are open for participation (Bergmann et al., 2012; Defila, Di Giulio, & Scheuermann, 2006). However, transdisciplinarity does not promote a scientific methodology as such. Instead, in alignment with the previously stated critique on Mode 1 Knowledge Production, transdisciplinarity constitutes the need for integration of different bodies of knowledge and ways of knowing across professional, disciplinary, and institutional boundaries as a scientific principle (Mittelstraß, 2005).



Against this theoretical outline, the following three chapters provide an in-depth discussion on problem-solving and transformation (section 2.2.2), disciplinary and institutional boundary-crossing (section 2.2.3) as well as integration through mutual learning and co-construction (section 2.2.4).

2.2.2 Problem-Solving and Transformation

In contrast to didactical contexts, within the discourse of transdisciplinarity the notion of problem-solving does not refer to a certain subject-specific, for instance mathematical (Scharnberg, 2019), or transversal competence (Klieme, Funke, Leuner, Reimann, & Wirth, 2001). Instead, problem-solving is understood as a general aspiration to overcome issues, problems, or challenges which are of scientific as well as of societal importance. According to Klein (2014) this notion of problem-solving has been firmly established within the discourse of transdisciplinarity during the much recognized International Transdisciplinarity (ITD) Conference, in 2000 (Häberli, Scholz, Bill, & Welti, 2000; Scholz, Häberli, Bill, & Welti, 2000). Especially, the notion of societal importance or practical relevance is often substantiated by a common understanding of desirable states or advancement concerning elementary fields such as security, health, education, and economic wealth. Most prominent examples at this time refer, for instance, to socio-ecological issues such as climate change or social and gender inequality (Klein, 2014). Thus, transdisciplinarity processes are supposed to initiate, foster, and/or implement the change of a current situation in order to achieve and maintain a desired target state.

Moreover, a transdisciplinary perspective becomes especially relevant, when problems challenging desirable states are characterized by ambiguous perceptions among different actor groups. Potential differences refer not only towards disparate attributions of urgency and pressure for action but more fundamentally to the very nature of a problem. The reason for this refers to a common understanding that problems, challenges, and issues calling for transdisciplinary approaches are in particular characterized by genuine complexity. In this regard, these problems are often referred to as “ill-defined” (Scholz & Steiner, 2015, p. 532), “wicked” (Neuhauser & Pohl, 2015, p. 100), or “messy” (Checkland, 2000, p. 17). In contrast to scientific research interests, challenges in the practical field or ‘real-world’ problems are in general neither confined within the boundaries of certain disciplines (Mittelstraß, 2005) nor are they the exclusive subject of the responsibility of a single institution or organization. In consequence, the notion of problem-solving does not exhaust itself in the sense of the proficient application of adequate means but implies a set of cascading prerequisites:



- (1) Problem-solving of ‘real-world’ problems requires sufficient problem framing or problem structuring which integrates scientific problem-understandings as well as practitioners’ requirements, interests, and needs (Pohl & Hirsch Hadorn, 2007, p. 31; Scholz, Spoerri, & Lang, 2009).
- (2) Problem-solving requires the specification of legitimate goals and desirable states (Lang et al., 2012).
- (3) The former statement, however, raises the issue of determining which stakeholder groups are relevant, entitled, and legitimate to be part of the negotiation process and thus exert influence on determining both previously state prerequisites (Lang et al., 2012, pp. 29–32; Scholz & Steiner, 2015, p. 539).

This understanding resonates well with the conceptual proposition by Pohl and Hirsch Hadorn (2007), which allows differentiating between “system knowledge”, “target knowledge” and “transformation knowledge” (Pohl & Hirsch Hadorn, 2007, pp. 36–40; Vilsmaier & Lang, 2014, pp. 99–100). According to this, system knowledge comprises the expertise on structures and processes as well as involved actors and their interdependence of given systems related to the challenge at hand. Target knowledge relates to desirable states and legitimates goals. Subsequently, transformation knowledge is linked to an understanding of approaches and means as well as success factors and boundary conditions required to achieve the desired targets states and goals.

This perspective further substantiates that the problem-solving discourse in transdisciplinarity does not only imply the application or development of adequate methods or innovations but to engage in comprehensive change and transformation processes. The notion of transformation further implies that in order to solve complex challenges, also far-reaching and fundamental changes are required. In alignment with that, wicked, ill-defined, and messy problems are understood to be embedded in complex relations and multi-dimensional structures. Therefore, problems addressed by transdisciplinarity are understood not to be solved in a ‘once-and-for-all manner’ but tend to be dynamic and persistent at the same time. In this sense, a presumably solved problem might be considered as situationally fixed but requires constant maintenance, has to be adapted according to changing circumstances, or even produce follow-up problems. Thus, ill-defined, wicked, or messy problems tend to be less solvable as such but are rather addressable or treatable in order to improve a given situation (Mitchell, Cordell, & Fam, 2015, pp. 90–91).



2.2.3 Disciplinary and Institutional Boundary-Crossing

According to Nowotny, Gibbons, and colleagues (2007; 2001) contemporary societies and science systems have been a product of a co-evolutionary transformation process which is characterized by hitherto unprecedented functional differentiation and specialization. This development, however, led to ambivalent states. On the one hand, differentiation, which is based on the division of labor among highly specialized experts, allowed an unprecedented productivity increase in terms of knowledge production, technological innovation, and economic growth. On the other hand, excessive functional differentiation resulted in overspecialization characterized by fragmentation of systems into even more specialized sub-systems and organizational units. In consequence, the functional re-integration of these sub-systems in order to engage and solve complex problems becomes not only a challenge but a source of complexity itself. This holds true not only for the differentiation of academia in various disciplines and sub-disciplines but also for the division of labor across various sectors, institutions, and organizations, be it public administrations, research institutions, companies, NGOs, or others.

As previously outlined, ill-defined, wicked, and messy problems usually lay across scientific disciplines. Thus, meaningful problem-solving efforts require the reintegration of various disciplines depending on the assumed characteristics of the given problem (Mittelstraß, 2005). Disciplines, however, emerge and develop within and likewise structure particular scientific communities which are bound to a more or less consistent set of theoretical assumptions, conceptual frameworks as well as methodological approaches, in short, paradigms (Kuhn, 2009). Paradigms of different disciplines or scientific communities, which are related due to a joint problem, do not necessarily have to be compatible. Brewer referred to this observation rather laconically by stating: “The world has problems, but university has departments” (1999, p. 328). In a similar sense, Mittelstraß states: “If the problems, whether scientific or not, do not do us the favour of defining themselves in the terms of a particular discipline or subfield, then special efforts will have to be undertaken, which will normally take us outside our normal subjects or disciplines” (2011, p. 331).

In alignment with Mittelstraß’s claim, various typologies have been outlined on how different disciplines may engage with a joint research problem. According to Klein (2010) multidisciplinary, interdisciplinary, and transdisciplinarity differ in particular with regards to their degree of cooperation and (knowledge) integration. In the context of multidisciplinary, various disciplines share common research subjects and thus are linked by pragmatic coordination ef-



forts. However, no further interrelation is required with respect to theoretical backgrounds, conceptual approaches, or methodologies. In contrast, interdisciplinarity depends at least to a certain extent on the interrelation of the involved disciplinary perspectives. From a conceptual viewpoint, this offers potential benefits resulting from synergy effects and cross-validation of findings.

Still, both, multi- and interdisciplinarity, focus essentially on the joint solution of a scientific problem. “Real-world” or “practice-based” problems, however, are embedded in nested context-specific conditions and constraints which substantially influence the success and continuity of an intended solution (Scholz & Steiner, 2015). Thus, transdisciplinary research highlights the need for the involvement of non-scientific partners which both possess profound knowledge of the given problem and target system. Usually, relevant practitioners are also immediately or directly affected by the issue and its solution and thus represent typical expectations, requirements, and needs.

In consequence, transdisciplinary research and development also foster engagement with context-specific and practice-based knowledge. Therefore, shared “legitimacy, ownership, and accountability” (Lang et al., 2012, p. 26) become essential quality criteria regarding practical application, outcome, and impact of research within the practical field (see also Gibbons et al., 2007; Nowotny et al., 2001). Hence, the transdisciplinary perspective advocates for an integrative collaboration among various stakeholder groups ranging across, for instance, political decision-makers, administration representatives, researchers, experts, practitioners, users, and further impact groups (Defila et al., 2006, p. 216).

Finally, transdisciplinary research and development are therefore characterized by relating various potential actors with manifold complementary and/or conflicting interests, demands, norms, and values. In alignment with that, ill-defined, wicked, and messy problems cannot be answered solely by following scientific principles and rational decision-making processes, but imply ethical, normative, and cultural dynamics, and thus are inherently political (Klein, 2014; Scholz, 2017).

2.2.4 Integration through Mutual Learning and Co-Construction

So far, it has been outlined that transdisciplinarity addresses complex, ill-defined, wicked, and messy problems which lay typically at the intersections of disciplinary, professional, and institutional boundaries. In order to address these types of problems, transdisciplinary research, and



development call for participatory involvement and integration of relevant actors (Klein, 2008b).

In this regard, there is a vast body of literature informing about different approaches for multi-actor participation that highlights various design principles, methodological approaches, conceptual frameworks, and case-studies (Bammer, 2015; Bergmann et al., 2012; Defila et al., 2006; Unger, 2014). Despite the fact that they vary according to the degree of involvement and the stage where involvement takes place within the research and development process (Elzinga, 2008), for instance, from “extended-peer-review” (Funtowicz & Ravetz, 1993) to participatory research (Unger, 2014). Participative approaches rooted in a fundamental assumption that the stakeholders’ involvement and integration in a shared process allow for necessary context-sensitivity in order to identify and address relevant but yet unknown obstacles and requirements. In consequence, the epistemological status of practitioners as research objects has to be reconsidered. Instead, the role of practitioners is not limited to functions as respondents, interviewees, or more general as a part of the research field but have to be understood as reflective subjects, which are actively involved in the research and development process (Jahn et al., 2012; Lang et al., 2012).

Context-sensitivity and participation, however, also increase complexity, since in addition to salient subject-related requirements of a certain problem additional interests and needs of the participating actors have to be considered (e. g. need for empowerment, appreciation). Thus, manifold interrelations and dynamics usually tend to unfold during the research and development process and cannot be fully anticipated a priori. Moreover, participatory involvement is assumed to be often enough conflicting, expensive but never the less a necessary means to ensure that crucial requirements are met (Funtowicz & Ravetz, 1993, pp. 753–754).

Against this background, the notion of integration, which allows for a critical appreciation of difference, received increasing attention within the transdisciplinary discourse (Klein, 2008b; Pohl, van Kerkhoff, Hirsch Hadorn, & Bammer, 2008). In alignment with that, at the epistemic core of transdisciplinarity lie processes of mutual learning (Scholz, 2001; Vilsmaier et al., 2015) and knowledge integration (Godemann, 2008). According to Scholz mutual learning refers to a “basic process of exchange, generation, and integration of existing or newly developing knowledge” (Scholz, 2001, p. 118). With respect to the interrelation of researchers and practitioners Vilsmaier et al. state that it “allow[s] for combining scientific insights with knowledge gained in non-scientific contexts” (2015, p. 564). Therefore, the notion of mutual learning comprises elements of knowledge acquisition about, from and together with partners



from different professional, disciplinary, and institutional backgrounds. In this respect, mutual learning implies also co-constructive interaction. Moreover, it is also closely related to knowledge integration (Godemann, 2008; Scholz & Steiner, 2015). Knowledge integration allows for the development of shared understanding about, for instance, relevant problems for joint research and development, desirable goals and outcomes as well as appropriate means and methods.

However, based on the previously outlined complex implications of collaboration at the intersection of different disciplines, professional fields as well as organizational and institutional backgrounds the aspiration of transdisciplinarity is not limited to knowledge integration. Instead, Jahn et al. (2012, pp. 7–8) advocate for a multi-dimensional understanding of integration which in addition to epistemic requirements also comprises social-organizational and communicative aspects. Similarly, Felt and colleagues propose an even more differentiated analytical framework which distinguishes between epistemic, spatial/material, temporal, symbolic, and social dimensions (Felt, 2009; Felt & Fochler, 2012). Despite the multitude of potential influencing factors, it seems reasonable to assume that epistemic, social, and organizational dimensions comprise the most relevant aspects.

2.3 Converging Discourses: Transdisciplinarity in Teacher Education

The aim of subchapter 2.3 is to consolidate the rationale of this dissertation, which substantiates the call for transdisciplinary collaboration in teacher education. In order to do so, selected contributions of a tentative emerging body of literature which explicitly link higher education, educational science, and teacher education with the discourse of transdisciplinarity are critically discussed in section 2.3.1. In addition, a boundary-crossing research and development project, namely the ZZL-Netzwerk at the Leuphana University of Lüneburg, will be introduced in section 2.3.2. Within this project, so-called Development Teams have been established, which allow for collaborative development of advancements for teaching and teacher education among various actors across the three-staged teacher education system. Finally, section 2.3.3 provides an interim discussion on transdisciplinary collaboration in teacher education.

2.3.1 References for Transdisciplinarity in Teacher Education

Early on, transdisciplinarity was also discussed within the context of higher education. The discourse, however, was characterized by a significant evolvement. With reference to chapter



2, this might be described as widening of the initial focus on “transgression of disciplines” by “transgression of institutional boundaries” and “problem-solving and transformation”.

In the 1970s, a primarily epistemological discourse led by seminal scholars such as Piaget (1972), Jantsch (1972), and Kockelmans (1979) framed transdisciplinarity as an epistemological construct which fueled conceptualizations of a universal systematization of sciences and respective arrangements for universities and research institutions (Klein, 2008a). Its aim was to outline relations and clusters of various disciplines and to point out potential synergies and discontinuities according to epistemological foundations and aims as well as methodologies. As pointed out in section 2.1.3, teacher education comprises a multitude of various disciplines which in part show significant overlaps with regards to theoretical foundations, methodologies, and general research aims (Terhart, 2004). In this regard, the boundaries of pedagogies, subject matter didactics, educational psychology, and sociology are in particular blurry, which point at the interdisciplinary features of teacher education. This holds also true for educational science (German: “Bildungswissenschaft”), which significantly benefited from and essentially owed its rise as an established academic discipline to the profound reform processes and “empirical turn” as discussed in section 2.1.1. With regards to Terhart, educational science is not only characterized by its interdisciplinary features but in particular by its self-concept as an empirical discipline, which promotes practically relevant research and contributes to the advancement and professional development in teacher education (2012, pp. 29–30). Due to that, educational science is understood to show central characteristics of transdisciplinarity as it is defined in this dissertation thesis.

In contrast to this position, Palaiologou (2010) argues that the strong practical orientation in educational science, in fact, diminish its actual transdisciplinary potential, which in her understanding lies within its ability to transcend adjacent disciplines such as sociology, psychology, and philosophy, and offer more integrated research approaches for the pedagogical field (Palaiologou, 2010, pp. 271–272). In order to fully unfold this transdisciplinary potential, she implies that it would be necessary to emancipate from the imperatives of “vocational requirements of teachers” and the narrowed focus on “‘training’ rather than the development of individuals as reflective thinking educators” (Palaiologou, 2010, p. 270). At the bottom of this argument lies the assumption that practical orientation jeopardizes scholarly significance and credibility. Her argument points tacitly at a delicate yet common reproach of the practical application of transdisciplinarity: the need for balancing between scientific credibility and practical relevance as well as instrumentality and reflexivity (Felt, Igelsböck, Schikowitz, & Völker,



2013). This contradiction, however, has to be understood as an inherent and ineluctable characteristic of transdisciplinarity.

Nevertheless, despite Palaiologou's (2010) critique, the present dissertation thesis advocates for a transdisciplinarity understanding of teacher education, which comprises, in addition to the notion of the transcendence of disciplines, also the notion of the transgression of institutional boundaries between researchers and practitioners and the engagement in problem-solving and transformation. Therefore, it is claimed, that education science or educational science respectively should not exhaust itself by transcending disciplinary boundaries across e. g. pedagogy, psychology, and sociology, but instead gain further epistemic significance as well as practical relevance, when facing challenges with regards to the enactment of scientific knowledge in the practical field. In this regard, additional efforts have to be made to meet requirements rooted within the scientific and the practical field. In alignment with that perspective, there is also a tentatively evolving body of literature linking higher education and vocational training with problem-solving transdisciplinarity, which highlight the necessity to prepare students to work in multi-professional, inter-organizational, project-based, and problem-solving oriented settings (Gibbs, 2015; Klein, 2008a; van den Berg, 2016).

With regards to the German-speaking teacher education context, however, the discourse of problem-solving transdisciplinarity has received little attention so far. There is one particular exception which refers to the subject of basic science and social studies at the primary level (German: "Sachunterricht"; Switzerland: "Natur, Mensch, Gesellschaft") (Barth, 2016; Künzli David, Gysin, & Bertschy, 2016). This appears consequential in so far as on the one hand basic science and social studies draw on multiple subject matters ranging from natural sciences (e. g. chemistry, biology, and physics) as well as social sciences, history, and ethics. On the other hand, this subject advocates for problem-based or inquiry-based teaching and learning arrangements which particularly addresses the pupils' lifeworld. The interrelation between interdisciplinary perspectives and practical application is in particular reflected through the tremendous impact of the UNESCO program for Education for Sustainable Development (ESD; German: "Bildung für eine nachhaltige Entwicklung") on the subject's curriculum development (Barth, 2016; Bürgener & Barth, 2018; Nagel & Affolter, 2004). In consequence of this, extra-curricular learning opportunities and cooperation with external partners are of particular importance.



2.3.2 Transdisciplinary Development Teams at the ZZZ-Netzwerk

The following section provides a brief outline of boundary-crossing cooperation within the so-called “Development Teams” at the ZZZ-Netzwerk from a transdisciplinary perspective. Throughout the course of the dissertation, these will be referred to as Transdisciplinary Development Teams (TDTs). The ZZZ-Netzwerk is a research and development project funded through the Teacher Training Quality Campaign (BMBF, 2017). The project is located at the Center for Teacher Education, entitled “Zukunftszentrum Lehrerbildung (ZZZ)”, at the Leuphana University of Lüneburg, Lower Saxony, Germany (ZZZ-Netzwerk, 2018). Its overall vision aims at the contribution of advances in teaching and teacher education through joint endeavors among a multitude of stakeholder groups representing various institutions and organizations. In order to do so, these representatives establish joint TDTs, which are characterized according to the project proposal by collaboration on “equal footing” and within a “culture of togetherness” (Straub & Dollereeder, 2019).

During the first funding phase from 2016 to 2019 eight, TDTs have been established, covering in alignment with overall reform agendas four pressing challenges in teacher education: competence-oriented instructional design, inclusive schooling, mentoring in practical studies, and maintaining teachers’ health. The following teaching subjects are addressed within the field of competence-oriented instructional design: Basic Social and Science Studies (German: “Sachunterricht”) and German at the primary level as well as Mathematics and Music at the secondary level. Finally, with regards to the issue of inclusive schooling two TDTs have been established. One TDT elaborated on inclusive schooling and competencies linking social pedagogies and special education, while the other developed teaching arrangements on inclusive teaching in English as a foreign language.

With regards to the transgression of professional, organizational, and institutional boundaries, more than 80 actors from 25 different organizations have been actively involved. According to the TDTs composition, there have been no particular prerequisites apart from the requirement that the TDTs should comprise relevant actor groups from at least the Leuphana University of Lüneburg and local partner schools. The factual TDTs, however, comprise in total a wide range of actor groups with heterogeneous professional backgrounds and organizational affiliations. These range from professors, research assistants, teacher training educators, principals, teachers, extra-curricular pedagogues, administrative staff, and public authorities. Due to pragmatic considerations, these heterogeneous actor groups are subsumed as follows: researchers,

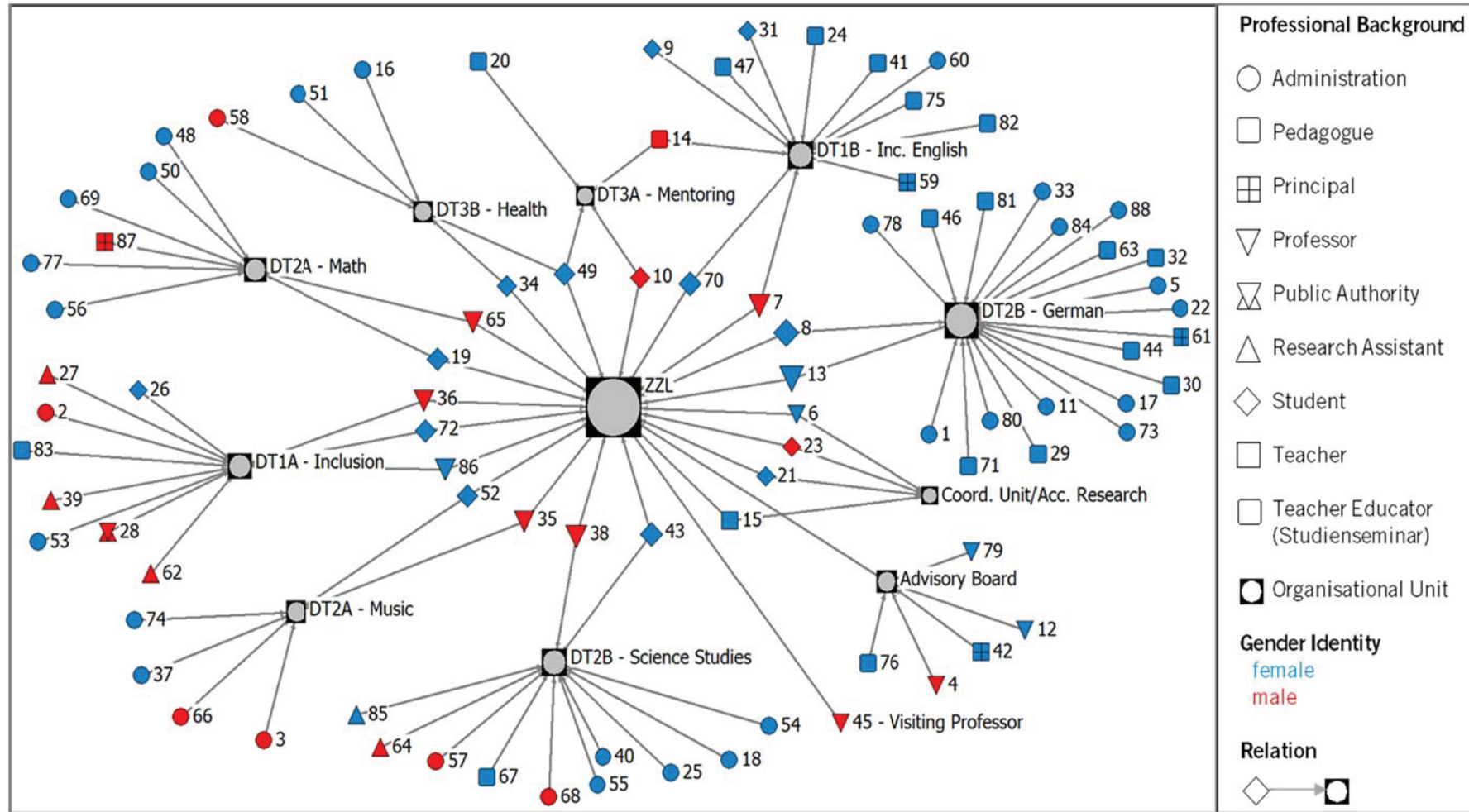


practitioners, and students. This pragmatic classification in particular applies to the empirical studies C and D.

The teams have met on a regular basis, about every three to six weeks. The Development Teams' general aim was the co-constructive development of innovative formats in teaching and teacher education. However, the question of how and which outcome levels should be addressed in particular were due to self-reliant negotiations and decision-making processes within the teams. These levels refer for instance to university-based teacher education, teacher training at teacher education colleges, and school-based classroom teaching or advanced teacher training at particular training facilities. Further details according to organizational structure and framework conditions, factual TDTs composition, goals, and outcomes, as well as working styles, are displayed in particular in article B, which is attached to this framing paper.

Figure 2 provides a visualization of the overall team composition with regards to team member's affiliation to organizational units, professional backgrounds, and gender distribution within the ZZL-Netzwerk. The visualization highlights organizational affiliations from actors to certain organizational units, for instance, a TDTs (arrows). In addition, it provides a general orientation about involved professional backgrounds (icon shapes) and gender distribution (color). The spatial arrangement of nodes (actors and organizational units) indicates that researchers (professors and research assistants) form the inner circle within the ZZL-Netzwerk, which link non-university-based development team members located at the outer circle. The size of each icon bases on the betweenness centrality measure, which indicates how many nodes (actor or organizational unit) are connected through this particular node. This spatial arrangement also represents the collaborative relations, the development team members are linked by researchers to the ZZL-Netzwerk.

Figure 2
Graphical Representation of the Development Teams within the ZZL-Netzwerk



Notes. Arrows indicate affiliations between nodes (actors to organizational units), for example team members to particular Development Teams (DT). Icon shapes differentiate actors' professional backgrounds. The size of icons base on betweenness centrality measure, which indicates how many nodes are connected with another through this node. Different colors represent the gender distribution, respectively. The visualization was conducted with NetDraw V.2.158.



2.3.3 Interim Discussion

Throughout chapter 2, it has been established that the German teacher education system is characterized by complex interrelating challenges. The inherent field of tension between academic knowledge and practical expertise (theory-practice interrelation, section 2.1.2) as well as institutional and disciplinary fragmentation (section 2.1.3) result in disparate claims, responsibilities, and decision-making competencies among fairly heterogeneous stakeholder groups in a multi-layered governance system (section 2.1.1). With regards to the discourse of transdisciplinarity, these challenges may be sufficiently characterized as complex and ambivalent, inherent to the contemporary system and thus persistent, as well as equally relevant for the scientific and the practical field (section 2.2.2). In order to face these challenges, divers but nevertheless increasingly significant demands for collaborative engagements have been established within the teacher education discourse (section 2.1.4).

Against this backdrop, transdisciplinarity promotes an integrative mode for research and development which highlights the reflective interrelation of different bodies of knowledge and expertise across professional, disciplinary, and institutional boundaries (sections 2.2.3 and 2.2.4). In alignment with that, transdisciplinarity advocates a multidimensional understanding of integration which comprises epistemic, social, and organizational features and promotes mutual learning and co-construction (section 2.2.4). In this way, it seeks to foster problem-solving and transformation through the joint development and enactment of innovative concepts, formats, tools, and material, which allow for systemic advancements for the involved stakeholder groups. Therefore, problem-solving and transformation have to be understood not only as approaches to overcoming problems in a reactive sense but also as proactive endeavors to foster advancements and innovations for teaching and teacher education (section 2.2.2).

Despite the structural analogies between challenges and requirements in teacher education with regards to boundary-crossing collaboration, the discourse of transdisciplinarity was not yet referred to within educational science and teacher education. However, it was also outlined that there is a tentatively emerging body of literature which explicitly links the discourse of transdisciplinarity with teacher education (section 2.3.1). It became apparent that these references remain heterogeneous, especially with regards to features of transcending disciplines on the one hand and transgression of institutional boundaries on the other hand. In contrast to this, the present dissertation, however, embraces an understanding of transdisciplinarity which allows for both and therefore subsumes the notions of transcending disciplines and transgression of institutional boundaries under the term disciplinary and institutional boundary-crossing



(section 2.2.3). This understanding corresponds with conceptualizations which have been established within subject didactics of basic science and social studies (Sachunterricht), especially when references to the discourse of education for sustainable development (BNE) are highlighted.

Finally, the research and development project ZZL-Netzwerk has been introduced, which fosters collaborative formats referred to as Development Teams (section 2.3.2). These Development Teams aim at the collaboration among various stakeholder groups in order to co-construct innovative advancements for teaching and teacher education. Overarching challenges within particular development teams refer, for instance, to competence-oriented instructional design, inclusive schooling, mentoring in practical studies, and maintaining teachers' health. Therefore, these research and development topics are understood to be of particular relevance with regards to scholarly as well as practical aspects of teaching and teacher education. In order to meet these aspirations, these Development Teams comprise at least representatives of the focal institutions in teacher education: universities, teacher education colleges, and schools. In addition, depending on particular challenges, and problem framing the involvement of further stakeholder groups located at educational authorities and administration as well as extra-curricular educational institutions and foundations may become of significance.

Moreover, it has been pointed out that transdisciplinarity exceeds the traditional logics of basic science as well as applied sciences by advocating that the pursuit of scientific rigor and credibility have to be integratively balanced with practical requirements, interests, and needs. Instead of a strict separation between research and practice as well as between innovation and application, transdisciplinarity advocates for a more integrative mode of research and development which also embraces the permeability among disciplinary and institutional boundaries.



3 Research Desiderata and Research Questions

Throughout chapter 2 the call for transdisciplinary collaboration in teacher education has been established. Against this background, chapter 3 is dedicated to pointing out overarching research desiderata and more concrete research questions. In order to provide a better orientation, these are further differentiated with regards to their primary epistemic characteristics, namely “T – theoretical”, “P – programmatic”, and “E – empirical”. *Theoretical contributions* aim at the further development and extension of underlying assumptions about basic characteristics, structures, processes as well as relationships between relevant entities with regards to transdisciplinary cooperation in teacher education. In contrast to theoretical contributions, the *programmatic level* comprises, for instance, guidelines and principles which aim at the practical application or enactment of theoretical positions. In this way, programmatic propositions do not focus primarily on descriptive or explicative features but highlight pragmatic and normative elements. Subsequently, *empirical insights* aim at the methodically sound measurement of observable phenomena, which provide a further understanding of factual transdisciplinary cooperation in teacher education. This differentiation is intended to provide a general orientation while being fully aware that these theoretical contributions, programmatic propositions, and empirical insights are in fact closely related. Table 1 offers a compact outline with regards to these research desiderata and research questions.

Table 1
Research Desiderata and Research Questions

Theoretical (T)

T1: Extension of the Systematization of Innovation and Transfer Strategies

- In what regards does the transdisciplinary approach contribute to the discourse on innovation and transfer strategies in teacher education?
- How does the transdisciplinary approach relate to more established innovation and transfer strategies such as top-down, bottom-up, and other cooperative approaches?

T2: Comparison of Boundary-Crossing Approaches in Teacher Education

- How does transdisciplinary perspective on boundary-crossing relate to other pertinent approaches, which advocate for in-depth interrelations between focal stakeholder groups in teacher education, namely Hybrid and Third Space, Community of Practice (CoP), and Research-Practice Partnership (RPPs)?



Programmatic (P)

P1: Guiding Principles for Transdisciplinary Cooperation in Teacher Education

- What are the basic guiding principles for initiating, establishing, and enactment of transdisciplinary cooperation in teacher education?

P2: Generic Process Model for Transdisciplinary Research and Development

- What are the fundamental structures and processes within a generic process model for transdisciplinary cooperation in teacher education?

Empirical (E)

E1: Attitude Assessment and Effect Relationships according to Dimensions of Integration Characteristics

- How do Transdisciplinary Development Team Members assess focal epistemic, social, and organizational dimensions of integration characteristics?
- Are there significant differences according to these characteristics between the main actor groups in teacher education (practitioners, researchers, and students)?
- How are these Dimensions of Integration Characteristics interrelated?

E2: Assessment Patterns and Types of Transdisciplinary Development Team Members with regard to Dimensions of Integration Characteristics

- How do the involved actors assess the Transdisciplinary Development Teamwork with respect to subjectively perceived successful and challenging aspects of transdisciplinary DICs?
 - Are there different types (clusters) of Transdisciplinary Development Team Members characterized by specific sets of assessments with regards to successful and challenging aspects of transdisciplinary DICs?
-

Throughout chapter 2 it has been established that that transdisciplinarity provides a fruitful theoretical and programmatic framework for research and development of boundary-crossing collaboration in teacher education. In order to further substantiate this claim on a *theoretical level* (T), research desideratum T1 focuses on how transdisciplinary collaboration in teacher education provides a substantial contribution in comparison to other innovation and transfer strategies, namely top-down, bottom-up, and cooperative approaches. Due to the fact that the transdisciplinary approach has to be understood as a further-developed cooperative strategy, the research desideratum T2 aims at the critical discussion of other cooperative approaches, which have been prominently discussed within the teacher education discourse. These cooperative approaches refer namely to *Hybrid or Third Spaces*, *Community of Practice* (CoP), and *Research-Practice Partnerships* (RPPs). At a *programmatic level* (P), contributions are missing,



which pragmatic guidance for constitution and enactment of transdisciplinary formats in teacher education, such as, for instance, the Development Teams at the ZZL-Netzwerk. Therefore, research desideratum P1 aims at the formulation of guiding principles for transdisciplinary cooperation and their critical-reflection against insights drawn from the Development Teams, which have been established at the ZZL-Netzwerk. In addition, research desideratum P2 refers to the introduction of a generic process model for transdisciplinary collaboration in the context of teacher education, which has been adapted from the sustainability science context. Both, guiding principles and the process model, are understood to provide necessary programmatic orientation and formative means to support the practical realization of transdisciplinary arrangements in teacher education.

Subsequently, at the *empirical level* (E), the discourse on transdisciplinarity roots in a comprehensive theoretical foundation and a wide range of case studies and project evaluations. Quantitative and evidence-based research, assessing attitudes and elaborating on effect mechanisms with regards to transdisciplinary integration characteristics, remain scarce. Due to that, research desideratum E1 points at a standardized analysis of epistemic, social, and organizational dimensions of integration characteristics. Hereby epistemic characteristics such as *mutual learning*, *knowledge integration*, will be linked to social prerequisites such as *perceived trustworthiness* and *appreciation within the team* as well as the organizational characteristic *collective ownership of goals*. In addition to that, further research is needed to establish whether there are certain assessment patterns among Transdisciplinary Development Team members. Research desideratum E2 provides empirical analysis in this regard and provides further insights on whether these patterns may be interrelated with focal background variables, such as gender, professional background, or professional experience in years.



4 Synopsis of Studies

In order to address the research desiderata and research questions outlined in chapter 3, four studies have been conducted, which provide theoretical advancements, programmatic guidelines, and empirical findings on transdisciplinary collaboration in teacher education. Subchapter 4.1 is dedicated to pointing out the general outline of the four studies A, B, C, and D, and visualizes which research desiderata are engaged by which article. Due to their genuine structure, each study corresponds to one or two research desiderata, which may also combine theoretical, programmatic, and empirical levels. Subsequently to the general study outline, compact summaries of each study will be provided.

4.1 General Study Outline

Study A is entitled “Pathways to Educational Change Revisited” and engages with research desideratum T1 by outlining a comparative systematization of ideal-typical approaches for innovation and transfer in teacher education. This systematization comprises established innovation and transfer strategies, such as top-down, bottom-up, and cooperative approaches, which contrasts the transdisciplinary perspective. In addition, study A introduces and critically discusses a generic process model for transdisciplinary collaboration among various stakeholder groups across universities, teacher training colleges, schools, and extra-curricular partners. Hereby the article engages with research desideratum P2.

Study B is named “Guiding Principles for Transdisciplinary Development Teams” and thus elaborates primarily on research desideratum P1. In order to do so, it also provides an additional comparison about seminal approaches for boundary-crossing collaboration in teacher education, namely Third Space, Community of Practice, and Research-Practice Partnerships, and thus provides further insights with regards to research desideratum T2.

Study C aims at the empirical assessment of attitudes and elaboration of effect mechanisms with regards to transdisciplinary dimensions of integration characteristics. This is labeled “Transdisciplinary Integration in Teacher Education” and focuses on research desideratum E1.

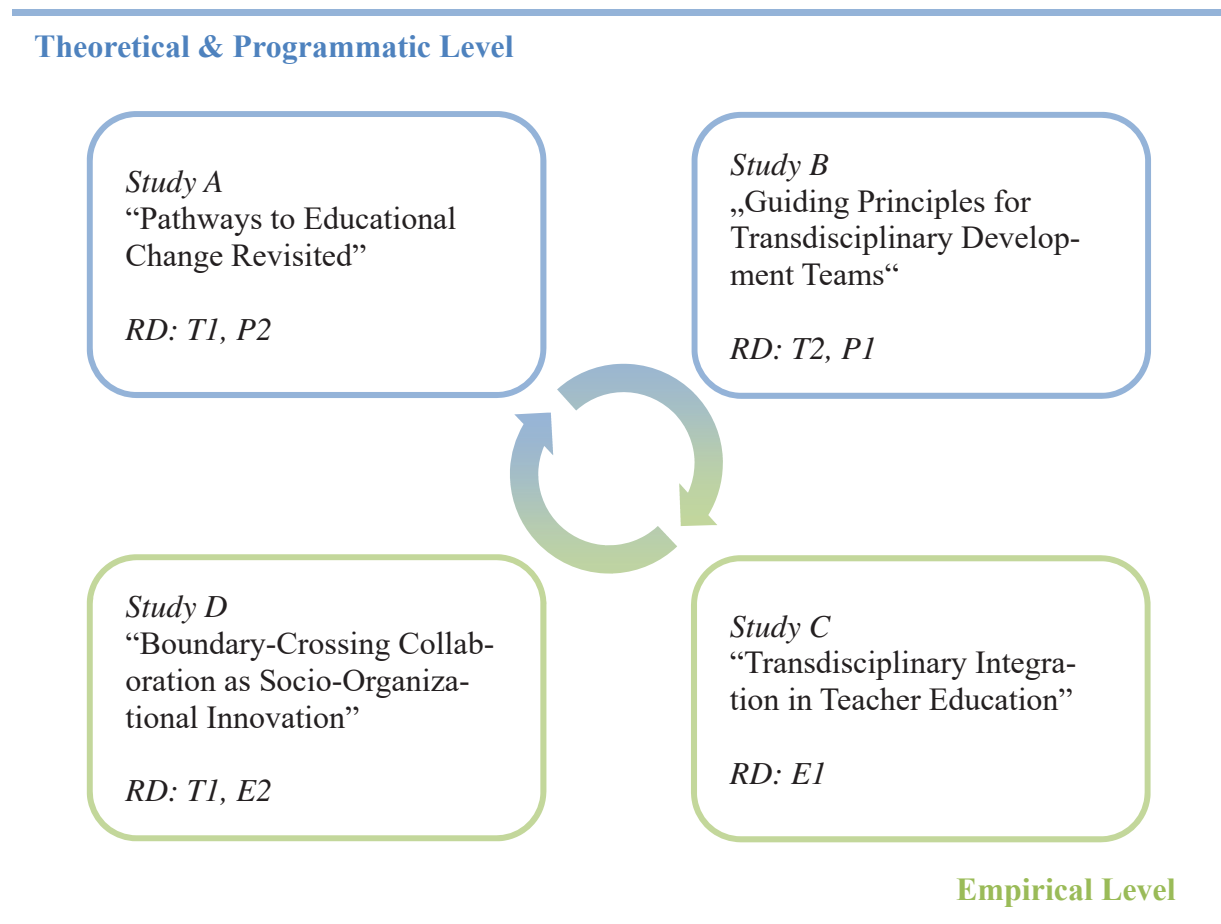
Subsequently, study D is entitled “Boundary-Crossing as Socio-Organizational Innovation” and provides additional theoretical insights on research desideratum T1 by linking theoretical positions of social innovation theory with transdisciplinary collaboration in teacher education. Moreover, a complementary empirical analysis of attitude patterns with regards to successful and challenging aspects of transdisciplinary dimensions of integration characteristics



are provided. These patterns allow for the differentiation of types or clusters of actors within the TDTs and thus provide further insights on research desideratum E2.

In addition, Figure 3 provides a graphical visualization of how the research desiderata are interrelated with the previously outlined research studies A, B, C, and D.

Figure 3
Overview and Interrelation of Studies with Research Desiderata (RD)



4.2 Study Summaries

4.2.1 Study A: Pathways to Educational Change Revisited

Straub, R. & Vilsmaier, U. (2020). Pathways to educational change revisited – controversies and advances in the German teacher education system. *Teaching and Teacher Education*, 96, 1–13. <https://doi.org/10.1016/j.tate.2020.103140>

The notion of *educational change* refers to a wide range of understandings, strategies, and means on how to initiate, establish, and distribute advancements in education (Fullan, 2016;



Hargreaves & Shirley, 2009). Study A contributes to this discourse with respect to the teacher education system in Germany. In order to do so, two main research interests are addressed against the wider background of a multitude of educational policies and reform processes: a) a systematical critique on three ideal-types of education change will be provided, distinguishing between top-down, bottom-up and cooperatives approaches. This provides the theoretical background for b) the introduction of programmatic propositions based on a transdisciplinary perspective. In this respect, article A answers desideratum T1.

The following conclusions are drawn from the conceptual analysis conducted in article A. Top-down approaches follow an authoritative-interventional understanding of innovations' development, implementation, and transfer. They base ideal-typically on clinical randomized controlled trials. Thus, the change process is primarily owned by researchers who are understood as active driving forces, while practitioners ought to remain executing agents of innovations. Top-down approaches are closely linked to the evidence-based paradigm in teacher education calling for scientific rigor and fidelity of implementation. These allow for methodologically sound effect assessment and evaluation. However, the pursuit of scientific rigor turns out to also be a major drawback with respect to practical application and transfer. According to Fullan, top-down approaches are vulnerable to the "fallacy of rationalism" (2007, p. 110): the erroneous assumption that change processes could be enforced by the sheer reference to scientific integrity and rational arguments. However, the urge for implementation fidelity inhibits adaptations with respect to context-sensitive needs and requirements which increase the risk of the refusal of change processes or lead to the gradual vanishing of intended effects.

In contrast, bottom-up approaches are considered to foster practitioners' participation and nourish commitment and acceptance. These are understood as constituting factors for enduring change processes. In addition, bottom-up processes are linked to cyclic-iterative process logics highlighting the interconnectedness of development, enactment, and diffusion of innovations. They aim for change from within the target system and collective capacity building which implies that process ownership has to remain with the practitioners. Again, bottom-up approaches are conceptually limited with regard to objectivity and generalizability of change processes. In correspondence to Fullan's notion, this could be referred to as 'shortcomings of proximity'.

Cooperative approaches feature the third ideal-type and constitute at the same time a middle ground or hybrid form between the former two. Cooperative approaches allow for shared ownership and better integration of interests among the process participants. Therefore, cooperative approaches are supposed to balance external push factors representing reform agendas



and innovations in educational research, while internal pull factors as appropriation and adoption mechanisms assure not only necessary integration but safeguard that internal goals and perspectives are achieved. Despite these advantages, cooperative approaches are quite resources consuming in comparison to the other approaches. They require continuous processes of mutual learning and knowledge integration in order to co-construct shared understandings with regards to goals, roles, and means. Moreover, collaborative approaches are inherently vulnerable to power asymmetries, which jeopardize equal participation and joint decision making.

Subsequently to the critical acknowledgments of top-down, bottom-up, and cooperative strategies an overarching point of critique serves as an entry point to introduce conceptual propositions based on transdisciplinarity. The discourse on pathways to educational change is still predominantly limited to a unidirectional understanding of innovation and transfer focusing on school improvement. In consequence, schools remain primary targets of change processes while universities are seen either as direct innovators or as accompanying facilitators respectively. In contrast, it is argued that profound and enduring change has to reach across the three-phased teacher education system. This requires a systemic approach which highlights the need for comprehensive integration of various actors and their respective expertise, interests, and needs. This holds particularly true for the German teacher education system which by international comparison counts as highly specialized but also institutionally fragmented.

In order to further substantiate a transdisciplinary perspective, an ideal-typical model for transdisciplinary processes, originally established within the sustainability science (Bergmann et al., 2012; Jahn et al., 2012), was adapted and applied to the TDTs within the ZZL-Netzwerk. This addresses research desideratum P2. The model features three main phases ‘problem framing and team building’, ‘mutual learning and knowledge integration’, and ‘re-integration and application of knowledge’. Preliminary findings suggest that transdisciplinary processes bear the potential to foster collaboration across professional and institutional boundaries and allows for a comprehensive interrelation of various bodies of knowledge and expertise as well as different interests and needs. This is supposed to allow for more systemic change since innovations refer likewise to the academic teacher education as well as the school practice. However, a transdisciplinary perspective also increases the complexity of researcher-practitioner interrelations. In consequence, the practical application of a transdisciplinarity has to face necessary trade-offs and balancing acts.



4.2.2 Study B: Guiding Principles for Transdisciplinary Development Teams

Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZL-Network, Leuphana University Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 57–82). Verlag Barbara Budrich. <https://doi.org/10.3224/84742209.04>

Article B seeks to further consolidate the theoretical outline of a transdisciplinary approach to innovation and transfer in teacher education provided in study A. In order to do so, two research questions are addressed. First, the article elaborates on commonalities and contrasts among a transdisciplinary perspective and other pertinent concepts prominently discussed within the discourse on boundary-crossing cooperation in teacher education. Second, based on a conceptual synthesis four guiding principles for the realization of cooperative formats across various professional, organizational, and institutional boundaries in teacher education are suggested. Subsequently, these principles are critically discussed with respect to insights based on the TDTs at the ZZL-Netzwerk. In doing so, article B offers insights with regards to research desiderata T2 (Comparison of Boundary-Crossing Approaches in Teacher Education) and P1 (Guiding Principles for Transdisciplinary Cooperation in Teacher Education).

The research literature on cooperative approaches in teacher education provides a vast amount of case studies, conceptual papers, and research reflections, which addresses the interrelation among various stakeholder groups across the theory-practice divide. However, a comprehensive literature research indicates that cooperative relations remain closely related to institutionalized intersections between universities and schools, for instance, in the context of practical studies and school work placements. Moreover, despite the recurrent and ubiquitous call for in-depth boundary-crossing collaboration factual examples for in-depth collaboration in terms of co-constructive development and distribution of joint innovations remain scarce. This assessment tends also to be true for empirical-based and methodically elaborated studies on boundary-crossing collaborations.

Based on these preliminary findings, the article reflects on three conceptually elaborated approaches which in addition are widely discussed the scientific community. These approaches refer namely to the concepts of *Third* or *Hybrid Spaces*, *Community of Practice* (CoP), and *Research-Practice Partnerships* (RPP).



The concept of *third or hybrid spaces, respectively*, highlights the interrelation of actor groups embedded in different reference systems such as researchers within the academia and practitioners in the field of school practice (Fraefel, 2018; Zeichner, 2010). It is understood as an open environment for in-depth negotiation, exchange, and co-construction. Moreover, it allows blurring the boundaries of the involved parties while mitigating potential power asymmetries among the involved stakeholder groups.

In contrast, the concept of CoPs highlights that professionals who work in similar professional settings may constitute a shared community which is characterized by social learning mechanisms such as “legitimate peripheral learning” (Lave & Wenger, 2011). These foster the establishment of a joint professional practice in terms of understandings and procedures. Professional socialization processes allow novices to become professionals and potentially experts. However, with respect to teaching and teacher education, it seems not justified that both professional fields converge to an overarching community by itself, unlike the underlying assumption of CoP suggests. Instead, deliberate efforts have to be made in order to bring together and foster exchange and co-constructive development among representatives from both fields of expertise.

Finally, RPPs advocated professional partnerships between educational researchers and practitioners. These are particularly dedicated to establishing long-lasting cooperative relations in order to develop and establish school improvement projects. The explication of communicative structures and cooperative which ensure that researchers and practitioners alike are sufficiently involved in this process in order to create mutually beneficial outputs. Nonetheless, RPPs focus refers primarily on the applicability of outcomes at school level, while the roles of academic research, as well as the impact of other stakeholder groups, remain secondary. Subsequently, commonalities and contrast of these concepts have been reflected and contrasted with a transdisciplinary perspective advocating four guiding principles for systemic cooperation in boundary-crossing settings:

- *Joint Problem-solving Orientation* refers to the requirement that collaboration should result in concrete benefits for the participating actors. This requires the identification and definition of shared problems and potential solutions which are of relevance for both educational research and practice alike.
- *Multi-Perspectivity* stands for the integration of expertise, perspectives, and interests across different stakeholder groups relevant for the joint problem-solving process.



- *Participation* is understood as a crucial prerequisite for in-depth exchange and co-constructive development of innovative concepts and materials.
- *Re-Integration* points at a two-fold requirement for transdisciplinarity: On the one hand the different stakeholders' expertise and perspectives have to be integrated into a shared problem-solving process, while its outcomes have to be re-integrated into the originating reference systems.

Finally, these guiding principles have been reflected against the TDTs established within the ZZL-Netzwerk. It has been shown, that these guiding principles provide some basic orientation in order to foster boundary-crossing cooperation. However, these guidelines have to be interpreted and reflected against case-specific characteristics of a particular cooperative situation. Therefore, questions concerning who are relevant stakeholder groups to be involved and what might be defined as joint problems are highly contingent. In addition, the wider structural and organizational framework conditions have considerable impacts on how TDTs are factually realized.

4.2.3 Study C: Transdisciplinary Integration in Teacher Education

Straub, R., Kulin, S., & Ehmke, T. (2021). A transdisciplinary evaluation framework for the assessment of integration in boundary-crossing collaborations in teacher education. *Studies in Educational Evaluation*, 68, 100952. <https://doi.org/10.1016/j.stueduc.2020.100952>

Collaborative approaches across institutional, organizational, and professional boundaries have been identified as promising pathways to bridge the theory-practice-gap in teacher education (Fraefel, 2018; Vanderlinde & van Braak, 2010). Advantages of such collaborations are seen in their potentials for teaching development in terms of generating and enactment of innovative concepts and materials (Damşa & Ludvigsen, 2016; Putnam & Borko, 2000), professional development for (pre-service) teachers and teacher educators (Korthagen, 2016; Ping, Schellings, & Beijgaard, 2018), as well as collective capacity building and institutional change (Fullan, 2016; Hartmann & Decristan, 2018).

The transdisciplinary perspective claims that integration with regards to epistemic, social, and organizational dimensions remains a paramount requirement for successful collaboration in boundary-crossing contexts (Hericks, 2004). This holds particularly true for the German



teacher education context which is characterized by its loosely-coupled three-phased system. However, the debate on integrative effects boundary-crossing collaboration bases primarily on theoretical assumptions and qualitative self-assessments. Therefore, further standardized empirical findings are needed to substantiate theoretical perspectives on success factors and effectiveness of boundary-crossing collaborations.

In order to contribute to this debate, theoretical foundations and empirical insights about an integrative format for boundary-crossing collaboration, so-called *Transdisciplinary Development Teams* (TDTs), will be presented. In addition, the analysis draws on a transdisciplinary perspective. Transdisciplinarity is understood as an integrative mode of research and development among actors from the academic and the practical field (Scholz & Steiner, 2015). Moreover, this discourse advocates, in particular, a multi-dimensional understanding of integration comprising not only epistemic but also social and organizational facets of collaboration (Bergmann et al., 2012; Jahn et al., 2012). In particular, the following dimensions of integration characteristics (DICs) are differentiated: At the epistemic heart of transdisciplinary cooperation lie process of *mutual learning* and *knowledge integration*. *Mutual learning* refers to the ability to engage in constructive conflicts as well as to learn from and together with team members from different professional, organizational, and institutional backgrounds about a shared problem or knowledge object. This is seen as a key requisite for *knowledge integration* in boundary-crossing settings (van den Bossche, Gijsselaers, Segers, Woltjer, & Kirschner, 2011). *Knowledge integration* is characterized by the capacity to take on other's perspectives and to make one's own understood which allow for the establishment of a common ground and shared understandings (Steinheider, Bayerl, Menold, & Bromme, 2009). Moreover, it has been recurrently outlined, that epistemic integration depends on trust-based (Costa & Anderson, 2011) and appreciative relationships (Carmeli & Gittell, 2009) as well as the organizational framework conditions which allow team members to develop a *collective ownership of goals* (Bronstein, 2003).

Against this background, article C focuses on the investigation of research desideratum E1 (Attitude Assessment and Effect Relationships according to Dimensions of Integration Characteristics). In doing so, it focuses following empirical research questions:

- (1) How do TDT Members assess focal epistemic, social, and organizational DICs?
- (2) Are there significant differences according to these characteristics between the main actor groups in teacher education (practitioners, researchers, and students)?
- (3) How are these DICs interrelated?



In order to answer the third empirical research question, a theoretically derived path model has been tested, which comprises the following hypotheses:

H1: According to the epistemic dimension of integration, *mutual learning* has a positive effect on *knowledge integration*.

H2: The effect of *mutual learning* on *knowledge integration* is moderated by *collective ownership of goals* indicating the importance of participatory organizational principles.

H3: *Perceived trustworthiness* and *appreciation within the team* have a positive effect on *mutual learning*.

H4: Finally, *perceived trustworthiness* and *appreciation within the team* have also a positive effect on *knowledge integration*.

In order to address these research questions, a written survey has been conducted with $n = 62$ TDT members. With respect to the first research interest, a one-way ANOVA was conducted to assess differences with respect to the main actor groups. In addition, a manifest path model was tested to assess the hypotheses according to the second research interest.

Research findings indicate that there are no fundamental assessment differences according to the professional background of the actor groups to be found, while the average assessment shows very high values. Therefore, it can be assumed that members perceive their joint engagement within the TDTs to be integrative with respect to all dimensions of integration characteristics. Moreover, findings indicate that none of the major actor groups were systematically neglected or shut out throughout the teamwork. In alignment with basic assumptions in transdisciplinarity, this is understood as a crucial indicator for participation on an equal footing and the co-construction of ‘socially robust knowledge’ (Nowotny, Scott, and Gibbons 2001).

Test results of the manifest path model indicate that *mutual learning* and *knowledge integration* build the epistemic core of transdisciplinary processes which allow for TDT members to exchange experiences and expertise, engage in the co-constructive process and integrate knowledge in order to develop for instance innovative teaching concepts and materials. Furthermore, both epistemic processes are dependent on *trust-based* and *appreciative* social relationships which encourage participating actors to contribute freely and nonetheless engage in critical discussions. Both social characteristics have a positive effect on *mutual learning*, while their effect on *knowledge integration* is fully mediated by *mutual learning*. Finally, organizational principles such as collective ownership of goals foster equal participation which again has a small moderating effect on the positive effect relationship between *mutual learning* and *knowledge integration*.



In consequence, article C offers further insights about team members' attitudes and effect relations with regards to DIC's which contributes to the empirical underpinning of focal assumptions of transdisciplinary cooperation in teacher education.

4.2.4 Study D: Boundary-Crossing Collaboration as Socio-Organizational Innovation

Straub, R. & Ehmke, T. (pre-print). Boundary-Crossing Collaboration in Teacher Education: Insights from a Socio-Organizational Innovation Perspective.

The aim of the fourth article D is twofold. At a theoretical level, it further develops the contribution of the transdisciplinary perspective for educational change with insights from social innovation theory. While transdisciplinarity stands for an integrative research and development mode, social innovation theory highlights in particular the transformation of social relations in order to satisfy social needs and to advocate empowerment. Based on this, TDTs can be framed as genuine socio-organizational innovations, which are considered as necessary prerequisites for boundary-crossing co-construction of didactical innovations in teacher education. In this regard, article D also addresses research desideratum T1 (Extension of the Systematization of Innovation and Transfer Strategies) and thus further develops positions made in article A.

On the other hand, drawing on the concept of transdisciplinary dimensions of integration characteristics (DICs), the article provides further empirical insights which complement findings in article C. The empirical research questions addressed in this article read as follows:

- (1) How do participating TDT members assess DICs with regards to successful and challenging aspects?
- (2) Are there different types of actors to be distinguished which are characterized by particular assessment patterns?
- (3) Do these types of actors correlate with relevant background variables such as gender, affiliation to professional groups, or professional experience in years?

In order to answer these research questions, the study draws on a complementary mixed-methods design combining qualitative and quantitative approaches. Data gathering was conducted using the same questionnaire which was also used for study C but draw on semi-structured questions with open response format. The participating TDT members were asked to write down three aspects each which in their opinion have been in particular successful and three aspects which have been in particular challenging with respect to the collaboration within the



TDTs. The resulting data corpus comprises $n = 62$ response sets. For initial data analysis, a qualitative content analysis has been conducted during which available responses have been coded with regards to DIC (Kuckartz, 2016). The resulting data set consists of $n = 139$ statements referring to DICs, while inter-coder reliability ranging between Cohen's Kappa = .8 and .88 is considered good. Due to the general tendencies towards keywords and brief sentences, the data set was quantified in order to allow for further statistical analysis. Research question a) was then answered using qualitative results and descriptive findings. Subsequently, a hierarchical cluster analysis was conducted using the Simple Matching Coefficient and Complete Linkage clustering algorithm. In addition, a non-parametric ANOVA was conducted based on the van-der-Waerden-test statistic in order to identify assessment differences regarding successful and challenging aspects of DICs among team member clusters. On this basis, research question b) was answered. Finally, χ^2 -tests of independence were conducted in order to answer research question c), whether there are any statistical relationships between cluster affiliation and focal background variables such as gender, affiliation to professional groups, or professional experience in years.

According to research question a), descriptive results show that development team members stated almost an identical number of statements according to successful (50.4 %) and challenging (49.6 %) aspects regarding DICs. In particular *mutual learning* (63 %), which refers to exchange and co-construction of knowledge, and *appreciation within the team* (76 %), indicating an equal footing among team members, was considered to be successful. In contrast, *knowledge integration* (73.3 %), which refers to mutual perspective-taking and the establishment of a common understanding, was considered predominantly as challenging.

With respect to research question b), the cluster analysis indicated four types of development team members identified which are characterized by differing assessment patterns towards successful and challenging aspects regarding DICs. Results of the non-parametric ANOVAs show principal effects with p-values ranging between $< .01$ and $.03$ for every characteristic except for *knowledge integration* (challenging) and *perceived trustworthiness* (challenging) and *appreciation within the team* (challenging). For measuring the effect size Cramer's V was calculated which ranged between .38 and .78 indicating medium to strong effect relationship between cluster affiliation and DICs. In addition, post-hoc analysis reveals particular response patterns for each cluster which allow characterizing as 'A – Indifferent Members', 'B – Integration Critics', 'C – Learning Critics', and 'D – Committed Learners'.



Finally, χ^2 -tests of independence indicate that there are no statistical relationships between cluster affiliation and gender, professional background, or professional experience in years. With regards to research question c), independence from focal background variables can be assumed, which further supports the previous finding of genuine clusters or types of actors involved within the TDTs.

In summary, this article contributes to the theoretical underpinning of a transdisciplinary approach in teacher education through insights from social innovation theory. In accordance with that, transdisciplinary cooperation in teacher education has to be understood as a genuine social-organizational innovation, which again allows for the co-constructive development of didactical innovations for teaching and teacher education across the three-staged teacher education system. In this regard, article D provides further insights about research desideratum (T1) and complements theoretical positions in article A, which highlights transdisciplinarity as a genuine approach for innovation and transfer in teacher education. In addition, article D provides further empirical insights about TDT members' perceptions and assessment patterns of DICs. In this sense article D also complements insights drawn from C.



5 Outcomes, Limitations, and Outlook

The concluding chapter offers reflections on the findings of the dissertation in terms of contributions to the scientific community and implications for the practical implementation of transdisciplinary collaboration at the boundary between university-based teacher education and school-based teaching. Finally, the limitations of this dissertation are discussed and a compact outlook on future research and development activities is provided.

5.1 *Contributions to the Scientific Community*

Throughout chapter 2 it was established that teacher education is characterized by structurally inherent challenges such as the institutional and disciplinary fragmentation (section 2.1.3), ambivalent and in part conflicting theory-practice interrelation (section 2.1.2), heterogeneity of stakeholder groups with differing requirements, and needs as well as decision-making authority within a multi-layered and multi-agent governance system (section 2.1.1). Moreover, it has been pointed out that boundary-crossing cooperation comprising various stakeholder groups across the three-staged teacher education has been increasingly discussed as a promising pathway to overcome these challenges (section 2.1.4). In addition, collaborative formats provide likewise integrative and effective means for the co-construction of innovative advancements for teaching and teacher education.

Against this background, structural analogies have been identified between the call for boundary-crossing teacher education and the discourse on transdisciplinarity. Transdisciplinarity is understood as an integrative mode of research and development, which allows for problem-solving and transformation (section 2.2.2). In order to do so, transdisciplinarity advocates for disciplinary and institutional boundary-crossing (section 2.2.3), which again allows for mutual learning and co-construction (section 2.2.4). Subsequently, transdisciplinarity aims at the joint development of beneficial outcomes, which satisfy both, the need for scientific credibility and practical relevance.

Chapter 2.3, then discusses a tentatively emerging body of literature explicitly linking boundary-crossing cooperation in teacher education with the discourse of transdisciplinarity. In addition, Transdisciplinary Development Teams at the ZZL-Network have been introduced as the wider research context for this dissertation. Against this backdrop, overarching research desiderata have been outlined in chapter 3, which have been addressed throughout articles A, B, C, and D. In this regard, the following subchapters are dedicated to outlining focal outcomes



for the scientific community, which refers to a set of theoretical propositions (T), programmatic guidelines (P) and empirical findings (E).

5.1.1 T1: Extension of the Systematization of Innovation and Transfer Strategies

With regards to research desideratum T1, article A provided a critical discussion of a transdisciplinary perspective in teacher education. Hereby, it has been elaborated that a transdisciplinary approach is capable of interlinking scientific-administrative innovation and transfer strategies with practice-driven developments. In doing so, transdisciplinarity allows for mediating between so-called top-down and bottom-up approaches. It has been further outlined that this perspective resonates well with other cooperative approaches in teacher education. Cooperative approaches, however, still tend to apply a unilateral development perspective, where either university-based or school-based practice are the primary beneficiaries. In contrast, transdisciplinarity advocates for a systemic and integrative perspective based on mutual learning and joint development, which highlights the joint integration not only of capacities and resources but the joint engagement of requirements and needs (Boer et al., 2018).

Moreover, throughout article D the transdisciplinary perspective in teacher education has been critically discussed with regards to theoretical assumptions related to the social innovation theory. As an essential outcome of this discussion, transdisciplinary collaboration in teacher education has been framed in terms of a socio-organizational innovation by itself, which again allows for establishing necessary epistemic, social, and organizational requirements for the co-construction of didactical innovations, for instance, new teaching and learning arrangements and teaching practices for both, the university-based as well as school-based practice. In this way, the introduction of transdisciplinarity in teacher education is considered to provide a theoretically as well as conceptually consolidated perspective to the discourse on innovation and transfer approaches in teacher education (Gogolin & Prenzel, 2010; Rürup & Bormann, 2013).

5.1.2 T2: Comparison of Boundary-Crossing Approaches in Teacher Education

In addition to the previous considerations, article B provides a critical discussion, which further elaborates on conceptual overlaps and differences among seminal cooperative approaches within the international teacher education literature. In this way, it addressed, research desideratum T2. Third Spaces, CoPs, and RPPs have been identified as dominating conceptual reference points within the contemporary discourse on boundary-crossing collaboration in teacher education.



The concepts of Third Spaces and RPPs share the understanding of university-based and school-based practices as interrelated but genuine different practices. They differ with regards to their conceptual determination of collaborative goals. Third Spaces highlight the need for an equal footing and mutual recognition but remain cautious with regards to hastily integration attempts, which may result in consolidating power asymmetries to the presumable disadvantage of practitioners. In contrast, RPPs are particularly dedicated to fostering advancements for school-based practices. Research, however, tends to remain a secondary by-product at the conceptual level. In contrast, the concept of CoPs presupposes that there is already a sufficient overlap between researchers and practitioners. According to this, it is expressed in terms of a shared domain of problems and work contexts as well as shared practices, which constitutes a shared community. This assumption remains problematic, against the backdrop of a persistent theory-practice dilemma, institutional fragmentation, and not yet fully overcome practices of mutual demarcation. The concept offers also fruitful considerations on social learning mechanisms, however, the concept of ‘legitimate peripheral participation’ implies to some extent asymmetries of expertise with regards to a master-novice relationship. This figure of thought, however, therefore requires further consideration, since it contradicts focal elements of an integrative approach which highlights mutual learning and where differences of knowledge and expertise are considered as a potential resource instead of a handicap which has to be overcome.

Subsequently, transdisciplinarity has been introduced as an integrative mode for research and development, which shares considerable overlaps to the previously discussed approaches. In contrast to these, transdisciplinarity is understood to circumvent conceptual shortfalls or allow exceeding potential benefits of boundary-crossing collaboration. This is in particular due to its systemic and integrative perspective, which advocates for mutual learning and co-construction of beneficial outcomes for both, scholars as well as practitioners. Finally, this contribution made with regards to research desideratum T2 is understood as a comparative consideration across different approaches advocating collaborative teacher education. This offers some systematizing thoughts on their potential benefits and limitations.

5.1.3 P1: Guiding Principles for Transdisciplinarity in Teacher Education

Throughout article B, guiding principles of transdisciplinarity have been articulated, which refer namely to “Problem-Solving Orientation”, “Multi-Perspectivity”, “Participation”, and “Re-Integration”. In alignment with theoretical considerations regarding research desideratum T2, it has been pointed out that these guiding principles allow for integrating beneficial aspects of



Third Spaces, *CoP*, and *RPPs* while circumventing potential shortfalls. In this sense, the principle of “problem-solving orientation” implies, that sufficient effort has been made with respect to jointly problem understanding and co-construction of solutions, while assuring that each involved stakeholder group also benefits from their engagement. In order to foster a comprehensive problem understanding, which comprises various stakeholder groups, the principle of “Multi-Perspectivity” becomes essential. The achievement of “Multi-Perspectivity” is also understood as an essential requirement for constructing socially and culturally robust knowledge and thus and facilitate acceptance and sustainable application of generated solutions. Both previous concepts are closely interrelated with the principle of “participation”. Participation allows for direct articulation of expertise as well as requirements and needs, which might fall short in mediated processes. In this way, participation is also understood as a substantial means to produce shared “legitimacy, ownership, and accountability” for collaborative processes (Lang et al., 2012, p. 26). Finally, the principle of “Re-Integration” refers to the requirement that jointly co-constructed solutions among different stakeholder groups should be embedded in their originating contexts and thus provides advantages for the respective reference systems. These considerations are understood as conceptual-programmatic propositions with regards to research desideratum P1.

5.1.4 P2: Generic Process Model for Transdisciplinary Research and Development

The guiding principles, “Problem-Solving Orientation”, “Multi-Perspectivity”, “Participation”, and “Re-Integration” correspond directly with a generic process model adapted from the sustainability sciences to the field of teacher education, as outlined in Study A. In particular, these principles are understood to lie transversally across the three main process steps: “Problem Framing and Team Building”, “Mutual Learning and Knowledge Integration”, and “Re-Integration and Application of Knowledge”. With reference to the so-called ISOE-Model, established at the Institute for Socio-Ecological Research (German: Institut für Sozial-Ökologische Forschung) in Frankfurt, Germany, (Bergmann et al., 2012) transdisciplinary research and development processes ideal-typically presuppose a symmetric and participatory integration of various stakeholder groups. This again allows for joint problem-solving and co-construction of advancements, which are of particular relevance and practical use for involved parties. In this regard, the previously mentioned process steps provide formative orientation in order to facilitate transdisciplinary research and development processes. In this way, it also highlights partic-



ular critical elements which require reflective considerations. With regards to the specific characteristics of “wicked”, “messy”, and “ill-defined” problems discussed in section 2.2.2 this is considered an undeniable requirement. By adapting this process model with regards to the context of the teacher education system, it extends and substantiates the application of this concept and thus supports the transdisciplinary perspective in general. On a programmatic level, it provides facilitating orientation which is of particular interest for practical establishment and enactment of concrete TDTs. In this way, the model provides conceptual advancements, which serve as a process-based support of transdisciplinary research and development.

5.1.5 E1: Attitude Assessment and Effect Relationships according to DICs

With respect to research desideratum E1, study C provided an empirical analysis of transdisciplinary DICs, which have been proposed within the transdisciplinary discourse. Despite the theoretical and conceptual elaboration on various process characteristics (Bergmann et al., 2012; Jahn et al., 2012), however, there were no established standardized measurement instruments available yet. Therefore, it was necessary to critically identify and adapt suitable scales from other research contexts. In this regard, study C proposed an unprecedented configuration of dimensions of integration with regards to epistemic, social, and organizational features as well as their particular operationalization at the level of measurement. Therefore, on a methodological level, the study’s contribution refers to both discourses on transdisciplinarity and boundary-crossing collaboration in teacher education. Especially with regards to transdisciplinarity, quantitative approaches are still relatively uncommon due to a certain reluctance with regards to standardized and therefore assumedly decontextualized characteristics (Bergmann et al., 2005; Bergmann & Schramm, 2008; Klein, 2006).

From an evaluative perspective, however, study C offers also some preliminary empirical evidence, that a) focal DICs are assessed predominantly positive within the TDTs and b) that there are no statistically significant differences to be found across focal stakeholder groups such as researchers, practitioners, and students. This supports to some extent the overall project aspiration of the ZZL-Netzwerk to establish boundary-crossing “collaboration on an equal footing” and within a “culture of togetherness”. Furthermore, a path model displaying effect relationships have been tested, which further substantiate the claim of a multi-dimensional understanding of integration as it is proclaimed within the transdisciplinary discourse. In this respect, social characteristics such as *perceived trustworthiness* and *appreciation within the team* are understood to provide necessary and facilitating social conditions for epistemic processes as



mutual learning and *knowledge integration*. The latter are understood as essential features of context sensitive problem-solving. Moreover, *collective ownership of goals* is understood as a moderating characteristic, which amplifies effect relationships between *mutual learning* and *knowledge integration*.

5.1.6 E2: Assessment Patterns and Types of TDT Members with regards to DICs

Complementary to study C, study D provides further empirical insights which addresses research desideratum E2. In this regard, a mixed-methods approach has been applied to investigate in what regards TDT members assess the aspects related to DICs as successful or challenging according to their own TDT work experiences. This allowed also identifying assessment patterns constituting particular clusters of actors, which are understood to be independent of other focal context characteristics such as sex, experience in years, stakeholder group, or TDT affiliation. In addition to E1, this allows to further differentiate the proposed multi-dimensional structure of integration, which is understood to be essential for boundary-crossing collaboration.

In this regard, assessment patterns of “Indifferent Members”, “Integration Critics”, “Learning Critics”, and “Committed Learners” indicate that epistemic characteristics of *mutual learning* and *knowledge integration* predominate the overall responses. These particular responses, however, vary significantly in their direction of assessment (successful or challenging). With regards to social characteristics, *appreciation within the team* was in particular referred to as a successful aspect among both clusters highlighting critical features with regards to mutual learning or knowledge integration. In combination with high values on satisfaction with teamwork and its output, this might be interpreted in such a way, that despite certain challenges with regards to epistemic aspects, social conditions rooted in mutual appreciation allowed for productive collaboration. In contrast, the significance of *perceived trustworthiness* seems to remain behind. Due to the well-established significance of trust in the literature on boundary-crossing collaboration (Kappauf & Kolleck, 2018; Sewell et al., 2018), it is not assumed that the role of trust is categorically diminished. However, further research is needed to explore the interrelation of trust and appreciation in heterogeneous teamwork settings. Finally, the significance of *collective ownership of goals*, indicating participatory organizational arrangements, remains ambivalent with regards to different clusters. Most interestingly, however, it seems that especially “Committed Learners” consider the issue of joint responsibilities and decision-making capacities among different stakeholder groups as a challenging requirement.



Subsequently, these insights might help to further investigate certain team dynamics and potential frictions during exchange, coordination, and co-constructive processes.

5.2 *Concluding Remarks on Practical Implications*

Throughout this dissertation, a transdisciplinary approach for boundary-crossing collaboration in teacher education has been elaborated and further substantiated through various contributions on the theoretical, conceptual, and empirical level. In this regard, it has been established that transdisciplinarity offers a fruitful perspective with regards to the engagement with a particular type of challenges, which are characterized as persistent, complex and of scientific as well as societal relevance. In order to engage with these “ill-defined”, “wicked”, and “messy” problems, which are understood to be inherent to the German teacher education system, a transdisciplinary perspective has been proposed.

However, its basic implications are equally comprehensive and potentially challenging, since it contradicts prevailing structures and process logics of the contemporary teacher education system. At the heart of the call for transdisciplinary collaboration in teacher education lies a somewhat sobering realization: Complexity, ambiguity, and uncertainty which is due to overspecialization and fragmentation of teacher education will not be solvable as such without jeopardizing to lose alleged privileges and benefits of professional specialization. Moreover, none of the institutions and their affiliated stakeholder groups are capable of resolving structural inherent challenges and paradoxes in teacher education on their own. In this way, no matter how excellent the performance of certain representatives across the teacher education system might be, they will not be able to overcome challenges which call for transdisciplinary collaboration. Therefore, this dissertation proclaims that boundary-crossing collaboration becomes an inherent necessity for an effective and innovative teacher education system.

This being said, one has to realize, however, that transdisciplinarity itself does not offer an arbitrarily scalable remedy for compensating inherent limitations and shortfalls of the contemporary teacher education system. Throughout the course of this dissertation, it has been elaborated that transdisciplinarity aims to overcome disadvantages of overspecialization through the integrative engagement among relevant stakeholder groups depending on the respective challenges at the intersection of professional, disciplinary, organizational, and institutional boundaries. Integration, which aims at joint research and development, however, requires sufficient occasions, commitment to engage, as well as available temporal and financial resources. Besides structural and organizational framework conditions, such as available time



budgets and formal decision-making capacities (see article B for further discussion), process characteristics aiming at epistemic, social, and organizational features of joint teamwork have been highlighted. In particular, the in-depth engagement with regards to *mutual learning* and *knowledge integration*, have to be understood as particularly demanding, since these processes roots in social perquisites, *trust* and *appreciation*, as well as and the establishment of collective ownership.

Therefore, it appears necessary to establish a highly reflective understanding of how and to what extent the transdisciplinary approach can be realized under given circumstances and constraints. As discussed in study B in further detail, the particular logics of external funding programs, pre-existing institutional structures, and cooperative arrangements constitute focal trajectories and pre-structuring factors. Moreover, research and development efforts are subject to certain dilemmas, which again are not solvable as such but may be addressed accordingly. For instance, transdisciplinarity typically faces balancing the need for scientific credibility versus the requirement of practical relevance. This again requires on the one hand the openness for engaging in mutual learning and problem framing, while on the other hand, it is necessary for productivity, which means to focus available resources at the co-construction of advancements and innovations for learning, teaching, and teacher education.

Bearing in mind that comprehensive boundary-crossing collaborations which are constituted beyond more recently established arrangements regarding school internships, are based on limited project funding and often enough on top of pre-existing job requirements. Therefore, critical considerations are required to allocate available resources most effectively. In this way, transdisciplinary collaboration is understood as a co-constructive and thus resource intensive practice should be applied especially when conventional modes of cooperation such as mutual exchange and coordinated division of labor do not suffice. Moreover, intelligent combinations of various cooperative modes are considered reasonable to allow for effective and innovative interaction under usual conditions of limited resources and capacities.

In order to address these dilemmas, it appears necessary to encourage informed critical reflexivity among involved actors with regards to the concrete application of transdisciplinarity. In this regard, the theoretical considerations, conceptual propositions, and empirical findings discussed in subchapter 5.1 are also understood as fruitful points of reference for formative support of concrete TDTs. In combination with the introducing considerations in chapter 2, the systematization and critical revision of innovation and transfer strategies provide according to research desideratum T1 theoretically saturated arguments for transdisciplinary collaboration in



teacher education. In alignment with that, the guiding principles (P1) and the generic process model (P2) are of practical value for initiating self-reflective discussions among TDTs whether the current organizational arrangements and modes of collaboration are sufficient. Moreover, the concept of multi-dimensional DICs indicates focal process features, which could be used as inspiring reference points for discussion. However, it is reasonable to assume that these concepts cannot be applied directly, but have to be operationalized with regards to concrete teamwork requirements. The preparation of these considerations has not yet been realized with regards to practical utilization in concrete TDTs settings. Potential formats could be for example team meetings and workshop arrangements which aim in particular to establish and enact a shared understanding of transdisciplinary collaboration.

Finally, the theoretical aspiration of transdisciplinary collaboration in teacher education as an integrative mode of research and development which highlights the reflective interrelation of different bodies of knowledge and expertise across professional, disciplinary, and institutional boundaries sets high requirements with regards to potential fields of inquiry. Due to the particular setup of the Development Teams within the ZZZL-Netzwerk, their focus aimed, in particular, to address the theory-practice divide and to allow for mutual learning and joint co-construction of didactical innovation for both, university-based and school-based practice. In consequence, the disciplinary structure of the ZZZL-Network has to be considered as predominantly multi-disciplinary, in a sense that various disciplines are connected within the shared project by a shared overall project vision. Therefore, interdisciplinary features, which according to Klein's (2014) notion of "transcending of disciplinary boundaries" represent relevant aspects of transdisciplinarity remained mostly latent. The phrasing "remained mostly latent" was deliberately chosen, since there were indeed some particular characteristics regarding to, for instance, development team composition and research interests.

With regards to the author's understanding, interdisciplinary collaboration was most salient within the TDT addressing "Teaching in inclusive English Settings" by addressing scholarly and practical relevant issues and interrelating expertise related to subject matter didactics with inclusive pedagogy (Straub, Spöhrer, & Meimerstorf, 2019). Other teams such as coaching and mentoring and teacher's health, for instance, addressed similarly transversal topics, however, did not engage in particular with interdisciplinarity. Interdisciplinary engagements, however, were not their jointly set goals. Therefore, it was also not within the focus of this present dissertation. Nevertheless, interdisciplinary collaboration is still considered as a strong potential



also with regards to the ZZZ-Netzwerk, in particular with regards to a shared theoretical framing of competence orientation, which transversally comprises and underpins research and development activities related to subject matter didactics.

5.3 *Limitations and Outlook*

Despite the various contributions proposed within the present dissertation, there is also a set of limitations to be addressed which refer to theoretical aspirations, conceptual propositions, and methodological aspects.

With regards to the theoretical aspirations of transdisciplinarity, two major limitations become apparent. As outlined in the previous chapters, the focal aim of the TDTs at the ZZZ-Network referred to the joint co-construction and establishment of advancements through boundary-crossing collaboration. However, due to the setup of the TDTs interdisciplinary dynamics and characteristics remained underexposed in contrast to inter-organizational and inter-institutional requirements. Therefore, the feature of transcending disciplinary perspectives was not within the focus of this dissertation.

Moreover, the discourse of transdisciplinarity has been primarily utilized as a theoretical framework and analytic perspective in order to investigate boundary-crossing collaborations in teacher education. In contrast to that, the potentials of transdisciplinarity as a fruitful framework for formative accompanying research and development approaches were not fully utilized. In this respect, there have been several occasions in the context of focal project meetings, so-called ZZZ-Meetings (German: “ZZZ-Tage”), and with regards to the already mentioned joint publication among practitioners within the TDT “Teaching in inclusive English Settings” (Straub et al., 2019). However, these engagements have to be considered as selective engagements aimed to share and discuss preliminary findings, which in consequence allowed for some member validation. However, in contrast to a genuine understanding of transdisciplinarity as an integrative mode of research and development, the degree of deliberate participation could have been extended. The reason for this is, at least in part, founded in an initial setup of the accompanying research, which according to the requirements of the funding agency was obliged to remain independent from the research and development activities in the context of the TDTs. In consequence, despite the overall aspiration of the present dissertation to promote a transdisciplinary mode of research and development in teacher education, it followed the rather conventional logics of Mode 1 Knowledge Production.



According to the methodological level, there are further limitations to be addressed. These limitations are mainly founded within the fact that the empirical data set based solely on a cross-sectional survey design without implementing an independent control group. In addition, despite a fairly sufficient response rate of 80.5 % the effective sample size of $n = 62$ has to be considered as rather limited with regards to advanced statistical analysis. Due to the limited number of participants, it was understood to be most expedient to apply a theoretically well-informed survey, but again without having the opportunity to separately examine the factorial structure of the questionnaire. In consequence, the proclaimed effect relationships among epistemic, social, and organizational DICs have to remain preliminary.

In addition, due to the small sample size, detailed differentiation with respect to professional background and TDT affiliation was not feasible. Therefore, the applied distinction between researchers, practitioners, and students has been used theoretically reasonable aggregation in order to allow for some fundamental comparisons between these groups. However, these aggregations are understood as equally pragmatic but also simplifying, since with regards to the involved professional groups further differentiations are plausible, especially with regards to teacher trainer educators (German “Studienseminarleitungen”) or principals. Moreover, it has to be considered, that the actor group students have not been represented in all TDTs as fully participating members. Finally, due to the considerably heterogeneous and small team size ranging between 4 to 22 members, systematic comparison between TDTs and their subject-specific contexts (e.g. competence-oriented instructional design, inclusive schooling, mentoring in practical studies, and maintaining teachers’ health), yet alone multi-level analyses were not applicable. Such analyses would have offered assessments to what degree the affiliation to a certain TDT has an impact on the assessment of DICs. Finally, due to the lack of multiple data collection time points, no empirically substantiated statements could be offered with regards to potential developments throughout the course of the collaboration within the TDTs.

Finally, the dissertation’s main focus addressed collaborative features within the development teams which have been informed by the transdisciplinary discourse. In contrast, the empirical studies have not been linked to indicators located at an outcome level of teaching or teacher education, for instance, TDT members’ professional competency development. Another possibility refers to the interrelation of the assessments of TDTs cooperation with performance tests, which point at the evaluation of learning arrangements for students at university-based courses or school lessons. Therefore, further evidence-based investigations are needed which link indicators based at the TDT collaboration level (independent variables) with indicators at



the outcome level (dependent variables), for instance, TDT members' professional competency development.



References

- Akkerman, S. F., & Bakker, A. (2011). Boundary Crossing and Boundary Objects. *Review of Educational Research*, 81(2), 132–169. <https://doi.org/10.3102/0034654311404435>
- Altrichter, H., Durdel, A., & Fischer-Münnich, C. (2017). Qualitätsoffensive Lehrerbildung: Ein Blick ins Umfeld [Quality Campaign in Initial Teacher Education: A View on the Surroundings]. Retrieved from http://www.ramboll.de/~media/Files/RDE/Management-Consulting/Studien_Handreichungen/qlb_umfeldbericht_kurzf_ramboll_barrierefrei.pdf
- Altrichter, H., & Mayr, J. (2004). 2.2 Forschung in der Lehrerbildung [Research in Teacher Education]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 164–183). Bad Heilbrunn/Obb.: Klinkhardt.
- Altrichter, H., & Posch, P. (2018). *Lehrerinnen und Lehrer erforschen ihren Unterricht: Unterrichtsentwicklung und Unterrichtsevaluation durch Aktionsforschung* [Teacher Explore Their Teaching: Development and Evaluation of Teaching Through Action Research] (5., grundlegend überarbeitete Auflage). Bad Heilbrunn: Julius Klinkhardt.
- Bammer, G. (2015). Toolkits for Transdisciplinarity. *GAIA - Ecological Perspectives for Science and Society*, 24(3), 149. <https://doi.org/10.14512/gaia.24.3.2>
- Barth, M. (2015). Implementing sustainability in higher education: Learning in an age of transformation. Routledge studies in sustainable development. London, New York: Routledge. Retrieved from <https://ebookcentral.proquest.com/lib/leuphana/reader.action?docID=1818153>
- Barth, M. (2016). Kompetenzentwicklung angehender Sachunterrichtslehrkräfte zwischen disziplinärer Verortung und interdisziplinärer Herausforderung: Einlassungen aus der Sicht der Bildung für nachhaltige Entwicklung [Competency Development of Prospective Teachers for Basic Social and Science Studies Between Disciplinary Positioning and Interdisciplinary Challenges]. *Beiträge zur Lehrerinnen- und Lehrerbildung*, 34(3), 294–304.
- Baumert, J., & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften [Keyword: Professional Competence of Teachers]. *Zeitschrift für Erziehungswissenschaft*, 9(4), 469–520.
- Baumert, J., & Kunter, M. (2011). Das Kompetenzmodell von COACTIV [The Competence Model of COACTIV]. In M. Kunter, J. Baumert, & W. Blum (Eds.), *Professionelle Kompetenz von Lehrkräften: Ergebnisse des Forschungsprogramms COACTIV* (pp. 29–53). Münster: Waxmann.



- Bergmann, M., Brohmann, B., Hoffmann, E., Loibl, M. C., Rehaag, R., Schramm, E., & Voß, J.-P. (2005). *Quality Criteria of Transdisciplinary Research: A Guide for the Formative Evaluation of Research Projects*. With a Foreword by Thomas Jahn (ISOE-Studientexte No. 13). Frankfurt am Main. Retrieved from Institute for Social Ecological Research (ISOE) website: <http://www.isoe-publikationen.de/fileadmin/redaktion/ISOE-Reihen/st/st-13-isoe-2005-en.pdf>
- Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C., & Schramm, E. (2012). *Methods for Transdisciplinary Research: A Primer for Practice* (1. Aufl.). *Sozialwissenschaften 2012*. Frankfurt am Main: Campus Verlag. Retrieved from https://content-select.com/media/moz_viewer/519cc457-3eb8-4599-9999-290f5dbbeaba
- Bergmann, M., & Schramm, E. (2008). Grenzüberschreitung und Integration: Die formative Evaluation transdisziplinärer Forschung und ihre Kriterien [Boundary-Crossing and Integration: The Formative Evaluation of Transdisciplinary Research and its Criteria]. In M. Bergmann & E. Schramm (Eds.), *Transdisziplinäre Forschung: Integrative Forschungsprozesse verstehen und bewerten* (pp. 149–173). Frankfurt/Main: Campus-Verl.
- Bernstein, J. H. (2015). Transdisciplinarity: A Review of its Origins, Development, and Current Issues. *Journal of Research Practice*, *11*(1). Retrieved from <http://jrp.icaap.org/index.php/jrp/article/view/510/412>
- Blömeke, S. (2006). Struktur der Lehrerausbildung im internationalen Vergleich. Ergebnisse einer Untersuchung zu acht Ländern [Structures of Teacher Education by International Comparison. Results of a Study in Eight Countries]. *Zeitschrift für Pädagogik*, *52*(3), 393–416. Retrieved from <http://www.pedocs.de/volltexte/2011/4466/>
- Blömeke, S. (2014). Forschung zur Lehrerbildung im Internationalen Vergleich [Research in Teacher Education in International Comparison]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrerberuf* (pp. 441–467). Münster [u.a.]: Waxmann.
- BMBF (2017). New approaches to teacher training Incentives from the programme ‘Qualitätsoffensive Lehrerbildung’. Retrieved from https://www.qualitaetsoffensive-lehrerbildung.de/files/BMBF-Neue_Wege_in_der_Lehrerbildung_kurz_engl_barrierefrei.pdf
- Boer, H. de, Fahrenwald, C., & Spies, A. (2018). Professionalization in Teacher Education As an Interorganizational Learning Challenge. *Frontiers in Education*, *3*, 1–8. <https://doi.org/10.3389/feduc.2018.00004>



- Bormann, I., & John, R. (2014). Trust in the education system – thoughts on a fragile bridge into the future. *European Journal of Futures Research*, 2(1). <https://doi.org/10.1007/s40309-013-0035-0>
- Bosse, D. (2012). Zur Situation der Lehrerbildung in Deutschland [To the Situation of Teacher Education in Germany]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 11–28). Immenhausen: Prolog.
- Brewer, G. (1999). The Challenges of Interdisciplinarity. *Policy Science*, 32, 327–337.
- Broekkamp, H., & van Hout-Wolters, B. (2007). The gap between educational research and practice: A literature review, symposium, and questionnaire. *Educational Research and Evaluation*, 13(3), 203–220. <https://doi.org/10.1080/13803610701626127>
- Bromme, R. (2008). Lehrerexpertise: eine psychologische Konzeption für die Entwicklung und Erforschung des Wissens und Könnens von Lehrern [Teachers' Expertise: A Psychological Conceptualization for Development and Research on Knowledge and Skills of Teachers]. In W. Schneider, M. Hasselhorn, & J. Bengel (Eds.), *Handbuch der Psychologie: / hrsg. von J. Bengel ... ; Bd. 10. Handbuch der pädagogischen Psychologie* (pp. 159–167). Göttingen: Hogrefe.
- Bronstein, L. R. (2003). A Model for Interdisciplinary Collaboration. *Social Work*, 48(3), 297–306. <https://doi.org/10.1093/sw/48.3.297>
- Bürgener, L., & Barth, M. (2018). Sustainability competencies in teacher education: Making teacher education count in everyday school practice. *Journal of Cleaner Production*, 174, 821–826. <https://doi.org/10.1016/j.jclepro.2017.10.263>
- Carmeli, A., & Gittell, J. H. (2009). High-quality relationships, psychological safety, and learning from failures in work organizations. *Journal of Organizational Behavior*, 30(6), 709–729. <https://doi.org/10.1002/job.565>
- Checkland, P. (2000). Soft Systems Methodology: Soft Systems Methodology, a 30-Year Retrospective. *Systems Research and Behavioral Science*, 17, 11–58.
- Coburn, C. E., & Penuel, W. R. (2016). Research–Practice Partnerships in Education. *Educational Researcher*, 45(1), 48–54. <https://doi.org/10.3102/0013189X16631750>
- Costa, A. C., & Anderson, N. (2011). Measuring trust in teams: Development and validation of a multifaceted measure of formative and reflective indicators of team trust. *European Journal of Work and Organizational Psychology*, 20(1), 119–154. <https://doi.org/10.1080/13594320903272083>



- Damşa, C. I., & Ludvigsen, S. (2016). Learning through interaction and co-construction of knowledge objects in teacher education. *Learning, Culture and Social Interaction*, 11, 1–18. <https://doi.org/10.1016/j.lcsi.2016.03.001>
- Defila, R., Di Giulio, A., & Scheuermann, M. (2006). *Forschungsverbundmanagement: Handbuch für die Gestaltung inter- und transdisziplinärer Projekte* [Manual for the Design of Interdisciplinary and Transdisciplinary Projects]. Zürich: vdf Hochschulverl.
- Döbrich, P., Klemm, K., Knauss, G., & Lange, H. (2003). Attracting, Developing and Retaining Effective Teachers: Supplement to the Country Background Report for the Federal Republic of Germany. Retrieved from <http://www.oecd.org/education/school/30100518.pdf>
- Edler, J., & Kuhlmann, S. (2008). Formative Evaluation in reflexiver Forschungspolitik [Formative Evaluation in Reflexive Research Policy]. In M. Bergmann & E. Schramm (Eds.), *Transdisziplinäre Forschung: Integrative Forschungsprozesse verstehen und bewerten* (pp. 203–229). Frankfurt/Main: Campus-Verl.
- Elzinga, A. (2008). Participation. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, . . . E. Zemp (Eds.), *Handbook of Transdisciplinary Research* (pp. 345–359). Dordrecht: Springer Science + Business Media B.V.
- European Commission/EACEA/Eurydice (2015). The Teaching Profession in Europe: Practices, Perceptions, and Policies: Eurydice Report.
- Felt, U. (2009). Knowing and Living in Academic Research. In U. Felt (Ed.), *Knowing and living in academic research: Convergence and heterogeneity in research cultures in the European context* (pp. 17–39). Prague: Inst. of Sociology of the Acad. of Sciences of the Czech Republic.
- Felt, U., & Fochler, M. (2012). Re-ordering Epistemic Living Spaces: On the Tacit Governance Effects of the Public Communication of Science. In S. Rödder, M. Franzen, & P. Weingart (Eds.), *Sociology of the Sciences Yearbook: Vol. 28. The Sciences' media connection -public communication and its repercussions: Untersuchung zum reflektierten Handeln in Profession und Ehrenamt* (Vol. 28, pp. 133–154). Dordrecht: Springer Science+Business Media B.V. https://doi.org/10.1007/978-94-007-2085-5_7
- Felt, U., Igelsböck, J., Schikowitz, A., & Völker, T. (2013). Growing into what?: The (un-)disciplined socialisation of early stage researchers in transdisciplinary research. *Higher Education*, 65(4), 511–524. <https://doi.org/10.1007/s10734-012-9560-1>



- Fichten, W. (2017). Forschendes Lernen in der Lehramtsausbildung [Explorative Learning in Teacher Education]. In H. A. Mieg & J. Lehmann (Eds.), *Forschendes Lernen: Wie die Lehre in Universität und Fachhochschule erneuert werden kann* (pp. 154–164). Frankfurt, New York: Campus Verlag.
- Fraefel, U. (2018). Hybride Räume an der Schnittstelle von Hochschule und Schulfeld: Ein zukunftsweisendes Konzept der Professionalisierung von Lehrpersonen [Hybrid Spaces at the Interface of University and School. A Pioneering Concept of Professional Teacher Education]. In L. Pilypaitytė & H.-S. Siller (Eds.), *Schulpraktische Lehrerprofessionalisierung als Ort der Zusammenarbeit* (pp. 13–43). Wiesbaden: Springer VS.
- Fullan, M. (2016). *The NEW meaning of educational change* (Fifth edition). New York, London, London, New York, Toronto: Teachers College Press; Routledge; Ontario Principals' Council. Retrieved from <https://ebookcentral.proquest.com/lib/leuphana/detail.action?docID=4513498>
- Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the Post-Normal Age. *Futures*, 25(7), 739–755. [https://doi.org/10.1016/0016-3287\(93\)90022-L](https://doi.org/10.1016/0016-3287(93)90022-L)
- Fussangel, K. (2008). Subjektive Theorien von Lehrkräften zur Kooperation: Eine Analyse der Zusammenarbeit von Lehrerinnen und Lehrern in Lerngemeinschaften [Subjective Theories of Teachers on Cooperation. An Analysis of the Cooperation of Teachers in Learning Communities] (Dissertation). Bergische Universität Wuppertal, Wuppertal.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (2007). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (Reprinted.). London: Sage Publ.
- Gibbs, P. (Ed.). (2015). *Transdisciplinary Professional Learning and Practice*. Cham: Springer International Publishing.
- Godemann, J. (2008). Knowledge integration: A key challenge for transdisciplinary cooperation. *Environmental Education Research*, 14(6), 625–641. <https://doi.org/10.1080/13504620802469188>
- Gogolin, I., & Prenzel, M. (Eds.). (2010). Transfer und Transferforschung in der Erziehungswissenschaft [Transfer and Transfer Research in Educational Sciences] [Special issue]. *Erziehungswissenschaft*, 13(1). VS Verlag.
- Gorodetsky, M., & Barak, J. (2008). The Educational-Cultural Edge: A Participative Learning Environment for Co-Emergence of Personal and Institutional Growth. *Teaching and Teacher Education*, 24(7), 1907–1918. <https://doi.org/10.1016/j.tate.2008.01.006>



- Gräsel, C. (2011). Die Kooperation von Forschung und Lehrer/innen bei der Realisierung didaktischer Innovationen [The Cooperation between Researchers and Teachers in the Realization of Didactical Innovations]. In W. Einsiedler (Ed.), *Unterrichtsentwicklung und didaktische Entwicklungsforschung* (pp. 88–101). Bad Heilbrunn: Klinkhardt.
- Gräsel, C., Fussangel, K., & Pröbstel, C. (2006). Lehrkräfte zur Kooperation anregen - eine Aufgabe für Sisyphos? [Prompting Teachers to Co-Operate – A Sisyphean Task?]. *Zeitschrift für Pädagogik*, 52(2), 205–219. Retrieved from <http://www.pe-docs.de/volltexte/2011/4453/>
- Gröschner, A., Schmitt, C., & Seidel, T. (2013). Veränderung subjektiver Kompetenzeinschätzungen von Lehramtsstudierenden im Praxissemester [Changes of Subjective Competence Assessments of Teacher Students in the Practical Semester]. *Zeitschrift für pädagogische Psychologie*, 27(1-2), 77–86. <https://doi.org/10.1024/1010-0652/a000090>
- Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. W. (2009). Teaching Practice: A Cross-Professional Perspective. *Teachers College record : TCR*, 111(9), 2055–2100.
- Häberli, R., Scholz, R. W., Bill, A., & Welte, M. (Eds.). (2000). Transdisciplinarity: Joint Problem-Solving among Science, Technology and Society: I. Dialogue sessions and idea market. Zürich: Haffmanns.
- Hargreaves, A., & Shirley, D. (2009). *The fourth way: The inspiring future for educational change*. Thousand Oaks, Calif.: Corwin Press.
- Hartmann, U., & Decristan, J. (2018). Brokering activities and learning mechanisms at the boundary of educational research and school practice. *Teaching and Teacher Education*, 74, 114–124. <https://doi.org/10.1016/j.tate.2018.04.016>
- Hedtke, R. (2000). Das unstillbare Verlangen nach Praxisbezug. Zum Theorie-Praxis-Problem der Lehrerbildung am Exempel Schulpraktischer Studien [The Insatiable Desire for Practical Relevance. Relating the Theory-Practice-Problem of Teacher Education on the Example of Practical School Studies]. In H. J. Schlösser (Ed.), *Wirtschafts- und Berufspädagogische Schriften: Berufsorientierung und Arbeitsmarkt* (Vol. 21, pp. 67–91). Bergisch Gladbach: Hobein.
- Heid, H. (1989). Über die praktische Belanglosigkeit pädagogisch bedeutsamer Forschungsergebnisse: Ein Entwurf [About the Practical Triviality of Pedagogically Significant Research Results]. In E. König, P. Zedler, & U. Bracht (Eds.), *Beiträge zur Theorie und Ge-*



- schichte der Erziehungswissenschaft: Vol. 3. Rezeption und Verwendung erziehungswissenschaftlichen Wissens in pädagogischen Handlungs- und Entscheidungsfeldern* (pp. 111–124). Weinheim: Dt. Studien-Verl.
- Helsper, W. (2014). Lehrerprofessionalität: Der strukturtheoretische Professionsansatz zum Lehrberuf [Teacher Professionalism]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrberuf* (pp. 216–240). Münster [u.a.]: Waxmann.
- Hericks, U. (2004). 3.4 Verzahnung der Phasen der Lehrerbildung [3.4 Interlinking of the Phases in Teacher Education]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 301–311). Bad Heilbrunn/Obb.: Klinkhardt.
- Hirsch-Hadorn, G., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffmann-Riem, H., Joye, D., Pohl, C., . . . Zemp, E. (2008). The Emergence of Transdisciplinarity as a Form of Research. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, . . . E. Zemp (Eds.), *Handbook of Transdisciplinary Research* (pp. 19–39). Dordrecht: Springer Science + Business Media B.V.
- Hirsch-Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., . . . Zemp, E. (Eds.). (2008). *Handbook of Transdisciplinary Research*. Dordrecht: Springer Science + Business Media B.V.
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between Mainstreaming and Marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Jantsch, E. (1972). Inter- and transdisciplinary university: A systems approach to education and innovation. *Higher Education*, 1(1), 7–37. <https://doi.org/10.1007/BF01956879>
- Jimenez-Silva, M., & Olson, K. (2012). A Community of Practice in Teacher Education: Insights and Perceptions. *International Journal of Teaching and Learning in Higher Education*, 24(3), 335–348.
- Kappauf, Z., & Kolleck, N. (2018). Vertrauen im Bildungsverbund [Trust in the Educational Network]. *Zeitschrift für Erziehungswissenschaft*, 21(5), 1045–1062. <https://doi.org/10.1007/s11618-018-0812-4>
- Keiner, E. (2002). *Rezeption und Verwendung erziehungswissenschaftlichen Wissens* [Reception and Use of Educational Knowledge]. Opladen: Leske und Budrich.
- Keuffer, J., & Oelkers, J. (2001). Reform der Lehrerbildung in Hamburg: Abschlussbericht der von der Senatorin für Schule, Jugend und Berufsbildung und der Senatorin für Wissenschaft und Forschung eingesetzten Hamburger Kommission Lehrerbildung [Reform of



- Teacher Education in Hamburg. Final Report of Hamburg's Commission for Teacher Education established by the Senator for School, Youth and Vocational Training and the Senator for Science and Research.]. Weinheim: Beltz Verlag.
- Klein, J. T. (2004). Prospects for transdisciplinarity. *Futures*, 36(4), 515–526. <https://doi.org/10.1016/j.futures.2003.10.007>
- Klein, J. T. (2006). Afterword: The emergent literature on interdisciplinary and transdisciplinary research evaluation. *Research Evaluation*, 15(1), 75–80. <https://doi.org/10.3152/147154406781776011>
- Klein, J. T. (2008a). Education. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, . . . E. Zemp (Eds.), *Handbook of Transdisciplinary Research* (pp. 399–410). Dordrecht: Springer Science + Business Media B.V.
- Klein, J. T. (2008b). Integration in der inter- und transdisziplinären Forschung [Integration in Inter- and Transdisciplinary Research]. In M. Bergmann & E. Schramm (Eds.), *Transdisziplinäre Forschung: Integrative Forschungsprozesse verstehen und bewerten* (pp. 93–115). Frankfurt/Main: Campus-Verl.
- Klein, J. T. (2010). A Taxonomy of Interdisciplinarity. In R. Frodeman, J. T. Klein, C. Mitcham, & J. B. Holbrook (Eds.), *The Oxford handbook of interdisciplinarity* (1st ed., pp. 15–30). Oxford: Oxford Univ. Press.
- Klein, J. T. (2014). Discourses of Transdisciplinarity: Looking Back to the Future. *Futures*, 63, 68–74. <https://doi.org/10.1016/j.futures.2014.08.008>
- Kleemann, K., Jennek, J., & Vock, M. (Eds.). (2019). *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* [Supporting Cooperation of University and School: Strengthen Schools, Improve Teacher Education] (1. Auflage). Leverkusen: Verlag Barbara Budrich.
- Klieme, E., Funke, J., Leuner, D., Reimann, P., & Wirth, J. (2001). Problemlösen als fächerübergreifende Kompetenz.: Konzeption und erste Resultate aus einer Schulleistungsstudie [Problem-Solving as a Transversal Competence]. *Zeitschrift für Pädagogik*, 47(2), 179–200.
- Klieme, E., Tenorth, H.-E., Vollmer, H. J., Gruber, H., Döbrich, P., Blum, W., . . . Prenzel, M. (2007). Zur Entwicklung nationaler Bildungsstandards: Eine Expertise [On the Development of National Educational Standards. An Expertise.]. Retrieved from https://www.bmbf.de/pub/Bildungsforschung_Band_1.pdf



- Knüppel, A. (2014). *Praxisphasen in der Lehrerbildung: Wie aus Vorbehalten Zusammenarbeit werden kann* [Practical Phases in Teacher Education. How Reservations Can Turn Into Cooperation]. *Theorie und Praxis der Schulpädagogik: Vol. 26*. Immenhausen bei Kassel: Prolog-Verl.
- Kockelmans, J. J. (1979). Why Interdisciplinarity. In J. J. Kockelmans (Ed.), *Interdisciplinarity and higher education* (pp. 123–160). University Park: Pennsylvania State Univ. Press.
- Kolbe, F.-U. (2004). Verhältnis von Wissen und Handeln [Relationship of Knowledge and Action]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 206–232). Bad Heilbrunn/Obb.: Klinkhardt.
- Korthagen, F. (2007). The gap between research and practice revisited. *Educational Research and Evaluation, 13*(3), 303–310. <https://doi.org/10.1080/13803610701640235>
- Korthagen, F. (2016). Inconvenient truths about teacher learning: Towards professional development 3.0. *Teachers and Teaching, 1*–19. <https://doi.org/10.1080/13540602.2016.1211523>
- Krauss, S., & Bruckmaier, G. (2014). Das Experten-Paradigma in der Forschung zum Lehrerberuf [The Expert Paradigm in Research of Teaching Profession]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrerberuf* (241-261). Münster [u.a.]: Waxmann.
- Krauss, S., Lindl, A., Schilcher, A., Fricke, M., Göhring, A., Hofmann, B., . . . Baumert, J. (Eds.). (2017). FALKO Fachspezifische Lehrerkompetenzen: Konzeption von Professionswissenstests in den Fächern Deutsch, Englisch, Latein, Physik, Musik, Evangelische Religion und Pädagogik ; mit neuen Daten aus der COACTIV-Studie [FALKO Subject-Specific Teacher Skills. Conception of Professional Knowledge Tests in German, English, Latin, Physics, Music, Protestant Religion and Pedagogy; With New Data from the COACTIV Study]. Münster, New York: Waxmann.
- Krauss, S., Lindl, A., Schilcher, A., & Tepner, O. (2017). Das Forschungsprojekt FALKO: ein einleitender Überblick [The Research Project FALKO. An Introductory Overview.]. In S. Krauss, A. Lindl, A. Schilcher, M. Fricke, A. Göhring, B. Hofmann, . . . J. Baumert (Eds.), *FALKO Fachspezifische Lehrerkompetenzen: Konzeption von Professionswissenstests in den Fächern Deutsch, Englisch, Latein, Physik, Musik, Evangelische Religion und Pädagogik; mit neuen Daten aus der COACTIV-Studie* (pp. 13–65). Münster, New York: Waxmann.



- Kuckartz, U. (2016). *Qualitative Inhaltsanalyse: Methoden, Praxis, Computerunterstützung* [Qualitative Content Analysis: Methods, Practice, Computational Support] (3., überarbeitete Auflage). *Grundlagentexte Methoden*. Weinheim: Beltz Juventa.
- Kuhn, T. S. (2009). *The structure of scientific revolutions* (3. ed., [Nachdr.]). Chicago: Univ. of Chicago Press.
- KMK (1997). *Grundsätzliche Überlegungen zu Leistungsvergleichen innerhalb der Bundesrepublik Deutschland: - Konstanzer Beschluss -* [Fundamental Considerations on Performance Comparisons within the Federal Republic of Germany. Convention of Constance.]. Retrieved from https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/1997/1997_10_24-Konstanzer-Beschluss.pdf
- KMK (2005). Eckpunkte für die gegenseitige Anerkennung von Bachelor- und Masterabschlüssen in Studiengängen, mit denen die Bildungsvoraussetzungen für ein Lehramt vermittelt werden [Key Issues of the Mutual Recognition of Bachelor and Master Degree Programmes in Courses of Study that are intended to convey the Educational Prerequisites of Teaching]. Retrieved from http://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2005/2005_06_02-Bachelor-Master-Lehramt.pdf
- KMK (2006). *Gesamtstrategie der Kultusministerkonferenz zum Bildungsmonitoring* [Overall Strategy of the Conference of Education Ministers for Educational Monitoring]. Retrieved from https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/Beschluesse_Veroeffentlichungen/Bildungsmonitoring_Broschuere_Endf.pdf
- KMK (2014). Standards für die Lehrerbildung: Bildungswissenschaften: Beschluss der Kultusministerkonferenz vom 16.12.2014 [Standards for Teacher Education]. Retrieved from http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2004/2004_12_16-Standards-Lehrerbildung.pdf
- KMK (2016). *Gesamtstrategie der Kultusministerkonferenz zum Bildungsmonitoring* [Overall Strategy of the Conference of Education Ministers for Educational Monitoring]. Retrieved from http://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2015/2015_06_11-Gesamtstrategie-Bildungsmonitoring.pdf
- KMK (2017). Sachstand in der Lehrerbildung [Current Situation in Teacher Education]. Retrieved from https://www.kmk.org/fileadmin/Dateien/pdf/Bildung/AllgBildung/2017-03-07__Sachstand_LB_o_EW.pdf
- Künzli David, C., Gysin, S., & Bertschy, F. (2016). Sachunterricht als inter- und transdisziplinär konstituiertes Fach: Ansprüche an die Unterrichtsgestaltung und Überlegungen im



- Hinblick auf die Lehrerinnen- und Lehrerbildung [‘Sachunterricht‘ as an Inter- and Transdisciplinary Constituted Subject. Aspirations towards the Teaching Design and Considerations Regarding Teacher Education.]. *Beiträge zur Lehrerinnen- und Lehrerbildung*, 34(3), 305–316.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., . . . Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Lave, J., & Wenger, E. (2011). *Situated Learning: Legitimate Peripheral Participation* (Reprint). *Learning in doing*. Cambridge: Cambridge Univ. Press.
- Lawrence, R. J., & Després, C. (2004). Futures of Transdisciplinarity. *Futures*, 36(4), 397–405. <https://doi.org/10.1016/j.futures.2003.10.005>
- Lenhard, H. (2004). 3.2 Zweite Phase an Studienseminaren und Schulen [Second Phase at Teacher Training Colleges and Schools]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 275–290). Bad Heilbrunn/Obb.: Klinkhardt.
- Levy, F., & Murnane, R. H. (2003). The Skill Content of Recent Technological Change: An Empirical Exploration. *The Quarterly Journal of Economics*, 118(4), 1279–1333. Retrieved from <https://www.jstor.org/stable/25053940>
- Makrinus, L. (2013). *Der Wunsch nach mehr Praxis: Zur Bedeutung von Praxisphasen im Lehramtsstudium* [The Desire for More Practice. On the Relevance of Practice Phases in Teacher Education.]. *Studien zur Schul- und Bildungsforschung: Vol. 49*. Wiesbaden: Springer.
- Merkens, H. (Ed.). (2005). *Schriftenreihe der DGfE. Lehrerbildung: Zentren für Lehrerbildung* [Teacher Education: Teacher Education Centers]. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Messner, H. (2012). Leitlinien einer phasenübergreifenden Professionalisierung der Lehrerbildung [Guidelines of a Cross-Phased Professionalisation of Teacher Education]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 63–92). Immenhausen: Prolog.
- Mitchell, C., Cordell, D., & Fam, D. (2015). Beginning at the End: The Outcome Spaces Framework to Guide Purposive Transdisciplinary Research. *Futures*, 65, 86–96. <https://doi.org/10.1016/j.futures.2014.10.007>



- Mittelstraß, J. (2005). Methodische Transdisziplinarität [Methodical Transdisciplinarity]. *Technikfolgenabschätzung*, 18–23.
- Mittelstraß, J. (2011). ON TRANSDISCIPLINARITY. *Trames. Journal of the Humanities and Social Sciences*, 15(4), 329. <https://doi.org/10.3176/tr.2011.4.01>
- MIWFT (2007). Ausbildung von Lehrerinnen und Lehrern in Nordrhein-Westfalen: Empfehlungen der Expertenkommission zur Ersten Phase [Teachers' Training in North Rhine-Westphalia. Recommendations of the Expert Commission on the First Phase.]. Retrieved from http://www.aqas.de/downloads/Lehrerbildung/Bericht_Baumert-Kommission.pdf
- Monitor Lehrerbildung (2017). Thema Klare Verantwortungsstrukturen [Topic: Clear Responsibility Structures]. Retrieved from http://www.monitor-lehrerbildung.de/web/thema/klare-verantwortungsstrukturen#hsfrage52_0
- Müller, K. (2010). *Das Praxisjahr in der Lehrerbildung* [The Practice Year in Teacher Education.]. *Klinkhardt Forschung*. Bad Heilbrunn: Klinkhardt.
- Nagel, U., & Affolter, C. (2004). Umweltbildung und Bildung für eine nachhaltige Entwicklung: Von der Wissensvermittlung zur Kompetenzförderung [Environmental Education and Education for Sustainable Development. From Knowledge Transfer to Competence Development.]. *Beiträge zur Lehrerinnen- und Lehrerbildung*, 22(1), 95–105.
- Neuhauser, L., & Pohl, C. (2015). Integrating Transdisciplinarity and Translational Concepts and Methods into Graduate Education. In P. Gibbs (Ed.), *Transdisciplinary Professional Learning and Practice* (pp. 99–120). Cham: Springer International Publishing.
- Neuweg, G. H. (2011). Distanz und Einlassung. Skeptische Anmerkungen zum Ideal einer „Theorie-Praxis-Integration“ in der Lehrerbildung [Distance and Admission. Skeptical Comments on the Ideal of “Theory-Practice Integration” in Teacher Education.]. *Erziehungswissenschaft*, 22(43), 33–45. Retrieved from <http://www.pedocs.de/volltexte/2012/5430/>
- Neuweg, G. H. (2014). Das Wissen der Wissensvermittler: Problemstellungen, Befunde und Perspektiven der Forschung zum Lehrerwissen [The Knowledge of Knowledge Mediators. Problems, Findings and Perspectives of Research on Teacher Knowledge.]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrerberuf* (pp. 583–614). Münster [u.a.]: Waxmann.
- Neuweg, G. H. (2015). *Das Schweigen der Könner: Gesammelte Schriften zum impliziten Wissen* [The Silence of the Experts. Collected Writings on Tacit Knowledge]. Münster: Waxmann.



- Nickolaus, R., Abel, M., & Gräsel, C. (Eds.). (2006). *Innovation und Transfer: Expertisen zur Transferforschung* [Innovation and Transfer: Expertise in Transfer Sciences]. Baltmannsweiler: Schneider-Verl. Hohengehren.
- Nowotny, H. (2003). Dilemma of expertise: Democratizing expertise and socially robust knowledge. *Science and Public Policy*, 30(3), 151–156. <https://doi.org/10.3152/147154303781780461>
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty* (1. Aufl.). Cambridge: Polity Press.
- OECD (2003). Attracting, Developing and Retaining Effective Teachers: OECD Activity, Country Background Report for the Federal Republic of Germany.
- Oevermann, U. (1997). Theoretische Skizze einer revidierten Theorie professionellen Handelns. [Theoretical Sketch of a Revised Theory of Professional Action.]. In A. Combe & W. Helsper (Eds.), *Suhrkamp-Taschenbuch Wissenschaft: Vol. 1230. Pädagogische Professionalität: Untersuchungen zum Typus pädagogischen Handelns* (2nd ed., pp. 70–182). Frankfurt am Main: Suhrkamp.
- Oser, F. (2013). “I KNOW HOW TO DO IT, BUT I CAN’T DO IT”: Modeling Competence Profiles for Future Teachers and Trainers. In S. Blömeke, O. Zlatkin-Troitschanskaia, C. Kuhn, & J. Fege (Eds.), *Professional and Vet Learning: Vol. 1. Modeling and Measuring Competencies in Higher Education: Tasks and Challenges* (pp. 45–59). Rotterdam, Boston, Taipei: SensePublishers.
- Palaiologou, I. (2010). The death of a discipline or the birth of a transdiscipline: subverting questions of disciplinarity within Education Studies undergraduate courses. *Educational Studies*, 36(3), 269–282. <https://doi.org/10.1080/03055690903220180>
- Patry, J.-L. (2005). Zum Problem der Theoriefeindlichkeit der Praktiker [On the Problem of the Practitioners’ Antipathy towards Theorizing]. In H. Heid (Ed.), *Verwertbarkeit: Ein Qualitätskriterium (erziehungs-)wissenschaftlichen Wissens?* (1st ed., pp. 143–161). Wiesbaden: VS Verl. für Sozialwiss.
- Penuel, W. R., Allen, A.-R., Coburn, C. E., & Farrell, C. (2015). Conceptualizing Research–Practice Partnerships as Joint Work at Boundaries. *Journal of Education for Students Placed at Risk (JESPAR)*, 20(1-2), 182–197. <https://doi.org/10.1080/10824669.2014.988334>



- Piaget, J. (1972). Interdisciplinarity: Problems of Teaching and Research in Universities. In L. Apostel, G. Berger, & G. Michaud (Eds.), *OECD Publications: Vol. 29569. Interdisciplinarity: Problems of teaching and research in universities ; this report is based on the results of a Seminar on Interdisciplinarity in Universities, Nice <France>, 7. - 12.9.1970* (pp. 127–139). Paris: OECD.
- Pilypaitytė, L., & Siller, H.-S. (Eds.). (2018). *Schulpraktische Lehrerprofessionalisierung als Ort der Zusammenarbeit* [School Practical Professional Teacher Education as a Space of Cooperation]. Wiesbaden: Springer VS. <https://doi.org/10.1007/978-3-658-17086-8>
- Ping, C., Schellings, G., & Beijaard, D. (2018). Teacher educators' professional learning: A literature review. *Teaching and Teacher Education*, 75, 93–104. <https://doi.org/10.1016/j.tate.2018.06.003>
- Pohl, C., & Hirsch Hadorn, G. (2007). *Principles for designing transdisciplinary research*. Munich: Oekom Verlag.
- Pohl, C., van Kerkhoff, L., Hirsch Hadorn, G., & Bammer, G. (2008). Integration. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, . . . E. Zemp (Eds.), *Handbook of Transdisciplinary Research* (pp. 411–424). Dordrecht: Springer Science + Business Media B.V.
- Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, 29(1), 4–15.
- Radtke, F.-O. (2004). Der Eigensinn pädagogischer Professionalität jenseits von Innovationshoffnungen und Effizienzerwartungen: Übergangene Einsichten aus der Wissensverwendungsforschung für die Organisation der universitären Lehrerbildung [The Stubbornness of Educational Professionalism Beyond Innovation Aspirations and Efficiency Expectations]. In B. Koch-Priewe, F.-U. Kolbe, & J. Wildt (Eds.), *Grundlagenforschung und mikrodidaktische Reformansätze zur Lehrerbildung* (pp. 99–149). Bad Heilbrunn/Obb.: Klinkhardt.
- Reusser, K. (2005). Problemorientiertes Lernen: Tiefenstrukturen, Gestaltungsformen, Wirkung [Problem-Oriented Learning. Deep structures, Design Forms, Impact.]. *Beiträge zur Lehrerbildung*, 23(2), 159–182.
- Richter, D., & Pant, H. A. (2016). Lehrerkooperation in Deutschland: Eine Studie zu kooperativen Arbeitsbeziehungen bei Lehrkräften in der Sekundarstufe I [Teacher Cooperation in Germany. A Study on Cooperative Work Relationships of Teachers in Secondary



- School.]. Retrieved from https://www.telekom-stiftung.de/sites/default/files/files/media/publications/studie_lehrerkooperation_in_deutschland_1.pdf
- Rothland, M. (2020). Legenden der Lehrerbildung: Zur Diskussion einheitstiftender Vermittlung von “Theorie” und “Praxis” im Studium [Legends of Teacher Education: For the Discussion of Unifying Interrelation of “Theory” and “Practice”]. *Zeitschrift für Pädagogik*, 66(2).
- Rothland, M., & Biederbeck, I. (Eds.). (2018). *Praxisphasen in der Lehrerbildung – Beiträge der Siegener Sommerakademie 2016* [Practice Phases in Teacher Education - Contributions of the Summer Academy in Siegen 2016]. Münster: Waxmann.
- Rürup, M., & Bormann, I. (Eds.). (2013). *Educational governance: Vol. 21. Innovationen im Bildungswesen: Analytische Zugänge und empirische Befunde* [Innovations in Education. Analytical Approaches and Empirical Findings.]. Wiesbaden: Springer VS. Retrieved from <http://dx.doi.org/10.1007/978-3-531-19701-2>
- Scharnberg, S. (2019). Entwicklungsteam Mathematik der Leuphana Universität Lüneburg [Development Teams of Mathematics at the Leuphana University of Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (1st ed., pp. 163–182). Leverkusen: Verlag Barbara Budrich.
- Scholz, R. W. (2001). The Mutual Learning Sessions. In J. T. Klein, R. Häberli, R. W. Scholz, W. Grossenbacher-Mansuy, A. Bill, & M. Welti (Eds.), *Schwerpunktprogramm Umwelt / Programme Prioritaire Environnement / Priority Programme Environment. Transdisciplinarity: Joint Problem Solving among Science, Technology, and Society: An Effective Way for Managing Complexity* (pp. 117–129). Basel: Birkhäuser Basel. https://doi.org/10.1007/978-3-0348-8419-8_11
- Scholz, R. W. (2017). The Normative Dimension in Transdisciplinarity, Transition Management, and Transformation Sciences: New Roles of Science and Universities in Sustainable Transitioning. *Sustainability*, 9(6), 991. <https://doi.org/10.3390/su9060991>
- Scholz, R. W., Häberli, R., Bill, A., & Welti, M. (Eds.). (2000). *Transdisciplinarity: Joint Problem-Solving among Science, Technology and Society: II. Mutual learning sessions*. Zürich: Haffmanns.
- Scholz, R. W., Spoerri, A., & Lang, D. J. (2009). Problem structuring for transitions: The case of Swiss waste management. *Futures*, 41(3), 171–181. <https://doi.org/10.1016/j.futures.2008.09.013>



- Scholz, R. W., & Steiner, G. (2015). The real type and ideal type of transdisciplinary processes: Part I—theoretical foundations. *Sustainability Science*, *10*(4), 527–544. <https://doi.org/10.1007/s11625-015-0326-4>
- Schüssler, R., Keuffer, J., Günnewig, & Scharlau, I. (2012). “Praxis nach Rezept?” - Subjektive Theorien von Lehramtsstudierenden zu Praxisbezug und Professionalität [”Practice by Following a Recipe?” - Subjective Theories of Teaching Students on Practical Relevance and Professionalism.]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 141–164). Immenhausen: Prolog.
- Sewell, A., Cody, T.-L., Weir, K., & Hansen, S. (2018). Innovations at the boundary: An exploratory case study of a New Zealand school-university partnership in initial teacher education. *Asia-Pacific Journal of Teacher Education*, *46*(4), 321–339. <https://doi.org/10.1080/1359866X.2017.1402294>
- Shulman, L. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review*, *57*(1), 1–23. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Sim, C. (2006). Preparing for Professional Experiences – Incorporating Pre-Service Teachers as “Community of Practice”. *Teaching and Teacher Education*, *22*(1), 76–83.
- Spieß, E. (2004). Kooperation und Konflikt [Cooperation and Conflict]. In H. Schuler, N. Birbaumer, & C. F. Graumann (Eds.), *Enzyklopädie der Psychologie Praxisgebiete Wirtschafts-, Organisations- und Arbeitspsychologie: ; Bd. 4. Organisationspsychologie - Gruppe und Organisation* (pp. 193–250). Göttingen: Hogrefe Verl. für Psychologie.
- Stadelmann, M. (2006). Differenz oder Vermittlung in der Lehrerbildung?: Das Verhältnis von Theorie und Praxis im Urteil von Praktikumslehrpersonen der Primar- und Sekundarstufe I [Difference or Mediation in Teacher Education?: The Relationship between Theory and Practice in the Judgment of Primary and Secondary Teachers in the Practical Training] (1. Aufl.). *Schulpädagogik - Fachdidaktik - Lehrerbildung: Vol. 13*. Bern: Haupt.
- Steinert, B., Klieme, E., & Maag Merki, K. (2006). Lehrerkooperation in der Schule. Konzeption, Erfassung, Ergebnisse: Paralleltitel: Teacher co-operation in school. Conception, recording, results. *Zeitschrift für Pädagogik*, *52*(2), 185–204. Retrieved from <http://www.pedocs.de/volltexte/2011/4452>
- Steinert, B., & Maag Merki, K. (2009). Kooperation zwischen Lehrpersonen und Schulen. Empirische Analysen und offene Forschungsfragen [Cooperation between Teachers and



- Schools. Empirical Analysis and Open Research Questions.]. *Beiträge zur Lehrerbildung*, 27(3), 395–403.
- Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP) [Development and Validation of a Scale to Identify Problems of Knowledge Integration in Interdisciplinary Project Teams]. *Zeitschrift für Arbeits- und Organisationspsychologie A&O*, 53(3), 121–130. <https://doi.org/10.1026/0932-4089.53.3.121>
- Stokols, D. (2006). Toward a science of transdisciplinary action research. *American Journal of Community Psychology*, 38(1-2), 63–77. <https://doi.org/10.1007/s10464-006-9060-5>
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional Learning Communities: A Review of the Literature. *Journal of Educational Change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>
- Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZZ-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZZ-Network, Leuphana University of Lüneburg]. In J. Jennek, K. Kleemann, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (1st ed., pp. 57–82). Leverkusen: Verlag Barbara Budrich.
- Straub, R., Spöhrer, S., & Meimerstorf, L. (2019). Disziplinen- und phasenübergreifende Kooperation für die Lehrkräftebildung fruchtbar machen: Einsichten aus dem Entwicklungsteam TIES im Kontext inklusiven Englischunterrichts [How To Make Disciplinary and Inter-Phase Cooperation Fruitful for Teacher Training. Insights from the Development Team TIES in the Context of Inclusive English Lessons]. In C. Blume, D. Gerlach, N. Benitt, S. Eßer, B. Roters, J. Springob, & T. Schmidt (Eds.), *Perspektiven inklusiven Englischunterrichts: Gemeinsam lehren und lernen*. Retrieved from <https://inklusive-englischunterricht.de/2019/08/disziplinen-und-phasenuebergreifende-kooperation-fuer-die-lehrkraeftebildung-fruchtbar-machen/>
- Terhart, E. (2000). Perspektiven der Lehrerbildung in Deutschland: Abschlussbericht der von der Kultusministerkonferenz eingesetzten Kommission [Perspectives of Teacher Education in Germany. Final Report of the KMK's Commission]. Beltz Pädagogik. Weinheim: Beltz.
- Terhart, E. (2004). 1.2 Struktur und Organisation der Lehrerbildung in Deutschland [1.2 Structure and Organisation of Teacher Education in Germany]. In S. Blömeke, P. Reinhold, G.



- Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 37–59). Bad Heilbrunn/Obb.: Klinkhardt.
- Terhart, E. (2005). Zentren für Lehrerbildung: systematische Probleme, institutionelle Widersprüche, praktische Schwierigkeiten [Centers for Teacher Education: Systematic Problems, Institutional Contradictions, Practical Difficulties.]. In H. Merckens (Ed.), *Schriftenreihe der DGfE. Lehrerbildung: Zentren für Lehrerbildung* (pp. 15–31). Wiesbaden: VS Verlag für Sozialwissenschaften.
- Terhart, E. (2012). „Bildungswissenschaften“. Verlegenheitslösung, Sammeldisziplin, Kampfbegriff [“Educational Science“]. *Zeitschrift für Pädagogik*, 58(1), 22–39.
- Trumpp, S., Franz, E.-K., & Greiten, S. (2016). Forschungsbefunde zur Kooperation von Lehrkräften: Ein narratives Review [Research Findings on the Cooperation of Teachers. A Narrative Review.]. *Die deutsche Schule*, 108(1), 80–92.
- Tulowitzki, P., Krüger, M., & Roller, M. (2018). Education Policies, the Teaching Profession and Teacher Training in Germany—The Ever-Evolving 16-Piece Mosaic. In R. Normand, M. Liu, L. M. Carvalho, D. A. Oliveira, & L. LeVasseur (Eds.), *Education Policies and the Restructuring of the Educational Profession: Global and Comparative Perspectives* (pp. 71–87). Singapore: Springer Singapore. https://doi.org/10.1007/978-981-10-8279-5_6
- Unger, H. v. (2014). *Partizipative Forschung: Einführung in die Forschungspraxis* [Participatory Research. Introduction to Research Practice.]. *Lehrbuch*. Wiesbaden: Springer VS.
- Välimaa, J., & Hoffman, D. (2008). Knowledge society discourse and higher education. *Higher Education*, 56(3), 265–285. <https://doi.org/10.1007/s10734-008-9123-7>
- Van den Berg, N. (2016). *Boundary Practices: Educators and researchers in development*. Wageningen: Stoas Wageningen.
- Van den Bossche, P., Gijsselaers, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>
- Vanderlinde, R., & van Braak, J. (2010). The gap between educational research and practice: Views of teachers, school leaders, intermediaries and researchers. *British Educational Research Journal*, 36(2), 299–316. <https://doi.org/10.1080/01411920902919257>
- Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education*, 24(1), 80–91. <https://doi.org/10.1016/j.tate.2007.01.004>



- Villiger, C. (2015). Lehrer(innen)bildung zwischen Theorie und Praxis: Erörterungen zu einer ungelösten Problematik.: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung [Teacher Education between Theory and Practice: Elaboration on an Unsolved Problem.]. In C. Villiger & U. Trautwein (Eds.), *Zwischen Theorie und Praxis: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung* (pp. 9–17). Münster [u.a.]: Waxmann.
- Villiger, C., & Trautwein, U. (Eds.). (2015). *Zwischen Theorie und Praxis: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung* [Inbetween Theory and Practice. Demands and Possibilities in Teacher Education]. Münster [u.a.]: Waxmann.
- Vilsmaier, U., Engbers, M., Luthardt, P., Maas-Deipenbrock, R. M., Wunderlich, S., & Scholz, R. W. (2015). Case-based Mutual Learning Sessions: Knowledge integration and transfer in transdisciplinary processes. *Sustainability Science*, *10*(4), 563–580. <https://doi.org/10.1007/s11625-015-0335-3>
- Vilsmaier, U., & Lang, D. J. (2014). Transdisziplinäre Forschung. In H. Heinrichs & G. Michelsen (Eds.), *Nachhaltigkeitswissenschaften* (pp. 87–113). Berlin, Heidelberg: Springer Spektrum. https://doi.org/10.1007/978-3-642-25112-2_3
- Weick, K. E. (1976). Educational Organizations as Loosely Coupled Systems. *Administrative Science Quarterly*, *21*(1), 1–19. <https://doi.org/10.2307/2391875>
- Weyland, U. (2012). Expertise zu den Praxisphasen in der Lehrerbildung in den Bundesländern [Expertise in Practical Phases of the Teacher Education in all States]. Retrieved from <https://li.hamburg.de/contentblob/3305538/70560ef5e16d6de60d5d7d159b73322f/data/pdf-studie-praxisphasen-in-der-lehrerbildung.pdf;jsessionid=45499CC1240EB3EB38027EE816A1DBFA.liveWorker2>
- Wissenschaftsrat. (2001). *Empfehlungen zur künftigen Struktur der Lehrerbildung* [Recommendations on Future Structures of the Teacher Education.]. Bonn: Wissenschaftsrat.
- Wissenschaftsrat. (2008). *Empfehlungen zur Qualitätsverbesserung von Lehre und Studium* [Recommendations on the Quality Improvement of Teaching and Studying.]. Bonn: Wissenschaftsrat.
- Zeichner, K. (2010). Rethinking the Connections Between Campus Courses and Field Experiences in College- and University-Based Teacher Education. *Journal of Teacher Education*, *61*(1-2), 89–99. <https://doi.org/10.1177/0022487109347671>
- ZZL-Netzwerk (2018). Zwischenbilanz 2018 - ZZL-Netzwerk [Interim Results]. Retrieved from https://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/zzl/files/ZZL/Zwischenbilanz_2018_ZZL-Netzwerk_30.08.2018.pdf



Appendices

Appendix I: Study A - Pathways to Educational Change Revisited

Appendix II: Study B - Guiding Principles for Transdisciplinary Development Teams

Appendix III: Study C - Transdisciplinary Integration in Teacher Education

Appendix IV: Study D - Boundary-Crossing Collaboration as Socio-Organizational Innovation

Appendix V: Scale Documentation

Appendix VI: Coding Scheme



Appendix I: Study A - Pathways to Educational Change Revisited

Straub, R. & Vilsmaier, U. (2020). Pathways to educational change revisited – controversies and advances in the German teacher education system. *Teaching and Teacher Education*, 96, 1–13. <https://doi.org/10.1016/j.tate.2020.103140>

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Pathways to educational change revisited— controversies and advances in the German teacher education system

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HIGHLIGHTS

- Innovation and transfer are imperative for a future-oriented teaching profession.
- Top-down approaches lack transformative momentum due to insufficient adaptability.
- Bottom-up approaches lack scientific rigor and scalability.
- Transdisciplinary collaboration fosters mutual learning and integration.
- This allows for systemic change in academic teacher education and school practice.

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ABSTRACT

This article contributes to the discourse of innovation and transfer strategies in German teacher education by (1) providing a conceptual analysis of prevalent approaches and (2) introducing a transdisciplinary perspective. The conceptual analysis indicates that top-down and bottom-up approaches lack either transformative momentum or scientific rigor. Collaborative approaches aim to mitigate this dilemma, but remain biased towards unidirectional innovation and transfer processes. In contrast, transdisciplinary approaches advocate for integrative and systemic pathways for educational change, which interlinks research and practice in teaching and teacher education. Illustrating examples from a boundary-crossing research and development project support this perspective.

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1. Introduction

Educational change in teacher education refers to the capacity to initiate, establish and diffuse advancements in the educational and pedagogical field (Fullan, 2016). Moreover, educational change is linked to a wide spectrum of pathways, which are located between interventionist top-down strategies and self-reliant grassroots initiatives (Hargreaves & Shirley, 2009). Inspired by the contributions and advancements in the Anglo-American sphere (inter alia Coburn & Penuel, 2016; Snyder, Bolin, & Zumwalt, 1992; Zeichner, 2010), collaborative approaches have gained increasing

momentum in the German teacher education discourse (Boer, Fahrenwald, & Spies, 2018; Kleemann, Jennek, & Vock, 2019).

However, despite the increasing acknowledgment and factual establishment of boundary-crossing approaches, a closer look reveals a much more ambivalent picture. The German teacher education system is still characterized by a three-phased and institutionally fragmented structure (Blömeke, 2006), which does not only further enhance the theory-practice gap inherent to the teaching profession (Dewey, 1904), but is also a major obstacle for innovation development and transfer (Gräsel, 2010). Thus, further advancements are needed to foster more integrative and systemic pathways to educational change.

To contribute to this vibrant discourse, the present article provides a) a systematization and conceptual analysis of the prevalent innovation and transfer approaches (namely top-down, bottom-up and collaborative), with particular consideration of the German

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teacher education context. Based on the resulting research desiderata, the article offers b) conceptual proposals informed by the discourse of transdisciplinarity. Transdisciplinarity is an integrative mode of research and development that promotes boundary-crossing collaboration among actors with various professional, organizational and institutional backgrounds to generate academic knowledge and practical solutions (Hirsch Hadorn et al., 2008; Klein, 2014). To substantiate these conceptual considerations, illustrative examples from a boundary-crossing research and development project in Germany will be discussed.

2. Research context: trends and frictions in teacher education in Germany

The following outline focuses on the institutional structure of the German teacher education system, the overarching reform agendas and the trends in educational governance, which are understood as principal boundary conditions for educational change in teacher education.

The German teacher education system is characterized by a three-phased consecutive model comprising academic studies at universities, pre-service teacher training at teacher training colleges and schools, and advanced training during the professional career (Hericks, 2004). In addition, this model is embedded in a complex multilayered governance structure (OECD, 2003). Therefore, German teacher education is described as highly functionally specialized, but also as loosely coupled or even disciplinary and institutionally fragmented by international comparisons (Blömeke, 2006; Messner, 2012).

Around the year 2000, disillusioning results in international large-scale student assessments¹ led to comprehensive debates about the capabilities and shortcomings of the current school system and teacher education, which is commonly subsumed under the notion “PISA shock” (Raidt, 2010). During the past two decades, these ongoing debates have been a major driving force for far-reaching reform agendas enacted by the Standing Conference of the Ministers of Education and Cultural Affairs (KMK).² One example is the introduction of compulsory and unifying educational standards aimed at the better alignment and coherence of the teacher education system (KMK, 2014). Other reforms address the expansion and better integration of practical studies during the first phase of teacher education (Weyland, 2012), or foster coordination and cooperation among teacher educating facilities by establishing centers for teacher education and schools of education (Messner, 2012).

Moreover, the “PISA shock” has been identified as a landmark “empirical turn” in educational science and a paradigm shift in educational policy towards “output control” and “evidence-based governance” (Halbheer & Reusser, 2008). Until the late 1990s, the dominant governance policies referred to loosely coupled mechanisms of “input control” through school authorities and relatively autonomous and self-reliant school development (Altrichter, 2015). While input control refers to the specification of curricula, and thus what pupils should learn about, output control focuses on the skills and abilities that pupils should achieve (KMK, 2016). Since the enactment of educational standards by the KMK in the early 2000s, schools are formally bound to match competence-oriented

requirements (KMK, 2014).

However, in addition to these reforms, a multitude of regional and local model projects involving researchers and practitioners alike have been facilitated too (Nickolaus, Abel, & Gräsel, 2006). More recently, a nationwide funding program called the “Teacher Training Quality Campaign” (Qualitätsoffensive Lehrerbildung) was launched by the Federal Ministry for Education and Research (BMBF). Over two funding phases, the program facilitates 59 teacher educating universities with 500 million euros in total. Overarching issues include, for instance, the increase of the practical orientation, the enhancement of school internships and the development of professional advisory services (BMBF, 2017).

3. Research aims and analytical procedure

Against the backdrop of a multilayered, three-phased educational system, the aim of this paper is twofold. First, this paper provides a conceptual analysis of the prevalent innovation and transfer strategies, namely the top-down, bottom-up and collaborative approaches, which allows for analyzing the given approaches and creates visibility for conceptual research desiderata. The second research aim is to provide theoretically informed suggestions for the further development of innovation and transfer strategies in teacher education by transferring the discourse on transdisciplinarity to the field of teacher education. To do so, two analytical procedures are combined within this article: (1) a conceptual analysis informed by a narrative literature review and (2) a discourse transfer and a case-based illustration.

- (1) The narrative literature review followed an inductive-explorative rationale based on the authors’ interpretative judgements (Bearman et al., 2012; Petticrew & Roberts, 2006). The start of the literature review comprises pertinent German-speaking special issues and edited volumes concerned with “innovation and transfer” (Nickolaus et al., 2006), “transfer and transfer research” (Gogolin & Prenzel, 2010), and “innovation within the education system” (Rürup & Bormann, 2013). In addition, a literature search was conducted using “fis-bildung”, a database for German-speaking literature, which also comprises papers from the international scientific community. Subsequently, a conceptual analysis has been conducted based on an inductively developed category system. The category system comprises the following characteristics: “overall vision”, “process logic”, “initiation context”, “innovation development”, “transfer mechanism”, “distribution of tasks and responsibilities”, “process ownership”, “goals and potentials”, “quality and success criteria”, “challenges and limitations”, and “research methodology”. Based on the conceptual analysis, further research gaps and desiderata have been outlined.
- (2) These research desiderata provide structural analogies to the discourse of transdisciplinarity that has emerged in the field of education and innovation in the 1970s and that has further developed as a collaborative research mode to tackle complex problems since the 1990s (Bammer et al., 2020; Bernstein, 2015). In particular, the so called problem-solving discourse of transdisciplinarity is currently popular in the fields of sustainability, environmental sciences and health sciences, among others (Hirsch Hadorn et al., 2008; Klein, 2014). This paper seeks to (re)connect the discourse of transdisciplinarity to the field of (teacher) education and to derive theoretically informed and experienced based suggestions for a transdisciplinary approach in this field. Guiding principles for transdisciplinary research and

¹ These assessments refer to PISA (Programme for International Student Assessment), TIMSS (Trends in International Mathematics and Science Study), and PIRLS (Progress in International Reading Literacy).

² The Standing Conference of the Ministers of Education and Cultural Affairs is one of the most influential political committees on educational policy at the federal state level. Its German designation reads “Kultusministerkonferenz” (KMK).

development are adapted to the field of teacher education and provide conceptual advancements and the further development of innovation and transfer strategies. To substantiate these conceptual considerations, illustrative examples from a selected research and development project are presented and critically discussed.

4. Innovation and transfer strategies in teacher education

Despite the overall trend towards evidence-based governance, in Germany the output orientation is relatively moderate in comparison to Anglo-American countries (Blömeke, 2006; Gräsel, 2010). In addition, the reform agendas are far from being accomplished within academia and in the field of daily teaching practice. Against this background, ideal-typical pathways for educational change will be presented and critically discussed in this chapter.

4.1. Top-down approaches

Top-down approaches in teacher education refer mainly to development programs and strategies, which follow a multistaged and unidirectional process model. Top-down approaches are predominantly owned by researchers and/or representatives of educational administration and are designed to implement interventions either within university-based teacher education or from the outside into target schools and classroom settings. The linear multistaged process model distinguishes between two focal levels, which should not be compromised by overlaps or back references (Gräsel, Jäger, & Willke, 2005). The conceptual stage comprises the initiation and design of an innovation, whereas the application stage refers to its implementation and institutionalization within a target environment. Top-down approaches are characterized by a clear distribution of tasks, responsibilities, and roles among the involved actor groups. Innovations are developed primarily by researchers, while the representatives of the target environment, such as students and teachers, are considered part of the application fields instead of active agents of change (Rürup, 2013). Thus, in the context of top-down approaches, educational change is characterized by the relative independency of innovations' initiators from their recipients. In the context of school development, this leads to a situation where innovations are implemented from the outside into a given target system. Consequently, teachers and principals are expected to follow the preset instructions, while adaptations, modifications, and readjustments by practitioners may compromise the intended effects of the intervention.

Methodologically, top-down approaches resonate well with experimental intervention research designs, following the logic of randomized controlled trials (RCTs) (Cohen, Manion, & Morrison, 2018). RCTs are not only considered to be the methodological "gold standard" for evidence-based educational research, but also as an ideal approach for evidence-based innovation and transfer in the educational field (Gräsel, 2010; Prenzel, 2010). Due to its methodological rigor, these studies shall ensure that variations of the target characteristics are identifiable as intended effects caused by the intervention, while effects caused by other sources are kept constant. Thus, interventions that have been proven to be effective under controlled boundary conditions are considered effective in comparable settings. For strict top-down approaches, implementation fidelity counts as the primary quality criterion for the application of an intervention or innovation (Snyder et al., 1992). In contrast, moderate evidence-based approaches proclaim that factual efficacy should take priority over the ideal of

implementation fidelity (Gräsel, 2010). Therefore, adjustments and adaptations to field conditions are justified when they are theoretically well founded and documented to identify possible unintended effects.

The major critique of top-down approaches addresses the alleged ignorance towards the complex dynamics of the target field and issues of limited acceptance and compliance by practitioners. The dilemma that classical interventions require laboratory conditions to be controllable implies de-contextualization from field conditions, including the school type, the composition of the student body, teaching styles and personality. Due to the heterogeneity of the educational system in Germany, it is hard to control the environmental conditions completely. Further, the high conceptual abstraction and scientific terminology of top-down approaches are obstacles in the transfer or adaption to practitioners' needs (Broekkamp & van Hout-Wolters, 2007; Gräsel et al., 2005). Educational practice, in general, is under high reform and innovation pressure, and objects to a multitude of reform agendas and innovation strategies. Therefore, practitioners often enough remain skeptical towards top-down innovation and transfer, which cannot sufficiently guarantee a good fit to pre-existing structures, processes, and working styles and account for a distinguishable benefit for teaching practice (Gräsel, 2010).

4.2. Bottom-up approaches

In contrast to top-down strategies, bottom-up approaches aim to improve everyday teaching practice through participative research and development. Bottom-up approaches emphasize the active involvement of teachers and (co)ownership of the initiation, development and implementation of innovations. Bottom-up approaches are understood as dynamic, iterative-cyclic and open-ended processes. In contrast to externally developed interventions, problem framing and the conceptualization of measures are developed primarily by or at least substantially together with the actual target group – the practicing teachers.

Rürup (2013) refers to bottom-up approaches in a rather narrow sense as grassroots initiatives that are independent of any administrative directives and public funding programs. This perspective excludes bottom-up initiatives, which take up the reform agendas induced and promoted by, e.g., federal state school authorities, the KMK, or the BMBF. In these cases, innovations are initiated and realized within the target system and owned primarily by local school representatives. While bottom-up approaches are considered to have important impacts on school development and improvement, these activities commonly do not qualify as innovation transfer since they are highly contextualized and locally bound (Gräsel et al., 2005). Nonetheless, Rürup (2013) claims that there is a vast number of local school development projects that have an impact on other schools but stay below the radar of administrative regulations and scientific observation initiatives, which resonates with what Fullan refers to as "lateral capacity-building" (2016, p. 120): the establishment of knowledge and support networks across schools to foster school development. The most prominent examples for self-reliant and highly successful projects are the award winners of the "German School Prize". This prize honors innovative school improvement endeavors to encourage further school improvement activities and to display outstanding and guiding projects that can inspire others (Beutel, Höhmann, Pant, & Schratz, 2016). Against this backdrop, it becomes apparent that Rürup's conceptualization of bottom-up approaches as grassroots initiatives tends to be too narrow. Instead, within this article, a wider understanding is suggested, which allows for the involvement of administrative and scientific actors as

long as the factual local school practitioners primarily own the change process.

In contrast to the dissemination and transfer in the context of top-down strategies, bottom-up approaches rely on diffusion mechanisms based on adaption and appropriation processes (Bormann, 2011). In this respect, practitioners actively take up, further co-develop innovations, and maintain their ownership during the innovation and distribution process. In addition, the example of the German School Prize schools indicates a rather horizontal outreach towards other schools and practitioners instead of reaching directly upwards to administration and science (Rürup, 2013). In this sense, it would be more precise to use the term “horizontal approaches” instead of bottom-up. Nonetheless, these diffusion mechanisms highlight and require the independent ability and readiness of practitioners to identify, select and incorporate external impulses with respect to the local context. Therefore, bottom-up approaches resonate well with social innovation strategies (Loogma, Tafel-Viia, & Ümarik, 2013), emphasizing the relevance of social relations and institutional embeddedness. Social innovations focus on how innovations change teaching behavior and how they affect status hierarchies or professional identities. From this point of view, the implementation of an external innovation appears as a disruptive interference with established work environments and professional self-concepts. This perspective might also explain some of the reluctance or even opposition of practitioners with respect to teacher education and school reforms.

Bottom-up strategies resonate highly with participative research and development approaches, which are commonly subsumed under the term action research. Action research emphasizes capacity building and the empowerment of local practitioners (Altrichter & Posch, 2018). Participatory action research proclaims the even further emancipation and democratization of change processes in teacher education and beyond. In alignment with that, school development should be initiated and owned within the target system, drawing on and utilizing context-specific knowledge and resources. These approaches acknowledge teachers as professional actors with situational specific competencies. Moreover, they advocate for school improvement initiatives, which draw upon local expertise and the commitment of those who are most likely to be affected to ensure in-depth and long-lasting change. Therefore, practitioners are not restricted to being mere executing agents but are encouraged to cocreate and take on responsibility for school development more extensively. Furthermore, participative approaches consider research and development activities as analytically distinguishable but practically inseparable sides of the same coin. Action research and participative research follow the iterative-cyclic research and development logics. Thus, action and reflection constitute the dualistic core of this kind of research, comprising both epistemic and transformative aims (Vilsmaier, Brandner, & Engbers, 2017).

However, bottom-up approaches mainly face critiques with regards to the lack of methodological rigor towards the assessment of cause-effect relations, an insufficient focus on more traditional scientific quality criteria and the generalizability of research findings (Altrichter & Posch, 2018). Likewise, the highly contextualized and embedded problem-solving strategies may lead to specific solutions and results, which in turn lead to certain limitations concerning the diffusion of innovation.

4.3. Cooperative approaches

The controversies on innovation, implementation and transfer strategies in teacher education peaked around 2010 and culminated in several pertinent special issues and edited volumes

(Gogolin & Prenzel, 2010; Nickolaus et al., 2006; Rürup & Bormann, 2013). During that period, the debate was increasingly influenced by approaches highlighting boundary-crossing cooperation. For instance, pertinent contributions by Gräsel and Parchmann (2004) and Bormann (2011) addressed the notion of a “mutual adaption perspective” initially introduced by Snyder et al. (1992). The term “mutual adaption” refers to approaches that acknowledge that “implementation *should* involve adjustments in needs, interests, and skills of participants and organizations as well as in project goals and methods” (Snyder et al., 1992, p. 412; emphasis in original). However, the degree to which local practitioners should have an impact on the development and implementation of innovations varies considerably.

Stark (2010) presents a research and development design that is rooted in the logic of intervention studies but highlights the importance of realistic field conditions. This evidence-based strategy seeks to develop teaching formats highly adapted to the local requirements while providing statistical findings on the effectiveness of these interventions. Others refer to design-based research, satisfying the need for scientific rigor while allowing for the necessary freedom of design (Einsiedler, 2010; Gräsel, 2010). Another proposal by Gräsel and Parchmann (2004) refers to a “symbiotic implementation strategy” that allows for the involvement of practitioners throughout the innovation and transfer process. Nonetheless, the innovation and transfer process is still primarily owned by researchers. This strategy also corresponds with the output-oriented governance approach that specifies rather broad objectives but grants high flexibility according to the implementation of the reform agenda (Gräsel et al., 2005). Others highlight the social innovation aspect of change processes and stress the importance of co-developmental or co-constructive processes among the involved parties; thus, they refer to the importance of local ownership of processes (Loogma et al., 2013).

Despite these differences, these approaches share – at least to some degree – an understanding of the co-ownership of the development, implementation, and transfer of innovations, which is reflected in the distribution of responsibilities, roles, tasks, and decision-making. The empowerment of local actors to be part of and to impact innovation is likely to increase the acceptance due to a better understanding and perceived relevance of the intended purposes and outcomes and the specific needs of the local context. This increased acceptance makes it more likely to activate local resources and commitment. Moreover, collaborative processes are more likely to follow a circular-iterative pattern, like bottom-up processes, alternating continuously between problem framing, (re)assessment, intervention, action, reflection, and adaption (Bormann, 2011). Thus, the conceptualization and application stages are intertwined.

However, due to the assumed lack of temporal resources and methodological capacities, it remains to be discussed to what extent practitioners should and could contribute to (traditional) research processes aiming to acquire empirical evidence. In this context, some authors argue that qualitative methods also provide necessary openness for practitioners’ participation (Altrichter & Posch, 2018). Despite this unsolved controversy, in general, collaborative approaches set their goals rather high by claiming the capability to conduct both in-depth research-practice collaboration and methodologically sound research.

Against this backdrop, one major point of critique refers to the balancing act between top-down reform agendas and bottom-up school improvement interests. For instance, Rürup (2013) argues that cooperative research and development approaches are at risk of remaining somewhat tender forms of top-down approaches, while innovation impulses primarily resemble overall reform

agendas. From this point of view, practitioners would take on the role of researchers' accomplices or vicarious agents to reform agendas preset by educational administrations instead of truly engaging as self-independent "change agents" (Rogers, 2003). Another point of critique addresses that the general thrust of innovation still focuses on the school level and everyday practice, while practitioners' expertise has no direct impact on academic practice. In addition, the comprehensive resource intensity, which in-depth cooperative approaches require, is highlighted. The establishment of stable and functioning relations between various organizations entrusted with teacher education is not only time-consuming but also requires necessary motivational, social, and organizational prerequisites.

4.4. Contrasts and commonalities

With regard to the outline of the three ideal-typical approaches for the initiation and establishment of advances in teacher education, essential differences became apparent. These differences are summarized in Table 1.

Despite these differences and complementarities, the outlined innovation and transfer strategies tend to be conceptually biased when considering contexts where actors from different organizational and institutional backgrounds work together. Under these circumstances, each approach implies that the primary target level for innovations rests at the level of school practice. When universities, teacher education colleges and schools collaborate, innovation pressure is conceptualized predominantly within the innovation, implementation and transfer discourse as either pointing vertically down along an assumed institutional chain from academia or governmental agencies at schools or horizontally from schools to other schools. However, none of the discussed approaches explicitly questions the implied unidirectional aim.

These tacit implications become essentially problematic when the improvement of teacher education becomes the focal aim instead of teaching and school improvement. Such perspectives neglect to acknowledge more recent trends in German teacher education, as already indicated in chapter 2.

What remains conceptually underexposed is, first, that

innovations at the school level often enough imply or even require innovations at the academic and governmental levels. Second and even more important, university-based innovations aspiring to be of practical relevance at the school level should also integrate sufficient expertise, experiences, and perspectives from its representatives. The increase of practical studies and the improvement of coherence among the phases in teacher education facilitate and also require bidirectional or symmetrical innovation mechanisms (Boer et al., 2018; Kleemann, Jennek, & Vock, 2019). These mechanisms indicate fruitful pathways for educational change where field practice and practitioners' expertise improve academic teaching and learning alike.

5. Bridging the gap: a transdisciplinary perspective in teacher education

Drawing on the concept of transdisciplinarity, the fifth chapter provides further conceptual considerations on how cooperative approaches could foster more integrative and thus symmetrical innovation and transfer strategies that serve both academic teacher education and school practice. These considerations will be further illustrated by examples from a research and development project in teacher education.

5.1. Theoretical background on transdisciplinarity

The discourse on transdisciplinarity has a firm stance within sustainability, environmental and health science, but it is likewise influenced by humanities and science and technology studies (Hirsch Hadorn et al., 2008; Klein, 2014; Lang et al., 2012). Transdisciplinarity represents an integrative research and development approach that acknowledges different sources of knowledge and ways of knowing across disciplinary, organizational and institutional boundaries. Transdisciplinarity resonates with what Nowotny and colleagues have introduced as Mode-2-knowledge production (Nowotny, Scott, & Gibbons, 2001). Traditional science and research (Mode-1-knowledge production) are based on traditional criteria such as objectivity, reliability, and validity. This type of research is characterized by a strict distinction between

Table 1
Ideal-typical pathways for educational change in teacher education.

Characteristics	Top-Down Approach	Cooperative Approach	Bottom-Up Approach
Overall vision	authoritative-interventional development and implementation	boundary-crossing collaboration	self-reliant school and teaching development
Process logic	unidirectional and multistaged; separation of initiation and transfer of innovation	iterative-cyclic; initiation and transfer are intertwined	interactive-cyclic; unity of invention and enactment of innovation
Initiation context	reform agendas; research projects	fit of political/research agendas and local needs	practical challenges and needs
Innovation development	development by researchers/experts	co-construction and mutual adaption	participative capacity building by practitioners
Transfer mechanism	scale-up through dissemination and transfer	transfer and diffusion through cooperative relations	diffusion of innovation through appropriation and adaption
Distribution of tasks and responsibilities	researchers are initiators, developers, and implementers of innovation; practitioners are executing agents	researchers and practitioners are co-initiators, co-developers and co-implementers of innovations	practitioners are initiators, developers, and implementers; researchers are facilitators and critical friends
Process ownership	external researchers and experts	shared among researchers and practitioners	internal agents teachers and principals
Goals and potentials	evidence-based and policy-driven teaching and school improvement	evidence-based capacity building	capacity building; oriented to the demands and needs of the target group
Quality and success criteria	implementation fidelity and evidence-based effects on target criteria	effects on target criteria; acceptance and participation of target group	acceptance and participation of target group
Challenges and limitations	risk of ill-fit with local needs; lack of acceptance and compliance in the field	resource-intensive (financial/temporal); requires high commitment	limited generalizability due to context specificity
Research methodology	mostly quantitative, (quasi-) experimental intervention designs and randomized controlled trials	broad range of methodology, including quantitative, qualitative and mixed-methods approaches	mostly qualitative research approaches; descriptive statistics

knowledge acquisition and knowledge application. In contrast, Mode-2-knowledge production takes account of both epistemic and transformative aims, e.g., the change of educational research and practice. Therefore, transdisciplinarity is characterized by an extended scope comprising not only scientific research standards but also addressing the applicability of research results, the diversity of disciplinary and professional cultures and the organizational heterogeneity in academia and practice. In addition to scientific credibility, this requires social accountability and reflectivity and an extended understanding of quality control (Lang et al., 2012). The claimed potential of transdisciplinary research and development lies within its capability of creating spaces for mutual learning and producing results that have positive effects on the legitimacy and acceptance of advances and innovations. Therefore, it is claimed that transdisciplinary processes increase the chances of transfer and diffusion by being socially and culturally robust (Nowotny, 2003; Vilsmaier et al., 2015).

Based on this theoretical background, four basic guiding principles for transdisciplinary research and development have been outlined in the context of teacher education: “problem-solving orientation”, “multi-perspectivity”, “participation” and “(re)integration” (Straub & Dollereider, 2019). First, a problem-solving orientation refers to the notion that collaboration should address concrete challenges deemed relevant by the involved actor groups. Second, it reflects the commitment to generate factual advancements to tackle these challenges, which again are considered suitable as such by the given actor groups. Multi-perspectivity addresses the need for various sources of knowledge across disciplines, professional backgrounds and levels of experience to address both practical and academic requirements. Participation highlights the necessity and advantages of in-depth engagements among various reference groups. Finally, (re)integration refers again to a twofold objective. First, there is the requirement for the epistemic, social and organizational integration of the relevant actor groups into cooperative processes. Second, co-constructed results and products have to be established within the reference systems such as universities, teacher education colleges and schools.

5.2. Conceptual framework of transdisciplinary processes

Fig. 1 displays an ideal-typical transdisciplinary process model (Jahn, 2008; Jahn, Bergmann, & Keil, 2012). This model distinguishes between “societal practice” and “academic practice” as two different reference systems (see columns A and C). Each system is defined by specific types of problems or challenges, involved actor groups, and discourses. It is assumed that innovative advancements necessarily refer to the specific problem perceptions within the given reference system (see rows 1 and 3). Consequentially, societal and academic practices are understood to be loosely coupled. Therefore, innovations developed in academic practice do not automatically initiate innovations in societal practice and vice versa. Transdisciplinary research and development spaces aim at fostering co-constructive interrelations between both reference systems through a three-staged process (see column B). Despite the seemingly linearity of the consecutive steps displayed in the figure, transdisciplinary engagement follows iterative-cyclic and adjusting processes. The key steps are (1B) “problem framing and team building”, (2B) “integration through mutual learning and co-construction” and (3B) “re-integration and application of knowledge”.

5.2.1. 1B – Problem framing and team building

In transdisciplinary processes, the initial activities of problem framing and team building are essential. They address the need to identify and construct shared problem understandings across disciplinary, professional, organizational and institutional boundaries (Lang et al., 2012; Scholz & Steiner, 2015) and intersect both challenges of everyday practice (1A) and academic research interests (1C). Since joint problem framing highly depends on the integration of different perspectives, the question regarding whether the actors are necessary, sufficiently qualified and legitimate for appropriate problem framing becomes an issue of its own (see A2 and C2; Lang et al., 2012). Moreover, the two main tasks of the first phase – problem framing and team building – are mutually dependent. Therefore, they should not be predefined a priori, but instead be explicitly dealt with as part of the transdisciplinary process (Muhar, Vilsmaier, Glanzer, & Freyer, 2006).

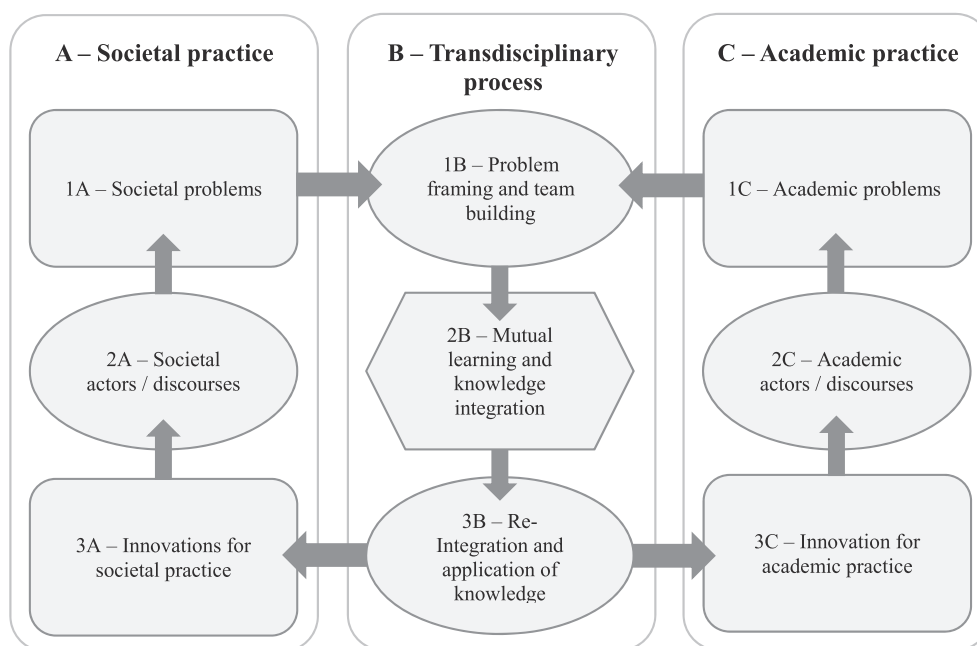


Fig. 1. Process model for transdisciplinary cooperation based on Bergmann et al. (2012) and Jahn (2008).

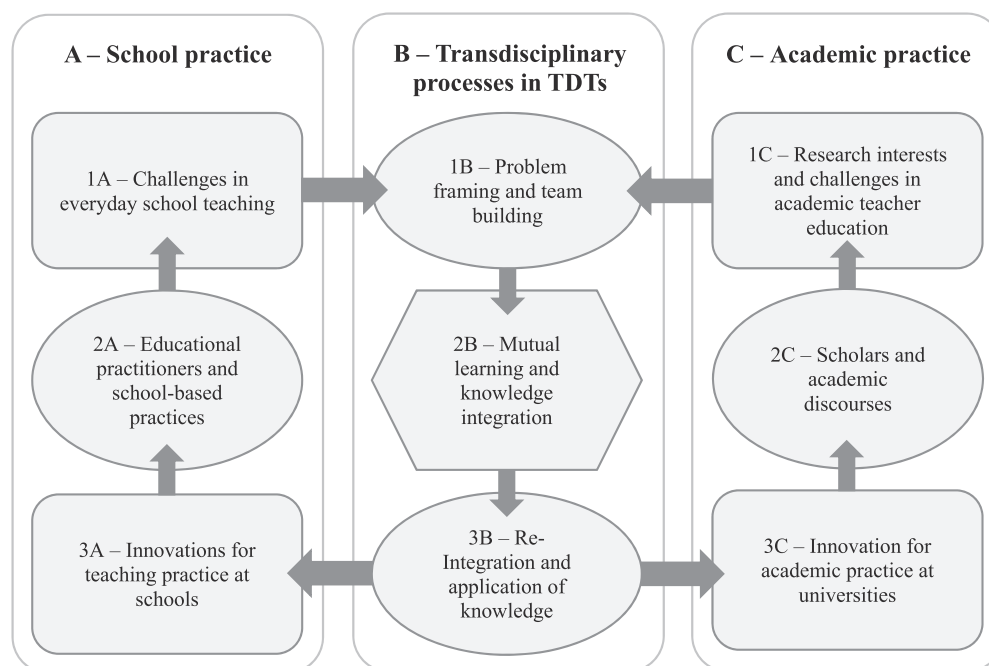


Fig. 2. Adapted process model of transdisciplinary cooperation in teacher education.

5.2.2. 2B – Mutual learning and knowledge integration

Transdisciplinary research is based on the process of mutual learning and knowledge integration (Scholz & Steiner, 2015; Vilsmaier et al., 2015). Mutual learning refers to the ability to learn from and with different actor groups through the exchange and co-construction of knowledge and experiences (Van den Bossche, Gijsselaers, Segers, Woltjer, & Kirschner, 2011). In addition, mutual learning also requires the adoption of mutual perspectives and the elaboration of a common understanding (Bayerl & Steinheider, 2009). To do so, the recognition of the differences in ways of perceiving, knowing, acting, and being becomes essential (Vilsmaier, Brandner, & Engbers, 2017). Co-constructive knowledge integration fosters a comprehensive understanding of the others' viewpoints, needs, and working methods and serves to consolidate the common ground (Bayerl & Steinheider, 2009). To develop a shared understanding of the problems and potential problem-solving approaches, collective reflection, critical feedback, and constructive conflicts are needed (Van den Bossche et al., 2011). The adoption of the others' perspectives helps to rethink viewpoints that are taken for granted within certain fields of expertise. In so doing, involved actors are more likely to generate new insights and knowledge on a more comprehensive basis.

5.2.3. 3B – Re-integration and application of knowledge

Joint problem framing and co-constructive processes ensure that various expertise and needs are taken into account to generate joint results and products that are socially (and culturally) robust (Nowotny et al., 2001; Vilsmaier et al., 2015). The reintegration and application of knowledge is directed at academia (3C) and practical fields (3A) alike, which requires balancing the scientific quality criteria and requirements for everyday practice. Again, another aim of integrative and collaborative approaches is to increase the legitimacy and ownership of co-produced results (Lang et al., 2012). Consequentially, transdisciplinary processes allow not only the interrelation of loosely coupled reference systems but also foster the reintegration and sustainable application of the co-developed

concepts, products, practices and knowledge in the reference systems.

5.3. Transdisciplinary Development Teams in teacher education

The following outline of the Transdisciplinary Development Teams (TDTs) within the research and development project ZZL-Netzwerk³ illustrates how innovations can be co-constructed and established at the boundary of university-based teacher education and school practice. To do so, the organizational structure and teamwork arrangements within the TDTs are exemplified and critically compared to the general process model of transdisciplinary cooperation (see Fig. 2).

The project's overall aim is to develop advances in teaching and teacher education through joint endeavors among representatives from universities, teacher training colleges, schools, and extramural partners. Since 2016, the representatives of these institutions established eight TDTs, which are characterized by collaboration on "equal footing" and within a "culture of togetherness". In alignment with overall reform agendas, they cover four pressing challenges in teacher education: "Competence-oriented Instruction", "Inclusive Schooling", "Mentoring in Practical Studies" and "Teachers' Health". TDTs are the main collaborative units within the network. TDTs are conceptualized as transdisciplinary research and development spaces where especially researchers and teachers and in part students, pre-service teachers, principals, teacher training educators from teacher training colleges, pedagogues from extra-curricular educational institutions, and authority representatives collaborate (Straub & Dollereider, 2019). In addition, the TDT work organization resonates with elements of (participative) action research (Altrichter & Posch, 2018) or design-based research (Bakker, 2018;

³ The ZZL-Netzwerk is located at the Center for Teacher Education at the Leuphana University Lüneburg, Lower Saxony, Germany and is part of the Teacher Training Quality Campaign funded by the German Ministry of Education and Research (BMBF).

McKenney & Reeves, 2018). In this regard, iterative cycles of problem-framing, joint co-construction, and implementation, as well as reflection, are constitutive elements of the TDT work. In addition, action-oriented research and development was also complemented by accompanying research following more classical research approaches. These refer, for instance, to effectiveness research using pre-post designs or in-depth interview studies aiming to address explorative research questions.

5.3.1. 1B – Problem framing and team building in the TDTs

The preferably open-ended iteration between problem framing and team building was in practice prestructured by two main factors (Straub & Dollereider, 2019). First, the logic of external funding made it necessary to determine the focal aspects of the research and development program prior to the resource allocation. Therefore, primarily researchers have set the overarching topics. These topics display general debates and mandatory educational policies and reforms, while the specification of particular research and development interests are jointly elaborated in the TDTs. Second, a mixed strategy for team member acquisition becomes apparent on an overall level. First, pre-existing connections, for instance, with partner schools, have been intensified, while personal contacts helped to establish new partnerships with additional schools and other relevant organizations. This mixed strategy helped to balance different requirements such as a) the need for sufficient expertise from relevant target institutions (e. g. universities, schools, teacher training seminars, and extra-curricular educational institutes), b) meeting productivity expectations and c) maintaining stable in-depth collaboration. Thus, while keeping the overarching goals in mind (such as “Competence-oriented Instruction”, “Inclusion”, “Mentoring”, and “Teachers’ Health”), key selection criteria for team members included their relevant professional backgrounds, regional affiliations, and capabilities for long-term cooperation.

Consequently, each team consisted of at least educational researchers and teachers representing the two focal institutions: universities and schools. In addition, depending on the specific research and development goals, further actor groups such as students, teacher training educators at teacher training colleges and representatives from educational administration and extra-curricular institutions were part of the core team (for a detailed overview of involved actor groups in each TDT, see (Straub & Dollereider, 2019: 71).

Nevertheless, the teambuilding and joint problem framing process was subject to intense negotiations and required significant time and commitment. In this regard, not only research and development goals had to be jointly specified and readjusted over time but also particular organizational processes, team members’ roles and responsibilities had to be established during the process. To do so, the TDTs comprising all involved actor groups met on average every three to six weeks. Depending on the particular work organization, additional tasks, preparatory sessions, and individual meetings became necessary.

The following paragraph provides an illustrative example for co-constructive problem framing within the TDT “Teaching in Inclusive English Settings” (Straub, Spöhrer, & Meimerstorf, 2019). The team was comprised of up to 16 team members from various actor groups, such as a professor and a research assistant for English didactics, subject and special education teachers, a school principal, students, teacher training educators, preservice teachers and, occasionally, a representative from educational administration. Among others, they agreed to jointly develop and establish a university-based seminar focusing in particular on student teachers’ development of attitudes, beliefs and competencies for inclusive English teaching (Blume, Gerlach, Roters, & Schmidt, 2019). In

this regards a broad understanding of inclusion was established, which highlights the requirement to embrace pupils’ general heterogeneous abilities and performance. In this regard, however, a debate arose concerning which aspects in particular should be focused on within the seminar. Initially, researchers and experienced teachers alike advocated general principles for inclusive teaching, which, for instance, were inspired by the universal design for learning (Blume et al., 2019). This approach was supposed to avoid that student teachers apply schematic knowledge instead of developing reflective competencies. However, student teachers, which were a part of the TDT, articulated their needs also to be able to deal with formally diagnosed special educational needs in particular. In this case, experienced teachers reconsidered their position and agreed that it is particularly challenging for novice teachers to interrelate highly abstract principles on inclusive education on the one hand and practical requirements concerning formally diagnosed special educational needs on the other hand. Consequentially, the TDT agreed to better balance holistic principles with pragmatic requirements.

Subsequently, this example of problem framing illustrates not only how this particular TDT aimed to interrelate scholarly and pragmatic requirements (theory-practice interrelation) but also how to mediate novices’ needs and experts’ aspirations. In addition, problem framing has to be understood as a recurring process, which is embedded in the cyclic research and development process.

5.3.2. 2B – Mutual learning and knowledge integration in TDTs

As outlined previously, mutual learning and knowledge integration are paramount features for transdisciplinary research and development processes. To facilitate both, within the eight TDTs, various forms of work organization have been established comprising different actor groups, collaborative and co-constructive processes, and dimensions of output and outcomes (Kulin, 2019; Straub & Dollereider, 2019). A central format for collaborative exchange and co-construction referred to regular TDT meetings, which again are closely coupled with the co-teaching arrangements of university-based seminars, school-based teaching or advanced training offers.

The following example of the TDT for “Competence-oriented instructional design in German didactics” is used to illustrate how the overall TDT work organization fosters mutual learning and co-constructive process and knowledge integration. In this particular example, three different collaborative formats are interrelated, namely, (1) regular TDT meetings, (2) a three-semester university-based Master’s course and (3) so-called “Tandems” between students and teachers during school-based work placements (Weinhold, 2018). Moreover, the example provides insights about how the work organization promotes the interrelation between research, development and implementation activities.

The TDT consists of three major actor groups: two researchers in the field of German didactics, about eight to ten student teachers and ten established primary school teachers from regional partner schools ($n_{\text{total}} = 20$ to 24 TDT members). During the monthly 2-h TDT meetings (1), the team jointly addressed practice-based challenges in literacy acquisition and orthography, which were brought up by the participating teachers and student teachers. In addition to the general principles for TDT work (see chapter 4.2; Straub & Dollereider, 2019; Weinhold et al., n.d.), team-specific procedures have been established, which provide organizational structures (regular agenda items) and orientations with regard to the analytical steps for discussing content-related and didactical issues. Despite the fact that these characteristics have evolved over time, they also correspond to general findings in the research on teacher professionalization and advanced teacher training (Weinhold, 2018, p. 167).

In addition, the TDT meetings are closely related to a three-semester master's course (2). This project-oriented course comprises a five-month work placement at schools, which is framed by preparatory, accompanying, and follow-up courses at the university. During these courses, student teachers and researchers lay the theoretical foundation and engage in in-depth discussions about content knowledge and pedagogical content knowledge regarding the overarching field of literacy acquisition and orthography. In addition, student teachers carry out research projects on teaching development. This inquiry-based learning approach aims to facilitate students' professional development (Straub & Waschewski, 2019) while developing also empirical insights that are included in joint conference presentations and publications (cf. Weinhold et al., n.d.).

Moreover, during the long-term work placements, student teachers and experienced teachers form so-called "Tandems" (3). Within these, students and teachers engage in co-planning, co-teaching and co-reflection activities with regard to daily teaching practice. These tandem settings are supposed to stimulate knowledge integration through mutual learning and the co-construction of didactical arrangements. Hereby, students provide primarily theoretically and conceptually informed perspectives, while teachers contribute practical expertise and knowledge about local contexts (for instance, about pupils' performance levels or organizational processes at schools). Moreover, students and teachers take on hybrid roles by blurring the distinction between investigating and practical teaching (Weinhold et al., n.d.).

Finally, the accompanying TDT meetings (1) allow for sharing experiences and expertise among different tandems about the challenges they face during their daily practice, discussing potential solutions and jointly reflecting about eventual implementations. After finishing the three-semester course, student teachers leave the TDTs. Apart from some fluctuations, researchers and teachers continue with the next TDT cycle. In addition, regarding co-constructive development and action-based inquiry, during each cycle, accompanying research activities were conducted, using, for instance, pre-post competence tests to assess students' and pupils' performance development (Waschewski, 2018; Weinhold et al., n.d.). Complementary in-depth interviews were conducted to study developments in teacher's beliefs and self-efficacy (Waschewski, 2018).

The example of the TDT on German didactics has to be considered as fairly extensive, especially about the temporal requirements and organizational interrelations. Other TDTs, for instance, usually accompany one or two-semester seminars. In addition, the close coupling between university-based courses and classroom teaching is particularly characteristic for a TDT directly related to a teaching subject.⁴ Other TDTs, such as those addressing "Teachers' Health" (Peperkorn & Frohn, 2018) and "Mentoring in Practical Studies" (Beckmann et al., 2018), focus their attention primarily at university-based seminars or advanced teacher training programs, respectively.

5.3.3. 3B – Re-integration and application of knowledge in TDTs

The previous section has already shown that TDTs do not only aim to jointly co-create, but they also aim to co-conduct and co-revise concepts, materials, and learning modules and engage in the implementation of these results. In this way, the TDT work is also concerned with the application of co-produced knowledge and its re-integration into the primary reference systems. In doing so,

TDTs contribute to satisfying professional requirements and needs regarding different stakeholder groups. Students, for instance, benefit from the close interrelation of scholarly knowledge and practical expertise. These courses foster, for example, the development of attitudes, beliefs and competencies for inclusive English teaching (Blume et al., 2019), competencies in basic social and science studies with a particular focus on education for sustainable development (ESD) (Bürgener & Barth, 2018), and competence development regarding mathematical problem-solving (Schilling & Leiß, 2019).

Moreover, practitioners also benefit from their engagement within the TDTs. In addition to having access to various teaching concepts and materials (ZZL-Netzwerk, 2018), teachers are directly involved in mutual learning and co-constructive processes. Consequentially, the accompanying research findings indicate, for instance, that German teachers feel empowered to critically and reflexively implement significant changes in their teaching practices concerning learning content, materials and the learners' and teachers' perspectives (Waschewski, 2018). Another example refers to advanced teacher training modules, which foster school-based mentors' conversation and feedback competencies to support preservice teachers during their school-based work placements (Beckmann, 2019).

Finally, the boundary-crossing TDT work provided significant outcomes for university-based teacher education and educational research. In total, ten university-based courses have been established addressing pertinent facets of the overarching topics "Competence-oriented Instruction", "Inclusion", "Mentoring", and "Teachers' Health" (ZZL-Netzwerk, 2018). Moreover, within the project's context, 40 publications have been released so far, out of which 18 papers refer at least to some extent to students', pupils' or teachers' competence development, the seminar and teaching arrangements or the TDT concept and work organization. There are also examples of co-authorships among researchers, students and practitioners in publication media with scientific and practical scopes (Beckmann et al., 2018; Straub, Spöhrer, & Meimerstorff, 2019; Weinhold et al., n.d.).

Apart from generating immediate benefits for participating team members, TDTs are also concerned with the institutionalization, dissemination and transfer of outcomes into the primary reference systems. Thus, TDT work resonates with aspects of design-based research, which addresses questions of transferability (Bakker, 2018). In addition, students and practitioners are beginning to tentatively act as change agents (Rogers, 2003) who are encouraged and empowered to feed their new capacities into their school practice and spread these among their colleagues (Waschewski, 2018). With regard to the TDT on German didactics, a recent change in the team member composition was that the number of participating teachers from a partner school, which showed promising changes in teaching practices, was reduced. These teachers are alternating their participation in the TDT meetings, while teachers from another partner school are able to join the next research and development cycle. In this regard, a mid- and long-term goal addresses the establishment of self-reliant working groups in the fashion of Professional Learning Communities (PLCs) (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006) or Communities of Practice (COPs) (Sim, 2006; Sutherland, Scanlon, & Sperring, 2005). However, this kind of transfer mechanism is in its early stage and requires significant support from the local school management. In addition, this strategy has to be further consolidated before other TDTs may consider adapting similar approaches.

Corresponding to the transfer of TDT outputs into the school field, further measures were taken to implement university-based seminars and teaching modules within the broader study

⁴ For further examples, see Schilling and Leiß (2019) with regards to mathematics didactics at the secondary level and Bürgener and Barth (2018) regarding basic social and science studies in primary schools.

curriculum. These university-based seminars and teaching modules require intensive dialogue and negotiations with teaching colleagues, module managers and the deans' offices. In some cases, for instance, with regard to the seminar on teachers' health, the course had to be adapted to fit into the study structure and to reach a necessary consensus among cooperating lecturers. In other cases, research assistants switched to faculty positions where they inter alia work on the further development and implementation of TDT outputs at the faculty level.

In addition to that, the outlines of each seminar concept, the material collections and the advanced training modules are publicly available in German via the project's web site (ZZL-Netzwerk, 2018). At present, a video portal is under construction in which a series of video-based teaching-modules will be accessible, which is an additional channel for the distribution of teaching materials.

6. Discussion and conclusion

In the following, the results of the conceptual analysis (chapter 4) and the introduction of a transdisciplinarity approach to teacher education (chapter 5) will be critically discussed. The final section states the key conclusions and outlines some limitations and our future outlook.

6.1. Critique on prevalent pathways for educational change

The outline of current trends and frictions in educational policy and reform agendas displays an ambivalent picture. Top-down approaches resonate with competency-based educational standards, evidence-based monitoring, and output control. The advantages lie in the articulation of evidence-based intervention programs for school, teaching, and professional development (Prenzel, 2010). Such programs are usually highly specialized and focused on selective outcomes. The factual effectiveness of these programs depends considerably on their implementation fidelity and the practitioners' compliance. Moreover, top-down strategies usually do not allow for adjustments to local contextual conditions. Thus, externally driven, punctual interventions and development measures tend to lack the necessary transformative momentum to induce long-lasting change.

In contrast, bottom-up approaches foster self-reliant school improvement and regional model projects for professional development. Bottom-up approaches usually integrate target groups and allow for participation in and the coownership of processes. Practitioners' involvement is considered to be a necessary requirement for the initiation of educational change that addresses the fundamental structures and processes of a given target system. Therefore, the practitioners' commitment and support are essential for capacity building and transformation. However, they tend to be bound to socio-cultural and historical trajectories and evolutionary and small-scale innovations. Therefore, bottom-up approaches especially face limitations with respect to systematic and evidence-based change processes and diffusion.

More recently, collaborative approaches based on participative interaction across professional, institutional and organizational boundaries have gained increasing attention within the discourse on innovation and transfer in teacher education. These trends also correspond with Anglo-American developments towards more systemic and interconnected modes of educational change (Fullan, 2016; Hargreaves & Shirley, 2009). Cooperative approaches aim to balance evidence-based professional development and reflective capacity building, which is of particular importance since the loosely coupled three-staged teacher education model was never seriously called into question. Collaborative approaches promise to provide necessary integration and interconnection at

organizational, curricular and personal levels to ensure effective and adaptive teacher education (Hericks, 2004).

However, throughout chapter four, it was elaborated that all three approaches are conceptually biased in terms of focusing on developing and establishing innovation and advancements at a single outcome level, mostly the school level. Against this backdrop, it has been argued that the long-term innovative capacity and effectiveness of teacher education, in general, requires a more systemic perspective, which takes the interdependencies among various institutions and actor groups into account to foster overall advancements in the multilayered teacher education system.

6.2. Reflecting the transdisciplinary approach in teacher education

Based on the previous considerations, a transdisciplinary approach was introduced. Transdisciplinarity is an integrative mode of research and development, which advocates for the interrelation of different sources of knowledge and ways of knowing across disciplinary, organizational and institutional boundaries. Moreover, transdisciplinarity offers guiding principles and integrative process logics to organize mutual learning, knowledge integration and the development of outcomes and outputs that address interrelated challenges across the three-staged teacher education system. For instance, the TDT work is characterized by "problem-solving orientation", "multiperspectivity", "participation" and "(re-)integration" (Straub & Dollereider, 2019) and follows iterative processes of "problem framing and team building", "integration through mutual learning and co-construction" and "re-integration and application of knowledge". In this respect, transdisciplinarity resonates with and also integrates characteristics of other collaborative approaches such as Third Space (Fraefel, 2018; Zeichner, 2010), Community of Practice (Sim, 2006; Sutherland et al., 2005) and Research-Practice Partnerships (Coburn & Penuel, 2016; Penuel, Allen, Coburn, & Farrell, 2015). However, in contrast to the prevalent collaborative approach, transdisciplinarity highlights not only the integration of different actor groups within co-constructive processes but also a more symmetric benefit from generated outputs.

Moreover, as the examples from the project ZZL-Netzwerk illustrates, TDT work allows at least to some extent the blurring of traditional roles among researchers, students and teachers. In addition to university-based teaching and research, researchers engage in facilitating and co-constructing counselors for students and practicing teachers at schools. Students engage in inquiry-based learning processes, where they engage in the co-constructive preparation, conduct and reflection of teaching and in the accompanying research activities. Finally, teachers engage in co-constructive development and reflection processes within the TDT and act as mentors, designers and experts for teaching practice. In this regard, TDTs activities resemble participatory action research (Altrichter & Posch, 2018) and design-based research (Bakker, 2018).

However, the case study on TDTs also revealed some challenges and limitations. It became apparent that such boundary-crossing collaboration requires comprehensive negotiation and commitment from each involved party. Thus, TDT work has to be understood to be quite resource intensive. As illustrated in chapter 5.2, TDTs had to balance collaborative formats, which, on the one hand, foster co-constructive processes and, on the other hand, promotes cooperation, which utilized the effectiveness of the division of labor.

Moreover, the available temporal resources, especially those of participating teachers, remained considerably scarce. This is due to the fact that the initially agreed reduction of teaching hours, to compensate for the additional workload, was eventually

withdrawn by the Ministry of Education and Cultural Affairs. Consequentially, teachers received moderate monetary compensation, but had to manage an additional workload on top of their regular working hours, which is also the reason why the TDT work focused primarily on the dialogue-oriented elaboration of practice-based issues and the co-construction of potential solutions during TDT meetings, classroom observations and individual meetings with students. Eventually, TDT work would presumably benefit from the further interrelation between development and research activities, such as writing research journal papers or participating in data gathering and analysis; however, additional research and documentation requirements have not been viable, especially for the participating teachers. Therefore, primarily the participating researchers have conducted scientifically elaborate studies.

Finally, the claim for evidence-based research on the intended effects was approximated but not satisfied completely. The conditions and dynamics of TDTs hardly allow for experimental research designs. Especially, the requirements for randomization were factually not achieved. At the TDT level, these requirements would delicately violate the autonomy and self-determination of the participating actors since their foremost voluntary engagement is driven by personal interests. Similar points of critique hold true for the evaluation of the teaching concepts and materials that have been applied in unique seminar and teaching settings. Thus, the evaluations are based primarily on pretest-posttest designs. In a pointed way, Nicolescu (2008) describes this dilemma as a shift from “in vitro” to “in vivo” research.

6.3. Conclusion

Transdisciplinarity has been introduced as an integrative mode of research and development facilitating co-constructive interrelations of different bodies of knowledge, perspectives, and interests across professional, institutional and organizational boundaries. In this way, transdisciplinarity resonates strongly with recent collaborative approaches for innovation and transfer in teacher education. Moreover, transdisciplinarity provides theoretically informed principles and an iterative-cyclic process model, which support and allow for the further development of current approaches, such as Third Space, the Community of Practice, and Research-Practice Partnerships. In particular, transdisciplinarity advocates for a more integrative and systemic pathway to educational change, which is of particular importance with regard to the backdrop of the multilayered and institutionally fragmented teacher education system in Germany.

However, the foundation of the underlying conceptual analysis is rooted in a narrative literature review, which allows for a broad but necessarily abstract and potentially biased overview of the comprehensive discourse on innovation and transfer. Moreover, up to now, there are comparatively few theoretical contributions and empirical studies related to the concept of transdisciplinarity as a conceptual framework for the analysis or design of boundary-crossing collaboration in teacher education. Thus, further research efforts are needed to theoretically and empirically substantiate the conceptual considerations made in this article.

Author contribution

Robin Straub: Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Ulli Vilsmaier: Conceptualization, Methodology, Writing - review & editing.

Declaration of competing interest

The authors declare no conflict of interest. All authors listed

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References

- Altrichter, H. (2015). Governance in education: Conceptualisation, methodology, and research strategies for analysing contemporary transformations of teacher education. In D. Kuhlee, J. van Buer, & C. Winch (Eds.), *Educational governance: Vol. 27. Governance in der Lehrerausbildung: Analysen aus England und Deutschland: Governance in Initial Teacher Education: Perspectives on England and Germany* (pp. 9–30). Wiesbaden: Springer VS.
- Altrichter, H., & Posch, P. (2018). *Lehrerinnen und Lehrer erforschen ihren Unterricht: Unterrichtsentwicklung und Unterrichtsvaluation durch Aktionsforschung [Teacher Explore Their Teaching: Development and Evaluation of Teaching Through Action Research]* (5., grundlegend überarbeitete Auflage). Bad Heilbrunn: Julius Klinkhardt.
- Bakker, A. (2018). *Design research in education*. Routledge. <https://doi.org/10.4324/9780203701010>
- Bammer, G., O'Rourke, M., O'Connell, D., Neuhauser, L., Midgley, G., Klein, J. T., ... Richardson, G. P. (2020). Expertise in research integration and implementation for tackling complex problems: When is it needed, where can it be found and how can it be strengthened? *Palgrave Communications*, 6(1), 7. <https://doi.org/10.1057/s41599-019-0380-0>
- Bayerl, P. S., & Steinheider, B. (2009). An exploration of knowledge integration problems in interdisciplinary research teams. In *24th annual conference of the society for industrial and organizational psychology (SIOP), new orleans, 2009*.
- Bearman, M., Smith, C. D., Carbone, A., Slade, S., Baik, C., Hughes-Warrington, M., et al. (2012). Systematic review methodology in higher education. *Higher Education Research and Development*, 31(5), 625–640. <https://doi.org/10.1080/07294360.2012.702735>
- Beckmann, T. (2019). *Professionalisierung im Langzeitpraktikum: Unterstützung Studierender durch universitäre und schulische Lehrkräftebildner/-innen*. Lüneburg: Leuphana Universität Lüneburg.
- Beckmann, T., Ehmke, T., Müller, K., Brückner, J., Spöhrer, S., & Witt, S. (2018). Lerngelegenheiten im niedersächsischen Langzeitpraktikum: Unterrichtsbesprechungen professionalisieren [Learning Opportunities in the Long Term Internship in Lower Saxony]. In M. Rothland, & I. Biederbeck (Eds.), *Praxisphasen in der Lehrerbildung – Beiträge der Siegener Sommerakademie 2016* (pp. 25–34). Münster: Waxmann.
- Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C., & Schramm, E. (2012). *Methods for transdisciplinary research: A primer for practice (1. Aufl.)*. Sozialwissenschaften 2012. Frankfurt am Main: Campus Verlag. Retrieved from https://content-select.com/media/moz_viewer/519cc457-3eb8-4599-9999-290f5dbbeaba.
- Bernstein, J. H. (2015). Transdisciplinarity: A review of its origins, development, and current issues. *Journal of Research Practice*, 11(1). Retrieved from <http://jrp.icaap.org/index.php/jrp/article/view/510/412>.
- Beutel, S.-I., Höhmann, K., Pant, & Schratz, M. (Eds.). (2016). *Handbuch gute Schule: sechs Qualitätsbereiche für eine zukunftsweisende Praxis. [Manual for Good Schools: Six Quality Areas for a Future-Orientated Practice]*. Seelze: Klett/Kallmeyer.
- Blömeke, S. (2006). Struktur der Lehrerausbildung im internationalen Vergleich. Ergebnisse einer Untersuchung zu acht Ländern [Structures of Teacher Education by International Comparison]. *Zeitschrift für Pädagogik*, 52(3), 393–416. Retrieved from <http://www.pedocs.de/volltexte/2011/4466/>.
- Blume, C., Gerlach, D., Roters, B., & Schmidt, T. (2019). The ABCs of inclusive English teacher education: A quantitative and qualitative study examining the attitudes, beliefs and (reflective) competence of pre-service foreign language teachers. *TESL-EJ*, 22(4).
- BMBF. (2017). *New approaches to teacher training Incentives from the programme 'Qualitätsoffensive Lehrerbildung'*. Retrieved from https://www.qualitaetsoffensive-lehrerbildung.de/files/BMBF-Neue_Wege_in_der_Lehrerbildung_kurz_engl_barrierefrei.pdf.
- Boer, H., Fahrenwald, C., & Spies, A. (2018). Professionalization in teacher education as an interorganizational learning challenge. *Frontiers in Education*, 3, 1–8. <https://doi.org/10.3389/educ.2018.00004>

- Bormann, I. (2011). *Zwischenräume der Veränderung: Innovationen und ihr Transfer im Feld von Bildung und Erziehung*. Freie Univ., Fachbereich Erziehungswissenschaft und Psychologie, Habil.-Schr.—berlin, 2009 [Interspaces of Change: Innovation and Its Transfer in the Field of Education.] (1. Aufl.). Wiesbaden: VS Verlag für Sozialwissenschaften/Springer Fachmedien Wiesbaden GmbH Wiesbaden. Retrieved from <http://gbv.ebib.com/patron/FullRecord.aspx?p=747868>.
- Broekkamp, H., & van Hout-Wolters, B. (2007). The gap between educational research and practice: A literature review, symposium, and questionnaire. *Educational Research and Evaluation*, 13(3), 203–220. <https://doi.org/10.1080/13803610701626127>
- Bürgener, L., & Barth, M. (2018). Sustainability competencies in teacher education: Making teacher education count in everyday school practice. *Journal of Cleaner Production*, 174, 821–826. <https://doi.org/10.1016/j.jclepro.2017.10.263>
- Coburn, C. E., & Penuel, W. R. (2016). Research–practice partnerships in education: Outcomes, dynamics, and open questions. *Educational Researcher*, 45(1), 48–54. <https://doi.org/10.3102/0013189X16631750>
- Cohen, L., Manion, L., & Morrison, K. (2018). Experiments. In L. Cohen, L. Manion, & K. Morrison (Eds.), *Research methods in education* (pp. 391–426). New York: Routledge.
- Dewey, J. (1904). The relation of theory to practice in education. In C. A. McMurry (Ed.), *The Third yearbook of the national society for the scientific study of education* (pp. 9–30). Chicago, Ill: The University of Chicago Press. Retrieved from <https://archive.org/stream/r00elationoftheorynatirich#page/21/mode/1up>.
- Einsiedler, W. (2010). Didaktische Entwicklungsforschung als Transferförderung [didactical development research as transfer support]. *Zeitschrift für Erziehungswissenschaft*, 13(1), 59–81. <https://doi.org/10.1007/s11618-010-0106-y>
- Fraefel, U. (2018). Hybride Räume an der Schnittstelle von Hochschule und Schulfeld: Ein zukunftsweisendes Konzept der Professionalisierung von Lehrpersonen [Hybrid Spaces at the Interface of University and School]. In L. Pilypaitytė, & H.-S. Siller (Eds.), *Schulpraktische Lehrerbildungsprofessionalisierung als Ort der Zusammenarbeit* (pp. 13–43). Wiesbaden: Springer VS.
- Fullan, M. (2016). *The NEW meaning of educational change* (5th ed.). New York, London, Toronto: Teachers College Press; Routledge; Ontario Principals' Council. Retrieved from <https://ebookcentral.proquest.com/lib/leuphana/detail.action?docID=4513498>.
- Gogolin, I., & Prenzel, M. (2010). Transfer und Transferforschung in der Erziehungswissenschaft [Transfer and Transfer Research in Educational Science] [Special issue]. *Erziehungswissenschaft*, 13(1). VS Verlag.
- Gräsel, C. (2010). Stichwort: Transfer und Transferforschung im Bildungsbereich [Keyword: Transfer and Transfer Research in Education]. *Zeitschrift für Erziehungswissenschaft*, 13(1), 7–20. <https://doi.org/10.1007/s11618-010-0109-8>
- Gräsel, C., Jäger, M., & Willke, H. (2005). *Konzeption einer übergreifenden Transferforschung unter Einbeziehung des internationalen Forschungsstandes [concept of an overlapping transfer research which involves the international state of research]*. Fachbereich G, Bildungswiss: Wuppertal: Univ. Retrieved from <http://edok01.tib.uni-hannover.de/edoks/e01fb06/510705960.pdf>.
- Gräsel, C., & Parchmann, I. (2004). Implementationsforschung - oder: der steinige Weg, Unterricht zu verändern [Implementation Research]. *Unterrichtswissenschaften*, 32(2), 196–214.
- Hallbeek, U., & Reusser, K. (2008). Outputsteuerung, Accountability, Educational Governance – einföhrung in Geschichte, Begrifflichkeiten und Funktionen von Bildungsstandards [Output Control, Accountability, Educational Governance - introduction to the History, Concepts and Functions of Educational Standards]. *Beiträge Zur Lehrerinnen- Und Lehrerbildung*, 26(3), 253–266. Retrieved from www.pedocs.de/volltexte/2017/13677/.
- Hargreaves, A., & Shirley, D. (2009). *The fourth way: The inspiring future for educational change*. Thousand Oaks, Calif: Corwin Press.
- Hericks, U. (2004). 3.4 Verzahnung der Phasen der Lehrerbildung [3.4 Interlinking of the Phases in Teacher Education]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 301–311). Bad Heilbrunn/Obb.: Klinkhardt.
- Hirsch Hadorn, G., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffmann-Riem, H., Joye, D., Pohl, C., ... Zemp, E. (2008). The emergence of transdisciplinarity as a form of research. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, et al. (Eds.), *Handbook of transdisciplinary research* (pp. 19–39). Dordrecht: Springer Science + Business Media B.V.
- Jahn, T. (2008). Transdisziplinarität in der Forschungspraxis. [Transdisciplinarity in research practice]. In M. Bergmann, & E. Schramm (Eds.), *Transdisziplinäre Forschung: Integrative Forschungsprozesse verstehen und bewerten* (pp. 21–37). Frankfurt/Main: Campus-Verl. Retrieved from <http://www.iso.de/fileadmin/redaktion/Downloads/Transdisziplinaritaet/jahn-transdisziplinaritaet-2008.pdf>.
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Kleemann, K., Jennek, J., & Vock, M. (Eds.). (2019). *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern [Supporting Cooperation of University and School: Strengthen Schools, Improve Teacher Education]*. Leverkusen: Verlag Barbara Budrich.
- KMK. (2014). *Standards für die Lehrerbildung: Bildungswissenschaften: Beschluss der Kultusministerkonferenz vom 16.12.2014 [Standards for Teacher Education]*. Retrieved from http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2004/2004_12_16-Standards-Lehrerbildung.pdf.
- KMK. (2016). *Gesamtstrategie der Kultusministerkonferenz zum Bildungsmonitoring [Overall strategy of the Conference of Education Ministers for educational monitoring]*. Retrieved from http://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2015/2015_06_11-Gesamtstrategie-Bildungsmonitoring.pdf.
- Klein, J. T. (2014). Discourses of transdisciplinarity: Looking back to the future. *Futures*, 63, 68–74. <https://doi.org/10.1016/j.futures.2014.08.008>
- Kulin, S. (2019). Beziehungen bilden als wesentliches Merkmal von Lehrer/innen-Bildung: Ein Fallbeispiel zu phasen- und institutionenübergreifenden Entwicklungsteams [Building Relationships as an Essential Characteristic of Teacher Education. A Case Study on Phase- and Institution-Crossed Development Teams.]. In U. Graf, & T. Iwers (Eds.), *Beziehungen bilden: Wertschätzende Interaktionsgestaltung in pädagogischen Handlungsfeldern. Schriftenreihe zur Humanistischen Pädagogik und Psychologie* (pp. 166–178). Bad Heilbrunn: Klinkhardt.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., ... Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Loogma, K., Tafel-Viia, K., & Ümarik, M. (2013). Conceptualising educational changes: A social innovation approach. *Journal of Educational Change*, 14(3), 283–301. <https://doi.org/10.1007/s10833-012-9205-2>
- McKenney, S., & Reeves, T. C. (2018). *Conducting educational design research*. New York: Routledge. <https://doi.org/10.4324/9781315105642>
- Messner, H. (2012). Leitlinien einer phasenübergreifenden Professionalisierung der Lehrerbildung [Guidelines of a Cross-Phase Professionalisation of Teacher Education]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 63–92). Immenhausen: Prolog.
- Muhar, A., Vilsmaier, U., Glanzer, M., & Freyer, B. (2006). Initiating transdisciplinarity in academic case study teaching. *International Journal of Sustainability in Higher Education*, 7(3), 293–308. <https://doi.org/10.1108/1467370610677856>
- Nickolaus, R., Abel, M., & Gräsel, C. (Eds.). (2006). *Innovation und transfer: Expertisen zur Transferforschung*. Baltmannsweiler: Schneider-Verl. Hohengehren.
- Nicolescu, B. (Ed.). (2008). *Advances in systems theory, complexity, and the human sciences. Transdisciplinarity: Theory and practice*. Cresskill, NJ: Hampton Press.
- Nowotny, H. (2003). Dilemma of expertise: Democratizing expertise and socially robust knowledge. *Science and Public Policy*, 30(3), 151–156. <https://doi.org/10.3152/147154303781780461>
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking science: Knowledge and the Public in an Age of uncertainty* (1. Aufl.). Cambridge: Polity Press.
- OECD. (2003). *Attracting, developing and retaining effective teachers: OECD activity, country background report for the Federal Republic of Germany*.
- Penuel, W. R., Allen, A.-R., Coburn, C. E., & Farrell, C. (2015). Conceptualizing research–practice partnerships as joint work at boundaries. *Journal of Education for Students Placed at Risk*, 20(1–2), 182–197. <https://doi.org/10.1080/10824669.2014.988334>
- Peperkorff, M., & Frohn, J. (2018). Prototypische Lehr-Lern-Bausteine: Ein Vergleich der Projektarbeit von ZL Lüneburg und FDQI-HU Berlin [Prototypical teaching and learning modules]. *Journal Für LehrerInnenbildung*, 18(3), 62–67.
- Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Malden: Blackwell. Retrieved from <http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10158863>.
- Prenzel, M. (2010). Geheimnisvoller Transfer?: Wie Forschung der Bildungspraxis nützen kann [Mystical transfer? How research can be useful in the educational practice]. *Zeitschrift für Erziehungswissenschaft*, 13(1), 21–37. <https://doi.org/10.1007/s11618-010-0114-y>
- Raidt, T. (2010). Bildungsreformen nach PISA: Paradigmenwechsel und wertewandel [educational reforms according to PISA. Paradigm shift and change of values.]. Hamburg: Tradition.
- Rogers, E. M. (2003). *Diffusion of innovations* (5. ed). New York, NY: Free Press.
- Rürup, M. (2013). Graswurzelbewegungen der Innovation -Zur Innovativität von Schulen und Lehrkräften "At-the-Bottom" der Schullandschaft [Grassroots Movements of Innovation - to Innovate Schools and Teachers "At-the-Bottom" of the School Landscape]. In M. Rürup, & I. Bormann (Eds.), *Educational governance: Vol. 21. Innovationen im Bildungswesen: Analytische Zugänge und empirische Befunde* (pp. 269–301). Wiesbaden: Springer VS.
- Educational governance. In Rürup, M., & Bormann, I. (Eds.), *Innovationen im Bildungswesen: Analytische Zugänge und empirische Befunde [Innovations in Education]* (Vol. 21), (2013). Wiesbaden: Springer VS. <https://doi.org/10.1007/978-3-531-19701-2>. Retrieved from.
- Schilling, L., & Leiß, D. (2019). Competence-oriented teaching: Combining theory and practice in a future-oriented teacher education. *Research in Teacher Education*, 9(2), 6–11.
- Scholz, R. W., & Steiner, G. (2015). The real type and ideal type of transdisciplinary processes: Part I—theoretical foundations. *Sustainability Science*, 10(4), 527–544. <https://doi.org/10.1007/s11625-015-0326-4>
- Sim, C. (2006). Preparing for professional experiences – incorporating pre-service teachers as "community of practice. *Teaching And Teacher Education : An International Journal of Research and Studies ; Tate*, 22(1), 76–83.
- Snyder, J., Bolin, F., & Zumwalt, K. (1992). Curriculum implementation. In P. W. Jackson (Ed.), *Handbook of research on curriculum: A project of the American educational research association* (pp. 402–435). New York: Macmillan.
- Stark, R. (2010). Integrative Lehr-Lernforschung [Integrative teaching and learning research]. In K.-H. Arnold, K. Hauenchild, B. Schmidt, & B. Ziegenmeyer (Eds.), *Zwischen Fachdidaktik und Stufendidaktik* (pp. 305–314). Wiesbaden: VS Verlag

- für Sozialwissenschaften.
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>
- Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZL-Network, Leuphana University Lüneburg]. In K. Kleeman, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 57–82). Leverkusen: Verlag Barbara Budrich.
- Straub, R., Spöhrer, S., & Meimerstorf, L. (2019). Disziplinen- und phasenübergreifende Kooperation für die Lehrkräftebildung fruchtbar machen: Einsichten aus dem Entwicklungsteam TIES im Kontext inklusiven Englischunterrichts [How to make interdisciplinary and cross-phase cooperation fruitful for teacher training]. In C. Blume, D. Gerlach, N. Benitt, S. Eßer, M. Roters, J. Springob, & T. Schmidt (Eds.), *Perspektiven inklusiven Englischunterrichts: Gemeinsam lehren und lernen*. Retrieved from <https://inklusive-englischunterricht.de/2019/08/disziplinen-und-phasenuebergreifende-kooperation-fuer-die-lehrkraeftebildung-fruchtbar-machen/>.
- Straub, R., & Waschewski, T. (2019). Transdisziplinäre Entwicklungsteams - Lerntheoretische und didaktische Implikationen eines kooperativen Ansatzes zur Theorie-Praxis-Verzahnung in der Lehrkräftebildung [Transdisciplinary Development Teams - Learning Theoretical and Didactical Implications of a Cooperative Approach to the Interlinking in Teacher Education]. In BMBF (Ed.), *Verzahnung von Theorie und Praxis im Lehramtsstudium: Erkenntnisse aus Projekten der "Qualitätsoffensive Lehrerbildung"* (pp. 63–73). Berlin. Retrieved from https://www.bmbf.de/upload_filestore/pub/Verzahnung_Theorie_Praxis_Lehramtsstudium_Erkenntnisse_QLB.pdf.
- Sutherland, L., Scanlon, L., & Sperring, A. (2005). New directions in preparing professionals: Examining issues in engaging students in communities of practice through a school- university partnership. *Teaching and Teacher Education*, 21(1), 79–92.
- Van den Bossche, P., Gijsselaers, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>
- Vilsmaier, U., Brandner, V., & Engbers, M. (2017). Research In-between: The Constitutive Role of Cultural Differences in Transdisciplinarity. *Transdisciplinary Journal of Engineering & Science*, 8(1), 169–179. <https://doi.org/10.22545/2017/00093>
- Vilsmaier, U., Engbers, M., Luthardt, P., Maas-Deipenbrock, R. M., Wunderlich, S., & Scholz, R. W. (2015). Case-based Mutual Learning Sessions: Knowledge integration and transfer in transdisciplinary processes. *Sustainability Science*, 10(4), 563–580. <https://doi.org/10.1007/s11625-015-0335-3>
- Waschewski, T. (2018). Rechtschreibunterricht innovieren: Wie die Zusammenarbeit in einer „Community of Practice“ die Unterrichtspraxis von Lehrpersonen verändert [Innovating Spelling Lessons. How Collaboration in a “Community of Practice” Changes the Teaching Practice of Teachers]. In S. Riegler, & S. Weinhold (Eds.), *Rechtschreibung unterrichten: Lehrerforschung in der Orthographiedidaktik* (pp. 173–191) (Berlin: Schmidt, Erich).
- Weinhold, S. (2018). Das „Professionelle Entwicklungsteam Deutsch“: Ein Modell der Kooperation von Wissenschaftlerinnen, Studierenden und Lehrpersonen zur Entwicklung des Rechtschreibunterrichts in der Primarstufe [The „Professional Development Team in German Didactics“]. In S. Riegler, & S. Weinhold (Eds.), *Rechtschreibung unterrichten: Lehrerforschung in der Orthographiedidaktik* (pp. 153–172) (Berlin: Schmidt, Erich).
- Weinhold, S., Bormann, F., Fischer, J., Hase, A., Junge, N., & Waschewski, T. (in press). Syntaxbasierte Großschreibung von Anfang an?!: Ergebnisse eines institutionenübergreifenden fachdidaktischen Forschungs- und Entwicklungsprojekts. [Syntax-based capitalization from the beginning?!]. In Hlebec, H., & Sahel, S. (Eds.), *Orthografie am Übergang*. Berlin: de: Gruyter.
- Weyland, U. (2012). *Expertise zu den Praxisphasen in der Lehrerbildung in den Bundesländern* [Expertise in Practical Phases of the Teacher Education in all States]. Retrieved from <https://li.hamburg.de/contentblob/3305538/70560ef5e16d6de60d5d7d159b73322f/data/pdf-studie-praxisphasen-in-der-lehrerbildung.pdf?=-45499CC1240EB3EB38027EE816A1DBFA.liveWorker2>.
- Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education*, 61(1-2), 89–99. <https://doi.org/10.1177/0022487109347671>
- ZZL-Netzwerk. (2018). *Ergebnisse [Findings]*. Retrieved from <https://www.leuphana.de/zentren/zzl/zzl-netzwerk-20-2019-2023/zzl-netzwerk-10-2016-2019/ergebnisse-aus-den-entwicklungsteams.html>.



Appendix II: Study B - Guiding Principles for Transdisciplinary Development Teams

Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZL-Network, Leuphana University Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 57–82). Verlag Barbara Budrich. <https://doi.org/10.3224/84742209.04>.

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Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg^{1, 2}

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1 Einleitung

In den letzten zwei Jahrzehnten wurden die intensiven Reformbestrebungen in Folge des sogenannten „PISA-Schocks“ durch eine breit und intensiv geführte Debatte über die grundlegenden Strukturen und Bedingungen in der Lehrkräftebildung begleitet. Kooperationen zwischen den Vertretern/-innen der drei Phasen Studium, Referendariat und Schuldienst stellen hierbei inzwischen altbekannte Forderungen mit dem Ziel einer besseren Verzahnung zwischen akademischer Ausbildung und berufspraktischem Handeln dar. Obwohl diese zunehmend im bildungswissenschaftlichen sowie pädagogisch-didaktischen Diskurs verhandelt werden und einschlägige Arbeiten zu angrenzenden Themen, wie bspw. Lehrkräftekooperationen (Fussangel 2008), interprofessionelle Zusammenarbeit (Dizinger/Fussangel/Böhm-Kasper 2011) und Bildungsnetzwerken (Kolleck et al. 2016) vorliegen, bestehen weiterhin zentrale Forschungs- und Entwicklungsbedarfe hinsichtlich der Konzeption und Ausgestaltung institutionen- und phasenübergreifender Zusammenarbeit (Gräsel 2011; Gräsel/Parchmann 2004).

Der vorliegende Artikel versteht sich im Kontext des Sammelbands als Beitrag zur theoretisch-konzeptionellen Rahmung multilateraler Kooperationen in der Lehrkräftebildung. Am Beispiel des „Qualitätsoffensive Lehrerbildung“-Projekts ZZL-Netzwerk der Leuphana Universität Lüneburg wird das Konzept transdisziplinärer Entwicklungsteams vorgestellt und kritisch diskutiert. Der Beitrag steckt somit den weiteren konzeptionellen Rahmen des ebenfalls in

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- 1 Das ZZL-Netzwerk am namensgebenden Zukunftszentrum Lehrerbildung der Leuphana Universität Lüneburg wird im Rahmen der gemeinsamen „Qualitätsoffensive Lehrerbildung“ von Bund und Ländern aus Mitteln des Bundesministeriums für Bildung und Forschung gefördert (Förderkennzeichen: 01JA1603; www.leuphana.de/zzl-netzwerk). Die Verantwortung für den Inhalt dieser Veröffentlichung liegt bei den Autoren.
 - 2 Die Autoren danken Sarina Scharnberg sowie anonymen Reviewern/-innen für kritisch-konstruktive Hinweise bei der Begutachtung einer früheren Beitragsfassung. Ebenso ist Hanna Elsner für die gewissenhafte Unterstützung bei der redaktionellen Überarbeitung gedankt.

diesem Band vorgestellten Praxisbeispiels zum Entwicklungsteam Mathematik ab (vgl. Scharnberg in diesem Band).

Den Ausgangspunkt des Beitrags bilden zentrale Bezugsprobleme institutionen- und phasenübergreifender Lehrkräftebildung (Kap. 2), anhand derer zugleich herausgestellt wird, warum eine ebenso akademisch anspruchsvolle wie handlungsorientierte Lehrkräftebildung auf kooperative Formate angewiesen ist. Im Anschluss daran werden prominent rezipierte Theorieangebote kooperativer Lehrkräftebildung – namentlich Third Spaces, Community of Practice (CoP) und Research-Practice Partnerships (RPPs) – vorgestellt und mit Blick auf das aus den Nachhaltigkeitswissenschaften entlehnte Konzept transdisziplinärer Forschung und Entwicklung diskutiert (Kap. 3). Im Anschluss an die theoretische Verortung folgt ein Überblick über die im Rahmen des ZZL-Netzwerks etablierten transdisziplinären Entwicklungsteams (Kap. 4). Im Zuge der darauffolgenden kritischen Schlussbetrachtung werden die Ausführungen zu den Entwicklungsteams vor dem Hintergrund der theoretischen Verortung reflektiert (Kap. 5).

Der Beitrag bietet somit anhand des Konzepts transdisziplinärer Entwicklungsteams konkrete Gestaltungsvorschläge für institutionen- und phasenübergreifende Kooperationen und trägt gleichzeitig durch die Auseinandersetzung mit einer vielversprechenden, aber in der bildungs- und erziehungswissenschaftlichen Diskussion bisher kaum verhandelten Transdisziplinaritätsperspektive zur Theorieentwicklung bei.

2 Bezugsprobleme kooperativer Lehrkräftebildung

Eine persistente Herausforderung für die Lehrkräftebildung stellt die organisationale, inhaltlich-curriculare und interpersonale Verzahnung und somit die Koordination und Zusammenarbeit der an ihr beteiligten Institutionen, Organisationen und Akteursgruppen dar (Hericks 2004; Villiger 2015). Dies findet nicht zuletzt seinen Ausdruck in den Schwerpunktthemen der durch Bund und Länder geförderten „Qualitätsoffensive Lehrerbildung“, zu denen deutschlandweit 59 involvierte Hochschulstandorte in 49 Projekten arbeiten. Schwerpunkte sind u.a. (Monitor Lehrerbildung 2016; Altrichter/Durdel/Fischer-Münnich 2017):

- Optimierung der Strukturen in der Lehrkräftebildung
- Praxisbezug
- Vernetzung von Fachwissenschaften, Fachdidaktiken und Bildungswissenschaften

Ein Blick auf die fortwährenden Reformbestrebungen in der Lehrkräftebildung verdeutlicht jedoch, dass diese Themenbereiche keineswegs nur dem gegenwärtigen Zeitgeist geschuldet sind. Vielmehr handelt es sich hierbei um in unterschiedlicher Weise akzentuierte, jedoch inhaltlich wiederkehrende Herausforderungen.

Unter dem Schlagwort „Theorie-Praxis-Problem“ wird bspw. eine Reihe unterschiedlicher Spannungsfelder adressiert, die aus den gleichzeitigen Anforderungen einer akademischen, d.h. theoretisch-konzeptionell fundierten sowie evidenzbasierten Ausbildung einerseits und Forderungen nach berufspraktischen Handlungskompetenzen andererseits resultieren (Villiger 2015). Nicht zuletzt, da bereits Ende der 1970er-Jahre mit dem Ausdruck „Praxisschock“ auf den wahrgenommenen Mangel berufspraktischer Elemente während des Lehramtsstudiums verwiesen wurde (u.a. Müller-Fohrbrodt/Cloetta/Dann 1978), konstatiert Terhart zwanzig Jahre später in einem vielbeachteten Gutachten der durch die Kultusministerkonferenz (KMK) beauftragten Expertenkommission, dass „der Ruf nach mehr Praxis!‘ (...) ein ‚argumentativer Dauerbrenner‘ seit Einrichtung einer organisierten Lehrerbildung“ (2000: 107) sei.

Diese Wahrnehmung setzt sich trotz der ab 2005 per Beschluss der KMK vorgenommenen Ausweitung der Praxisanteile im Studium in Form von aufeinander aufbauenden Kurz- und Langzeitpraxisphasen fort (Weyland 2012; KMK 2005). Aktuelle Forschungsbefunde indizieren indes, dass der qualitative Aufbau berufspraktischer Kompetenzen nicht einfach durch ein „Mehr“ an Praxisbezügen sichergestellt werden kann, sondern einer fundierten, theoretisch-konzeptionellen Einbettung, bspw. in Form von Vorbereitungs- und Begleitseminaren, bedarf. Diese ermöglicht, konkretes (schul-)pädagogisches Handeln systematisch zu verorten und zu reflektieren (Gröschner 2015).

Unter den Schwerpunktthemen „Bildungsstandards“ und „Kompetenzorientierung“ lässt sich ein weiterer langjähriger Reformdiskurs in der Lehrkräftebildung zusammenfassen. Dieser zielt im Kern auf die Frage ab, wie durch allgemeinverbindliche Vorgaben und Rahmungen sowohl die Qualität schulischen Unterrichts als auch die Ausbildung von angehenden Lehrkräften substantiell verbessert werden kann (Klieme 2011). In Folge des, hinter den allgemeinen Erwartungen weit zurückbleibenden, Abschneidens deutscher Schülerinnen und Schüler bei international vergleichenden Schulleistungsstudien³ und des öffentlich kontrovers diskutierten „PISA-Schocks“ (Artelt et al. 2001), wurden allgemeinverbindliche Bildungsstandards sowie Kerncurricula für Schulen (Klieme et al. 2007) als auch Standards für die Lehrkräfteausbildung (KMK 2014) eingeführt. Diesen liegen der Kognitionspsychologie entlehnte Kompetenzmodelle zugrunde, die es ermöglichen sollen, Handlungskompetenzen in Kompetenzbereiche aufzuschlüsseln und entlang sukzessiv auf-

3 An dieser Stelle sei exemplarisch auf Studien, wie PISA – Programme for International Student Assessment, TIMSS – Trends in International Mathematics and Science Study und PIRLS – Progress in International Reading Literacy Study verwiesen.

bauender Niveaustufen diagnostizieren, beurteilen und fördern zu können (u.a. Baumert/Kunter 2006, 2011). Das ausschlaggebende Argument in Bezug auf die Theorie-Praxis-Integration lautet, dass unter dem Kompetenzbegriff explizit die konkrete Befähigung, fachspezifische Problemstellungen unter Rückgriff auf entsprechendes Handlungsrepertoire bewältigen zu können, verstanden wird. Demnach liegt den Kompetenzmodellen bereits der Anspruch zugrunde, nicht nur über formales, mitunter „träges“ fachliches bzw. fachdidaktisches Wissen zu verfügen, sondern dieses in konkreten Handlungssituationen problemadäquat aktivieren, anwenden bzw. übertragen zu können (Reusser 2014). Eine kompetenzorientierte Lehrkräftebildung wiederum bedarf daher der Verbindung fachlichen sowie fachdidaktischen Wissens mit ausbildungs- bzw. berufspraktischem Handeln.

Die bisher skizzierten Problemlagen eint die Notwendigkeit der gemeinsamen Anstrengung zahlreicher an der Lehrkräftebildung beteiligten bzw. von ihr betroffenen Akteursgruppen, Organisationen und Institutionen. Die Verzahnung der an der Lehrkräftebildung beteiligten Institutionen ist jedoch in Gutachten unterschiedlicher Expertenkommissionen und durch den Wissenschaftsrat wiederholt als unzureichend, wenn nicht gar als durch wechselseitige Abgrenzungstendenzen gekennzeichnet, beschrieben worden (Döbrich et al. 2003: 24; Terhart 2000: 120; Wissenschaftsrat 2008: 57–58). Als eine Reaktion darauf erfolgte bundesweit eine flächendeckende Einrichtung von Zentren für Lehrkräftebildung bzw. Schools of Education, die eine institutionelle Stärkung der Lehrkräftebildung innerhalb der bestehenden Universitätsstrukturen, aber auch in Hinblick auf eine bessere Kommunikation und Koordination zwischen Universität, Studienseminar, Schule und Behörden sowie weiteren Partnerorganisationen, ermöglicht (Merkens 2005; Messner 2012). Vor dem Hintergrund, dass eine grundsätzliche Infragestellung des dreiphasigen Lehrkräftebildungssystems in Deutschland zugunsten eines integrierten Modells nach wie vor nicht flächendeckend diskutiert wird (Hericks 2004: 303; aktuelles Gegenbeispiel Riedl et al. 2018), bedarf es weiterer kooperativer Formate, die eine integrative Verzahnung von akademischen und schulpraktischen Anteilen der Lehrkräftebildung befördern.

3 Theoretische Verortung

Das vorliegende Kapitel dient der theoretischen Verortung institutionenübergreifender Ansätze in der Lehrkräftebildung und verfolgt das Ziel, einen konzeptionellen Referenzrahmen für die in Kap. 4 vorzustellenden transdisziplinären Entwicklungsteams abzustecken. Zu diesem Zweck werden in Kap. 3.1 drei Ansätze, namentlich Hybride Räume bzw. Third Spaces, Community of

Practice (CoP) und Research-Practice Partnerships (RPPs), vorgestellt, die in den einschlägigen Diskursen zur institutionen- und phasenübergreifenden Lehrkräftebildung verhandelt werden.⁴ Zudem wird die in der Lehrkräftebildung bisher kaum rezipierte Transdisziplinaritätsperspektive eingeführt, weshalb hierfür einer umfassenderen Darstellung Raum gegeben wurde. Im Anschluss daran gilt es in Kap. 3.2 die vorgestellten Ansätze in Bezug zueinander zu setzen und konzeptionelle Schnittstellen und Abgrenzungspunkte herauszuarbeiten.

3.1 Institutionenübergreifende Kooperationsansätze in der Lehrkräftebildung

3.1.1 Hybride Räume und Third Spaces

Das Konzept des Hybriden Raums bzw. der Third Spaces wird insbesondere in den USA und der Schweiz als fruchtbarer Referenzrahmen für das Zusammenspiel der an der Aus- und Weiterbildung von Lehrkräften beteiligten Institutionen verstanden (Zeichner 2010; Fraefel/Bernhardsson-Laros 2016). Diese werden im Wesentlichen als ein „Ort der Verhandlung“ gefasst, innerhalb dessen die Interessen, Sichtweisen und (Problem-)Verständnisse aus unterschiedlichen Herkunftskontexten dargelegt und ausgehandelt werden (Fraefel/Bernhardsson-Laros 2016: 103).

Ein charakteristisches Element des Hybriden Raums besteht in der strukturellen Offenheit. Trotz ungleich verteilter Ressourcenausstattung, Status- und Hierarchieansprüche sowie Deutungsmacht und Autorität, ermöglicht dies eine Annäherung an die Forderungen nach einem gleichberechtigteren Verhältnis zwischen Forschung und Praxis (Zeichner 2010; Gorodetsky/Barak 2008: 1907–1908). Demnach sei ein Hybrider Raum als ein „herrschaftsarmer Raum“ zu denken, „in dem kein Element a priori dominiert oder mehr Gewicht hätte, es sei denn, es überzeuge im Diskurs und bewähre sich in der Praxis“ (Fraefel/Bernhardsson-Laros 2016: 105).

Hierbei wird meist betont, dass die aufgrund der Auseinandersetzung hervorgegangenen Denkmuster und Handlungsrouninen einen, entsprechend namensprägenden, hybriden Charakter aufweisen und sich nicht eindeutig oder ausschließlich einem Herkunftskontext zuordnen ließen. Daher weisen Third Spaces Eigenschaften von Zwischenräumen auf, die sich einer Zuschreibung des Entweder-oder entziehen und sich stattdessen treffender durch ein Sowohl-

4 Exemplarisch sei auf Beiträge in diesem Band verwiesen: Bartsch/Bönninghausen wie auch Staub setzen sich mit Third Spaces bzw. Hybriden Räumen auseinander, während Dreher/von Gehlen/Holzäpfel/Hochbruck auf das Konzept der Community of Practice zurückgreifen.

als-auch beschreiben lassen (Zeichner 2010: 92). Mit Bezug auf die Lehrkräftebildung meint dies, dass ein Third Space durch Denkmuster und Handlungs-routinen gekennzeichnet ist, die sowohl der Domäne der Wissenschaft als auch der Schulpraxis entspringen können. In dieser Hinsicht wird der Ansatz des Third Space bzw. der Hybridität als vielversprechend für die Überwindung des Theorie-Praxis-Problems verstanden (Fraefel/Bernhardsson-Laros 2016: 103–104).

3.1.2 *Community of Practice (CoP)*

Ein weiteres Konzept, welches kooperatives Arbeiten beschreibt, sind Communities of Practice (CoP). In Bezug auf die Lehrkräftebildung liegen verschiedene Arbeiten vor, in denen der Zusammenschluss von Lehramtsstudierenden zu CoPs untersucht wird und die Potenziale für die Entwicklung professioneller Handlungskompetenzen herausgearbeitet werden (u.a. Sim 2006; Jimenez-Silva/Olson 2012). Die explizite Auseinandersetzung mit institutionenübergreifenden Kooperationen stellt jedoch nach wie vor eine Ausnahme dar (vgl. Dreher/von Gehlen/Holzäpfel/Hochbruck in diesem Band).

Das Konzept der CoP geht auf Arbeiten zur Theorie des Sozialen Lernens zurück (Lave/Wenger 2011) und bezeichnet ein soziales Konstrukt, in welchem sich Personen aus ähnlich gelagerten professionellen Kontexten austauschen und einander unterstützen (Wenger 2000: 227). Hierzu richten die Mitglieder einer CoP ihre Ressourcen und ihre Aktivitäten auf ein gemeinsames Anliegen bzw. Domäne aus (Wenger/McDermott/Snyder 2002: 29–32). Die CoPs dienen somit als ein Forum, in dem es zu Lerneffekten der Mitglieder im Wesentlichen über die Interaktionen in der Gruppe kommt.

Das gemeinsame zielgerichtete Handeln basiert auf Integrations- und Sozialisationsprozessen im Fokus einer „shared practice“ (ebd.: 37–40). Dabei greifen die Mitglieder bspw. auf gemeinsame Lösungsstrategien für themenspezifische Problematiken oder auf Erfahrungsberichte anderer Mitglieder zurück. Dieses Repertoire umfasst ebenfalls den Gebrauch von in der Gruppe bereitgestellten Artefakten, Instrumenten oder Datenbanken. Der Lernprozess, der durch die Interaktionen und Partizipation an einer gemeinsamen Praxis geschieht, folgt dem Muster der „legitimate peripheral participation“ im Spannungsfeld zwischen Novizen und erfahrenen Mitgliedern einer CoP (Lave/Wenger 2011). Durch routinierte Interaktion wird letztendlich eine vollwertige Partizipation im Kontext der CoP erreicht. Die CoPs beschreiben somit einen durch das gemeinsame Interesse der Mitglieder beförderten, langfristigen und informellen Strukturaufbau vor dem Hintergrund des sozialen Lernens.

3.1.3 *Research-Practice Partnerships (RPPs)*

Nicht zuletzt aufgrund positiver Erfahrungen in den USA, Großbritannien und den Niederlanden finden in letzter Zeit sogenannte Research-Practice Partnerships, kurz RPPs, Einzug in den deutschen Lehrkräftebildungsdiskurs. Diese multiprofessionelle Kooperationsform intendiert, die Perspektiven der Lehrkräfteausbildung miteinander zu verzahnen, um der Kluft zwischen (akademischer) Forschung mit theorielastiger Perspektive und den Herausforderungen einer „everyday classroom“ Praxis zu begegnen (Hennessy 2014).

In erster Linie bezeichnen RPPs „long-term collaborations between practitioners and researchers“ (Coburn/Penuel 2016: 48; Penuel et al. 2015). Durch die langfristig angelegte Perspektive wird eine Organisationsstruktur für Institutionen der beruflichen Praxis und der Universität aufgebaut, die eine institutionenübergreifende Arbeit durch einen kontinuierlichen Austausch aller Beteiligten ermöglicht. Ziel dieser Kooperationsform ist es, auf persistente Herausforderungen in der Praxis zu reagieren, um passgenaue Lösungen für die Schulentwicklung zu finden – RPPs „are organized to investigate problems of practice and solutions for improving schools and school districts“ (Coburn/Penuel 2016: 48; Penuel et al. 2015). Da Entscheidungsprozesse gemeinsam gestaltet und der Arbeitsfokus möglichst von allen Partnern/-innen festgelegt wird, kommt der wechselseitigen Bezugnahme eine besondere Bedeutung zu (Coburn/Penuel 2016: 49).

Die Bezugskontexte universitärer und (schul-)pädagogischer Praxis bedingen auch unterschiedliche Arbeitsweisen und kulturelle Praktiken der Kooperationspartner/-innen. Voraussetzung für die Arbeit in den RPPs unter der Prämisse einer „Kultur des Miteinanders“ ist daher eine möglichst transparente Kommunikationsstruktur, um die kulturellen Aspekte, wie zum Beispiel unterschiedliche Handlungslogiken, Einstellungen und Werte im Rahmen dieser Kooperationsform zu berücksichtigen. Als ein weiteres Kriterium zur Förderung kontinuierlicher Zusammenarbeit nennen Coburn und Penuel deswegen „carefully designed rules, roles, routines, and protocols that structure interaction“ (ebd.).

3.1.4 *Transdisziplinäre Forschung und Entwicklung*

Die nachstehende Darstellung nimmt auf einen Transdisziplinaritätsdiskurs Bezug, der unter dem Label „joint problem-solving“ auf einen integrativen Forschungs- und Entwicklungsansatz verweist, der vorrangig in den Nachhaltigkeitswissenschaften diskutiert wird (Klein 2014; Hirsch Hadorn et al. 2008). Dieser zielt darauf ab, unterschiedliche Wissensbestände und Expertisen wie auch Interessenlagen und Bedürfnisse über professionelle, disziplinäre, organisationale und institutionelle Grenzen hinweg miteinander in Beziehung zu

setzen und dadurch gemeinsame Lösungsansätze für übergreifende Herausforderungen zu ermöglichen (Bernstein 2015; Hirsch Hadorn et al. 2008). Im Folgenden werden vier zentrale, eng miteinander verzahnte Gestaltungsprinzipien transdisziplinärer Forschung und Entwicklung vorgestellt:

1) Problemlöseorientierung

Transdisziplinäre Prozesse sind durch konkrete Anwendungsbezüge und durch hohe gesamtgesellschaftliche Relevanz gekennzeichnet (Jahn/Bergmann/Keil 2012). Gleichzeitig sprechen sie Problemlagen an, die aufgrund ihrer komplexen Struktur und dynamischen Interdependenzbeziehungen vielfach als „ill-defined“ (Scholz/Steiner 2015: 532), „wicked“ (Neuhauser/Pohl 2015: 100) bzw. „messy“ (Checkland 2000: 17) bezeichnet werden. Dies erfordert, dass der Erarbeitung von konkreten Problemlöseansätzen eine fundierte Bestimmung der jeweiligen Problemlage der beteiligten Akteure/-innen in Abhängigkeit der unterschiedlichen Interessen und Expertisen zugrunde liegt (Felt et al. 2011; Lang et al. 2012: 29–30). Konsequenterweise sollten transdisziplinäre Prozesse so gestaltet sein, dass die Bearbeitung gemeinsamer Problemlagen letztlich in konkrete Lösungsangebote für alle beteiligten Akteursgruppen mündet.

Darüber hinaus weisen Probleme, die transdisziplinäre Zugänge erforderlich machen, eine gewisse Problempermanenz auf. D.h. dass Herausforderungen oftmals systemimmanent sind und daher nicht durch „ein für alle Mal“-Bewältigungsstrategien bedient werden können (Mitchell/Cordell/Fam 2015: 90–91). Die in Kap. 2 ausgeführten Herausforderungen integrativer Lehrkräftebildung weisen allesamt eine ebenso hohe Relevanz sowie Komplexität als auch Beständigkeit auf.

2) Multiperspektivität

Transdisziplinäre Forschungs- und Entwicklungsprozesse werden insbesondere dann erforderlich, wenn sich Problemlagen nicht ohne Weiteres entlang gängiger disziplinärer, professioneller, organisationaler und institutioneller Kategorisierungen verorten und von Expert/-innen jener Provenienz vollständig bearbeiten lassen (Mittelstraß 2003: 9). Vielfach sind Expert/-innen unterschiedlicher Bezugsdisziplinen erforderlich, die multi- bzw. interdisziplinär zusammenarbeiten und so eine Integration notwendiger Expertisen ermöglichen (Klein 2010; Brewer 1999). Die Bearbeitung der transdisziplinären Herausforderung, die einen handlungs- und problemlöseorientierten Anspruch verfolgt, bedingt darüber hinaus die Überschreitung innerwissenschaftlicher Diskurse und den Einbezug von Vertretern/-innen aus den relevanten berufspraktischen Feldern (Jahn/Bergmann/Keil 2012).

Die Frage, welche Akteure/-innen als relevant zu erachten sind, lässt sich nicht a priori bestimmen, sondern muss stets in Abhängigkeit des gemeinsam zu entwickelnden Problemverständnisses heraus erfolgen (Lang et al. 2012: 29–30; Scholz/Steiner 2015: 539). Somit gilt es im Kontext der Lehrkräfteausbildung zu erörtern, welcher Differenzierungsgrad hinsichtlich beteiligter Disziplinen (Fachwissenschaften, Fachdidaktiken, Bildungswissenschaften u.a.), Institutionen (Universität, Studienseminar, Schule, weitere Partnerorganisationen) aber auch mit Blick auf Status- und Berufsgruppen (Wissenschaftler/-innen, Studierende, Lehrkräfte, Studienseminarmitarbeiter/-innen) als notwendig bzw. zielführend zu erachten ist.

3) Partizipation

Transdisziplinäre Prozesse sind gekennzeichnet durch eine hohe Mitbestimmung und Teilhabe aller involvierten Akteursgruppen. In der Forschungsliteratur finden sich hierzu eine Vielzahl von Ansätzen, Konzepten und Fallstudien (u.a. Bammer 2015; Defila/Di Giulio/Scheuermann 2006), die hinsichtlich ihrer Funktion und ihres Grads der Beteiligung entlang des Forschungs- und Entwicklungsprozesses variieren (Elzinga 2008; Defila/Di Giulio/Scheuermann 2006: 216–217). Die Konzepte bzw. Studien können bspw. in Form von multidisziplinären/-professionellen Steuerungsgruppen (Bergmann/Schramm 2008) bis zu vollständig-partizipativer Forschung und Entwicklung (Unger 2014) reichen.

Teilhabe nimmt im Kontext transdisziplinärer Prozesse insofern einen zentralen Stellenwert ein, als die integrative Verhandlung akteursgruppenspezifischer Wissensbestände und Expertisen, unter Berücksichtigung jeweiliger Bedürfnisse und Interessenslagen, mit einer erhöhten Legitimität und Akzeptanz der Ergebnisse in den jeweiligen Bezugskontexten verknüpft ist (Lang et al. 2012: 26). Vor diesem Hintergrund erheben transdisziplinäre Prozesse den Anspruch, nicht nur wissenschaftliche Gütekriterien wie Objektivität, Validität und Reliabilität zu wahren, sondern auch „sozial und kulturell robustes“ Wissen und Ergebnisse zu generieren (Nowotny/Scott/Gibbons 2001; Vilsmaier et al. 2015). Übertragen auf den Kontext der Lehrkräftebildung meint dies, dass kooperative Formate zu gestalten sind, die die Teilhabe aller als zentral erachteten Akteurs-, Ziel- und Anspruchsgruppen in Bezug auf den Forschungs- und Entwicklungsprozess gewährleisten und somit zu einer erhöhten Akzeptanz der generierten Ergebnisse und Produkte beitragen.

4) (Re-)Integration

In Anlehnung an Konzepte wie „mode-2-knowledge production“ (Gibbons et al. 2007; Nowotny/Scott/Gibbons 2003) und „post-normal science“ (Funtowicz/Ravetz 1993) verweisen transdisziplinäre Ansätze darauf, dass die Bear-

beitung komplexer Problemlagen integrativer Forschungs- und Entwicklungsprozesse bedarf (Scholz/Steiner 2015; Lang et al. 2012). Unter Integration wird hierbei nicht die Einpassung von externen Akteursgruppen in ein Zielsystem verstanden – bspw. von Lehrkräften in den Wissenschaftsbetrieb oder von Wissenschaftlern/-innen in die Schulpraxis – sondern die Einlassung und Etablierung eines gemeinsamen, die Grenzen der Bezugsinstitutionen überschreitenden Arbeitsbereiches. Daher erschöpft sich Integration im Sinne transdisziplinärer Prozesse nicht allein in der konstruktiven Beteiligung der jeweiligen Akteursgruppen, sondern setzt gemeinsames Lernen sowie ko-konstruktive Prozesse für die vertiefende, gemeinsame Erarbeitung, Weiterentwicklung und Reflexion voraus (Scholz/Steiner 2015: 531). Zudem bezieht sich Integration im Kontext transdisziplinärer Ansätze nicht nur auf epistemische Qualitäten. Stattdessen wird auf die Bedeutsamkeit u.a. sozialer, kommunikativer, organisationaler und kultureller Kontextbedingungen als wesentliche Gelingensbedingungen (nicht nur) transdisziplinärer Forschungs- und Entwicklungsprozesse verwiesen (Felt/Fochler 2012).

In Abgrenzung zu Integration steht Reintegration für den Rücktransfer und die Dissemination der im transdisziplinären Arbeitsprozess generierten Forschungs- und Entwicklungsergebnisse (Jahn/Bergmann/Keil 2012: 5–7). Die aufgrund der partizipativen Arbeitsprozesse erhöhte Legitimität und Akzeptanz in den jeweiligen Bezugssystemen (vgl. Partizipationsprinzip) stellt zugleich eine zentrale Gelingensbedingung für den nachhaltigen Transfer und die Verstetigung der Arbeitsergebnisse dar.

3.2 Theoriesynthese

Die vorgestellten Ansätze teilen einen, wenngleich in unterschiedlicher Weise nuancierten Anspruch, übergreifende Herausforderungen und Problemstellungen durch kooperative Anstrengungen zu begegnen. Darüber hinaus zeichnen sie sich jedoch durch unterschiedliche Schwerpunktsetzungen aus, wobei keiner der bisher in der Lehrkräftebildung diskutierten Ansätze, hybride Räume, CoPs und RPPs, die im Folgenden noch vorzustellenden Entwicklungsteams des ZZL-Netzwerks in Gänze erfasst. Daher wird der Versuch unternommen, entlang der vier Gestaltungsprinzipien transdisziplinärer Forschungs- und Entwicklungsprozesse, konzeptionelle Schnittstellen zwischen den Ansätzen herauszuarbeiten und in einer gemeinsamen Theoriesynthese zusammenzuführen.

Während CoPs gewissermaßen aufgrund überschneidender Berufsfelder ein geteiltes Kooperationsinteresse voraussetzen (vgl. kritisch Kap. 2), betonen Ansätze wie hybride Räume, RPPs und insbesondere transdisziplinäre Forschungs- und Entwicklungsprozesse, dass aufgrund der unterschiedlichen Bezugskontexte die Aushandlung gemeinsamer Problemverständnisse, Ziele und

Vorgehensweisen gesonderter Anstrengungen bedarf. RPPs fokussieren hierbei unmittelbar auf Schul- und Unterrichtsentwicklung als zentrale Zielgröße, während diese in Hybriden Räumen ergebnisoffen verhandelt wird. Entsprechend des Prinzips der *Problemlöseorientierung* wird im Transdisziplinaritätsdiskurs hingegen explizit für einen Interessenausgleich aller beteiligten Akteursgruppen geworben, sodass durch die gemeinsamen Forschungs- und Entwicklungsaktivitäten ein Mehrwert sowohl für die akademische als auch schulpädagogische Praxis anzustreben ist.

An die vorangegangene Überlegung knüpft das Prinzip der *Multiperspektivität* transdisziplinärer Prozesse an und spiegelt insbesondere den durch das Konzept Hybrider Räume postulierten Anspruch wider, die unterschiedlichen Expertisen aber auch Interessenslagen und Bedürfnisse der beteiligten Akteursgruppen zum Ausgangspunkt der Zusammenarbeit zu machen. Die konkrete Bestimmung relevanter Vertreter/-innen wird dabei durch die jeweils zugrundeliegende Problemstellung deutlich. RPPs betonen die Beteiligung von Wissenschafts- und Praxisvertretern/-innen, wobei im Bedarfsfall weitere Partner/-innen hinzugezogen werden können. CoP's zeigen sich ebenfalls offen für die Beteiligung unterschiedlicher Status- und Akteursgruppen, erheben dies jedoch nicht zu einem konstitutiven Gestaltungsprinzip.

Alle Ansätze eint hingegen, dass für eine gelingende Kooperation die Einlassung und Aushandlung unterschiedlicher Positionen notwendig ist. Hierfür werden möglichst hierarchiearme Austausch- und Arbeitsformate vorgeschlagen, die durch wechselseitige Wertschätzung und einer Interaktion auf Augenhöhe gekennzeichnet sind. Hierfür steht stellvertretend das *Partizipationsprinzip* transdisziplinärer Forschung und Entwicklung. Unterschiede der jeweiligen Ansätze treten insbesondere in Bezug auf die Institutionalisierungsgrade der Kooperationsbeziehungen auf. Hybride Räume werden als offene Diskursräume gedacht und zeichnen sich wie auch CoPs aufgrund informeller Handlungspraktiken und der Betonung sozialer Lernprozesse durch geringe formale Regelungen und Strukturen aus. Im Gegensatz dazu postulieren RPPs verbindliche Kommunikationsstrukturen und -regeln in möglichst langfristigen und gleichbleibenden Kooperationsbeziehungen. Der Transdisziplinaritätsansatz betont ebenfalls die herausgehobene Bedeutung von Kommunikationsprozessen und wirbt für eine Einbindung relevanter Akteursgruppen entlang des gesamten Forschungs- und Entwicklungsprozesses. Er macht jedoch keine verbindlichen Vorgaben bzgl. der Dauer bzw. Teamkonstellationen, solange gemäß dem *Partizipationsprinzip* hinreichende Mitgestaltungsmöglichkeiten gewahrt bleiben.

Umfassende Partizipation der beteiligten Akteursgruppen wird zudem als eine notwendige Voraussetzung für die *Integration* in den gemeinsamen Arbeitsprozess angesehen. Diese erschöpft sich allerdings nicht allein in Wissensintegration – mittels Austausch, Arbeitsteilung, Ko-Konstruktion und Reflexion (Gräsel/Fussangel/Pröbstel 2006; Fussangel 2008) – sondern berücksich-

tigt soziale und organisationale Integration als wesentliche Rahmenbedingungen. Andererseits ermöglichen partizipative Prozesse und Integration die Generierung sozial sowie kulturell robuster Expertisen, Ergebnisse und Produkte, die im Sinne des *Reintegrationsprinzips* durch erhöhte Potenziale nachhaltigen Transfers und Verstetigung in die jeweiligen Bezugssysteme Universität, Studienseminar und Schule gekennzeichnet sind.

4 Transdisziplinäre Entwicklungsteams im ZZZ-Netzwerk

Im Rahmen des durch die „Qualitätsoffensive Lehrerbildung“ geförderten Projekts *ZZZ-Netzwerk* an der Leuphana Universität Lüneburg sind insgesamt acht transdisziplinäre Entwicklungsteams etabliert worden. Ihnen liegt das gemeinsame Ziel zugrunde, durch die institutionen- und phasenübergreifende Zusammenarbeit zwischen unterschiedlichen, an der Lehrkräftebildung beteiligten Status- und Akteursgruppen, innovative Konzepte, Lehr-Lern-Formate und Materialien für die universitäre als auch (schul-)pädagogische Praxis zu entwickeln und so einen Beitrag zu einer integrierten Lehrkräftebildung zu leisten.

4.1 Strukturelle Einbettung und Handlungsfelder

Die transdisziplinären Entwicklungsteams sind als Teil des *ZZZ-Netzwerks* institutionell an das *Zukunftszentrum Lehrerbildung (ZZZ)* der Leuphana angegliedert. Die besondere Hochschulstruktur der Leuphana, insbesondere die Bündelung fast aller an der Lehrkräftebildung beteiligten Disziplinen unter dem Dach einer gemeinsamen Fakultät Bildung, ermöglicht es dem ZZZ, einen besonderen Fokus auf die Themenfelder Innovation, Forschung und Entwicklung zu legen. Im Unterschied zu einer Mehrzahl der Zentren für Lehrkräftebildung bzw. Schools of Education in Deutschland werden administrative Aufgaben bzgl. der Studienorganisation, Lehre, Beratung und Qualitätssicherung durch die Fakultät Bildung übernommen (Merkens 2005; Terhart 2005). Diese günstige Ausgangslage erlaubt es, die Projektziele und -aktivitäten mit einem besonderen Fokus auf die lokale und regionale Zusammenarbeit mit außeruniversitären Partnerorganisationen, wie Studienseminaren, Schulen, Behörden und weiteren Bildungseinrichtungen, auszurichten.

Insgesamt sind in den transdisziplinären Entwicklungsteams ca. 80 Personen aus über 25 Organisationen beteiligt, wobei alle Phasen der Lehrkräfte-

bildung, Studium, Vorbereitungs- sowie Schuldienst repräsentiert sind. Hierbei kommt den seit 2012 initiierten Leuphana-Campusschulen eine besondere Bedeutung zu. Bei den mittlerweile sechs Campusschulen handelt es sich um allgemeinbildende Schulen, die mit der Leuphana langfristige Kooperationsvereinbarungen abgeschlossen haben. Aufgrund der langfristigen Perspektive fixieren diese Vereinbarungen zunächst neben allgemeinen Kooperationschwerpunkten⁵ Absichtserklärung an gemeinschaftlichen Schulentwicklungsprojekten, institutionenübergreifenden Lehrkonzepten und Forschungsvorhaben mitzuwirken. Wie im vorliegenden Fall transdisziplinärer Entwicklungsteams werden detaillierte Projektziele und konkrete Ansprechpersonen anlassbezogen vereinbart. Darüber hinaus sind im Rahmen der Entwicklungsteamarbeit eine Reihe weiterer Lehrkräfte involviert, zu denen meist aus vorangegangenen Kooperationen gute Kontakte bestanden. Dies gilt analog für den Einbezug von Studienseminaren, Behörden sowie Stiftungen und einer außerschulischen Bildungseinrichtung.

Die Arbeitsschwerpunkte der acht Entwicklungsteams sind den drei Handlungsfeldern „Heterogenität und Inklusion“, „Kompetenzorientierte Unterrichtsgestaltung“ sowie „Professionsbezogenen Unterstützungsangebote“ zugeordnet und greifen somit drei in der Lehrkräftebildung als zentral erachtete Herausforderungen auf (vgl. Kap. 2). Das Handlungsfeld „Kompetenzorientierte Unterrichtsgestaltung“ ist mit vier Entwicklungsteams im Vergleich zu den beiden anderen Handlungsfeldern mit je zwei Entwicklungsteams umfangreicher aufgestellt, was durch das Ziel, verschiedene Unterrichtsfächer in das Projekt miteinzubeziehen, begründet ist.

Inhaltlich finden sich unter dem Handlungsfeld „Heterogenität und Inklusion“ zwei Entwicklungsteams, die Konzepte, Lehr-Lern-Formate sowie Materialien in Bezug auf (schul-)pädagogische Heterogenität und inklusive Schule entwickeln und Unterricht als (fach-)didaktische und bildungswissenschaftliche Querschnittsaufgabe verstehen (Lindmeier/Lütje-Klose 2015). Das Entwicklungsteam „Inklusion professionell umsetzen“ erarbeitet Grundlagen für inklusive Bildung, Unterrichts- und Schulentwicklung aus sonder- bzw. allgemeinpädagogischen sowie bildungswissenschaftlichen Perspektiven. Das Entwicklungsteam „Englischunterricht inklusiv gestalten“ rückt im Gegensatz dazu stärker fachdidaktische Herausforderungen inklusiven Unterrichts in den Fokus.

Auch zehn Jahre nach Einführung allgemeinverbindlicher Bildungsstandards durch die KMK (Klieme et al. 2007) bleibt die Unterrichtspraxis wie auch die Lehrkräfteausbildung hinter den Reformervorstellungen zurück. Daher bündelt das Handlungsfeld „Kompetenzorientierte Unterrichtsgestaltung“ vier

5 Beispielsweise wurde mit der sog. „Campusschule Online“ ein Videokonferenzsystem eingerichtet, das eine Live-Schaltung zwischen universitärem Seminar und Schulunterricht ermöglicht und somit Unterrichtsbeobachtungen als didaktische Lerngelegenheit zur Theorie-Praxis-Verzahnung nutzbar macht (Drexhage et al. 2016).

Entwicklungsteams, die sich entlang der Unterrichtsfächer Mathematik, Musik, Deutsch und Sachunterricht mit der Frage auseinandersetzen, wie Unterricht gestaltet werden muss, damit Schülerinnen und Schüler neben fachlichem Wissen die Fertigkeit erwerben, dieses Wissen situationsadäquat anwenden zu können. Die Auswahl der vertretenen Fächer repräsentiert sowohl Disziplinen, in denen die Diskussion um Kompetenzorientierung, wie im Fall der Mathematik, bereits fortgeschritten ist, während andere, wie im Fall von Musik und Sachunterricht, vergleichsweise wenige Standards aufweisen. Diese fachspezifische Bandbreite wird ebenso als Bezugspunkt für die entwicklungsteamübergreifende Diskussion fruchtbar gemacht, wie auch die Berücksichtigung der Schulformen Sekundarstufe I (Mathematik, Musik) sowie Primarstufe (Deutsch, Sachunterricht). Das Handlungsfeld „Professionsspezifische Unterstützungsangebote“ adressiert durch die Entwicklungsteams zu „Coaching im Langzeitpraktikum“ und „Lehrkräftegesundheit“ als zentral erachtete fächerübergreifende Themengebiete für die Lehrkräfteprofessionalisierung. Insbesondere durch das Weiterbildungsangebot „ProMentoring“ soll der Aufbau handlungspraktischer Kompetenzen von angehenden Lehrkräften systematisch begleitet werden. In Ergänzung hierzu wird im Entwicklungsteam zu Lehrkräftegesundheit ein wichtiger Beitrag zur Erhaltung der psychischen und physischen Gesundheit von angehenden und etablierten Lehrkräften geleistet.

4.2 Teamkonstellationen, Ziele und Arbeitsorganisation

Korrespondierend zu den Prinzipien transdisziplinärer Forschungs- und Entwicklung erfolgte die personelle Zusammenstellung der Entwicklungsteams in Form eines Aushandlungsprozesses, der sich jeweils an den zu bearbeitenden Problemstellungen als zentrale Bezugsgrößen orientierte. Dementsprechend variieren die konkreten Teamkonstellationen, Zielsetzungen, Arbeitsorganisationen sowie Ergebnisse. Die nachstehende Tab. 1 bietet eine komprimierte Übersicht darüber, welche Status- und Berufsgruppen an der Entwicklung, Umsetzung und Reflexion verschiedener Produkte beteiligt sind.

Daran lässt sich zunächst erkennen, dass eine Vielzahl unterschiedlicher Akteursgruppen involviert ist, deren spezifische Perspektiven es erforderlich machen, nicht nur nach ihrer Herkunftsinstitution zu unterscheiden, sondern genauer auch Status- und Berufsgruppen zu differenzieren. Alle Entwicklungsteams sind durch die Mitarbeit von Professoren/-innen und wissenschaftlichen Mitarbeitern/-innen gekennzeichnet, die somit Forschungs- und hochschuldidaktische Expertisen einbringen. Ebenso wirken in allen Entwicklungsteams Lehrkräfte mit, die über berufspraktische Erfahrungswerte verfügen. Darüber hinaus sind z.T. auch Studierende und Schulleitungen vertreten, wodurch wichtige Perspektiven ergänzt werden.

Tabelle 1: Beteiligte Status- und Berufsgruppen in den transdisziplinären Entwicklungsteams (vgl. ZZL-Netzwerk 2018)

Handlungsfelder	Heterogenität und Inklusion	Kompetenzorientierte Unterrichtsgestaltung	Professionsspezifische Unterstützungsangebote	Ergebnisse	Professoren/-innen	Wissenschaftliche Mitarbeiter/-innen	Studierende	Referendare/-innen	Lehrkräfte	Schulleitung	Studienseminar	Behördenmitarbeiter/-innen	Stiftungsmitarbeiter/-innen	Mitarbeiter/-innen ext. Bildungseinrichtungen			
Entwicklungsteams	Inklusion professionell umsetzen	Inklusion	Lehrkräfte-gesundheit	Lernbaustein*	✓	✓	✓	✓	✓	✓							
				Fallbeschreibungen & Handlungsstrategien*	✓	✓	✓	✓	✓								
				MA-Seminar*	✓	✓	✓	✓	✓								
Ergebnisse	Englisch-unterricht inklusiv gestalten	Mathematik	Coaching Im Langzeitpraktikum	Lehrvideo#	✓	✓	✓		✓								
				Weiterbildungsangebot#	✓	✓			✓								
				Videolernbaustein*	✓	✓			✓								
				Unterrichtsmaterialien#	✓	✓	✓		✓				✓			✓	
				BA-Seminar*	✓	✓			✓			✓	✓			✓	
				Lernbaustein*	✓	✓			✓								
				Unterrichtsmaterialien#	✓	✓	✓		✓	✓	✓						
				MA-Seminar (Projektband)*	✓	✓	✓		✓	✓							
				Videolernbaustein*	✓	✓	✓		✓								
				Materialsammlung#	✓	✓	✓		✓								
Ergebnisse	Inklusion professionell umsetzen	Mathematik	Coaching Im Langzeitpraktikum	MA-Seminarbausteine*	✓	✓	✓		✓								
				Videolernbaustein*	✓	✓			✓								
				Unterrichtsbausteine#	✓	✓	✓		✓	✓							
				BA-Seminar*	✓	✓			✓	✓							
				Videolernbausteine*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
				Handreichung#	✓	✓	✓		✓								
Ergebnisse	Inklusion professionell umsetzen	Mathematik	Coaching Im Langzeitpraktikum	Videolernbaustein*	✓	✓			✓		✓			✓			
				BA-Seminar*	✓	✓			✓		✓	✓	✓	✓			
				BA-Seminar*	✓	✓			✓		✓	✓	✓	✓			

Quelle: Eigene Darstellung; Primäre Zielgruppe der Ergebnisse: * = Universität, # = Schulpraxis

Ferner wird deutlich, dass neben den oftmals als Kerninstitutionen der Lehrkräftebildung verstandenen Institutionen Universität, Studienseminar und Schule der Einbezug weiterer Organisationen von zentraler Bedeutung ist. Im Handlungsfeld „Inklusion“ sind bspw. Behörden bzw. zusätzlich Stiftungen vertreten, die relevante Impulse zur Gestaltung inklusiver Lehrkräftebildung einbringen. Dies gilt analog für den Einbezug einer außerschulischen Bildungseinrichtung für das Entwicklungsteam zur kompetenzorientierten Unterrichtsgestaltung im Sachunterricht. Dadurch wurden die Gestaltungsoptionen problem- und situativer Lehr-Lern-Settings grundlegend erweitert.

Die Zusammenstellung der Entwicklungsteammitglieder erfolgte je nach Arbeitsschwerpunkten entlang als einschlägig erachteter Expertisen. Zu Beginn der Projektlaufzeit wurden hierzu durch die Universitätsvertreter/-innen der jeweiligen Entwicklungsteams Auftaktveranstaltungen mit potenziellen Kooperationspartnern/-innen organisiert, um über die Vision der Entwicklungsteamarbeit als auch wechselseitige Erwartungen und mögliche Arbeitsweisen zu sprechen. Hierbei wurden einerseits Personen und Organisationen adressiert, zu denen aus vorangegangenen Arbeitskontexten bereits gute Kooperationsbeziehungen bestanden. Andererseits wurden innerhalb der sich konstituierenden Entwicklungsteams geprüft, ob, entsprechend der jeweiligen Arbeitsschwerpunkte, die Hinzunahme weiterer Status- und Berufsgruppen erforderlich schien. Dadurch wiesen einige Entwicklungsteams insbesondere im ersten Halbjahr verschiedentlich Ab- und Neuzugänge auf, bis eine relative Konsolidierung der Teamkonstellation eintrat.

Gleichzeitig zeigt sich für die Entwicklungsteams insgesamt eine große Spannweite hinsichtlich zentraler Diversitätsmerkmale wie u.a. Geschlecht, Alter sowie Berufstätigkeit in Jahren. Die beteiligten Akteure/-innen unterscheiden sich jedoch auch hinsichtlich der Dauer und Verbindlichkeit der Kooperationsbeziehungen. Somit variieren nicht nur die verfügbaren Wissensbestände und Expertisen, sondern auch der Institutionalisierungsgrad der Zusammenarbeit. Aus organisations- und netzwerktheoretischer Perspektive wird jedoch insbesondere in Bezug auf langfristige und nachhaltige Innovationsprozesse eine ausgewogene Mischung aus verbindlichen wie auch losen Kooperationsbeziehungen als zielführend erachtet (Kolleck 2014). Folglich können sowohl die Vorteile enger und stabiler Kontakte als auch die Innovationskraft neuer Partner/-innen entsprechend nutzbar gemacht werden.

Ebenso wie die Zusammensetzung der Entwicklungsteams variiert die Arbeitsorganisation. In der Regel finden die Entwicklungsteamtreffen alle drei bis sechs Wochen statt, die aufgrund der Ausstattung, Verfügbarkeit und guten Anbindung vorrangig in den Räumlichkeiten der Universität durchgeführt werden. Treffen an einer der Partnerorganisationen dienen vor allem dazu, die Gegebenheiten vor Ort besser kennenzulernen sowie die Mehrbelastung durch Fahrzeiten gleichmäßiger zu verteilen. Die gemeinsamen Treffen bilden den Kern der Entwicklungsteamarbeit, da sie insbesondere das ko-konstruktive

Arbeiten und das gemeinsame Lernen befördern. Um diese möglichst produktiv nutzen zu können, werden gut abgrenzbare Aufgaben außerhalb der Treffen arbeitsteilig bearbeitet und insbesondere administrative Fragen per E-Mail geklärt.

In Bezug auf die Produktebene kann vereinfacht zwischen universitären und schulpraktischen Anwendungsbereichen unterschieden werden. Dementsprechend zielt die Konzeption, Durchführung und Evaluation von BA- bzw. MA-Seminaren wie auch modularer (Video-)Lernbausteine auf die Weiterentwicklung universitärer Lehre ab und leistet somit einen unmittelbaren Beitrag für die Ausbildung von angehenden Lehrkräften im Rahmen der ersten Phase. Die in enger Abstimmung mit den hochschuldidaktischen Produkten erarbeiteten Formate für die (schul-)pädagogische Praxis reichen bspw. von erprobten, evaluierten und revidierten Unterrichtsbausteinen, Materialsammlungen und Handreichungen bis hin zu grundständigen Weiterbildungsangeboten und Lehrvideos für die Lehrkräftefortbildung. Demzufolge richten sich diese Ergebnisse und Produkte direkt an die zweite sowie dritte Phase der Aus- und Weiterbildung, die dadurch zur Etablierung von „good-practice“-Beispielen an den regionalen Partnerorganisationen beiträgt.

4.3 Theorie-Praxis-Integration durch Austausch, Ko-Konstruktion und gemeinsames Lernen

Der genuine Mehrwert der Kooperationen in transdisziplinären Entwicklungsteams für eine integrierte Lehrkräftebildung besteht in der Verknüpfung institutionen- und phasenspezifischer Expertisen und verfolgt das Ziel, problemlöseorientierte und somit handlungsrelevante und -unterstützende Ergebnisse und Produkte zu generieren.

Hierbei nehmen im Gegensatz zu rein koordinativen Absprachen vertiefende Austauschprozesse, Ko-Konstruktion und Reflexion einen besonderen Stellenwert ein (Gräsel/Fussangel/Pröbstel 2006; Fussangel 2008). Dieser Anspruch konnte in der Zusammenarbeit in den transdisziplinären Entwicklungsteams mit gewissen Einschränkungen eingelöst werden. Die Problem- und Zielidentifikation wurde wesentlich durch den, von Universitätsvertretern/-innen verfassten, Förderantrag und die darin zugrunde gelegten Handlungsfelder und Arbeitsbereiche vorstrukturiert. Die in der Logik von Drittmittelförderprogrammen strukturell verankerte Notwendigkeit, bereits im Rahmen der Beantragung konkrete Problembereiche, Zielsetzungen und Lösungsstrategien zu skizzieren, um überhaupt Fördermittel einwerben zu können, führte zu einer, insbesondere aus transdisziplinärer Perspektive suboptimalen, aber in der Wissenschaftspraxis gängigen Ausgangslage. Im Nachgang des positiven Förderbescheids war es daher erforderlich, die thematischen, methodischen und orga-

nisatorischen Setzungen im Antrag gemeinsam mit den Entwicklungsteampartnern/-innen zu konkretisieren und auch zu adaptieren, sodass die jeweiligen Expertisen wie auch Interessen und Bedürfnisse hinreichende Berücksichtigung fanden. Hierbei galt es abzuwägen, möglichst große Schnittmengen zwischen den Status- und Berufsgruppen herauszuarbeiten, die gleichzeitig spezifisch genug waren, um konkrete Ziele und Arbeitsschritte formulieren zu können. Da der Prozess zudem durch Mehrheitsentscheidungen sowie freiwillige Teilnahme gekennzeichnet ist, ist die Fluktuation von Kooperationspartnern/-innen grundsätzlich möglich und auch vereinzelt erfolgt.

Die Planung und Entwicklung universitärer Seminarveranstaltungen wird in allen Entwicklungsteams realisiert. Dabei ist die zugrundeliegende Didaktik insgesamt auf situiertes Lernen (Fölling-Albers/Hartinger/Mörtl-Hafizovic 2004) bzw. problem- und handlungsorientierte Lehr-Lern-Konzepte (Reusser 2005) fokussiert, um größtmögliche Synergieeffekte aus der Verzahnung akademischer Ausbildungsinhalte und berufspraktischer Expertise für den Aufbau professionsbezogener Kompetenzen, wie sie u.a. in den Standards für die Lehrkräftebildung empfohlen bzw. gefordert werden, zu ermöglichen (KMK 2014). Aufgrund des thematischen Fokusses auf kompetenzorientierte Unterrichtsgestaltung nimmt die Erarbeitung von Unterrichtskonzepten und Materialsammlungen für die (schul-)pädagogische Praxis im gleichnamigen Handlungsfeld einen besonderen Stellenwert ein. Zudem unterscheiden sich in den Entwicklungsteams die Kopplung der unterschiedlichen Arbeits- und Entwicklungsbereiche. Im Entwicklungsteam Mathematik sind Studierende bspw. nicht unmittelbar Teil der Entwicklungsteams, erarbeiten im Rahmen der Seminarteilnahme jedoch Unterrichtsentwürfe, die an den Campusschulen erprobt und reflektiert werden und nach einer vertiefenden Revisionsphase im Entwicklungsteam in Unterrichtsbausteine für die Schulpraxis eingehen (vgl. Scharnberg in diesem Band). Neben der ko-konstruktiven Entwicklung kommt somit auch Co-Teaching innerhalb universitärer als auch schulpraktischer Settings zum Tragen, was ebenfalls zur vertiefenden Theorie-Praxis-Verzahnung beiträgt (vgl. Entwicklungsteam Deutsch, Waschewski 2018).

Die ko-konstruktive Problem- und Zielidentifikation, Planung und Entwicklung, Durchführung und Erprobung wie auch die gemeinsame Reflexion und Revision erfordern und befördern zugleich gemeinsame Lernprozesse der beteiligten Akteure/-innen, wie sie bspw. Vilsmaier et al. (2015) und Scholz (2001) mit dem Verweis auf das Konzept „mutual learning“ beschreiben. Dies fördert ein erweitertes Verständnis für die jeweiligen Perspektiven und Lösungsansätze für die gemeinsame Problemstellung und ermöglicht durch die Außenperspektive ebenfalls eine weiterführende Reflexion über die oft impliziten Vorannahmen und Prämissen im eigenen Handlungskontext.

Darüber hinaus verweist der Begriff transdisziplinärer Entwicklungsteams bereits auf den Entwicklungsfokus der institutionen- und phasenübergreifenden Zusammenarbeit. Versierte Begleitforschungs- und Evaluationstätigkeiten

liegen indessen weitestgehend im Verantwortungsbereich der Universitätsvertreter/-innen. An dieser Stelle soll lediglich auf eine, im Kontext partizipativer Forschungsansätze (bspw. Aktionsforschung) verortete, aber nicht unumstrittene, Position verwiesen werden, dass ko-konstruktiven Entwicklungsarbeiten zwischen Wissenschaft und Praxis bereits ein genuiner Forschungscharakter innewohnt (Unger 2014; Altrichter/Feindt/Zehetmeier 2014; Vilsmaier/Brandner/Engbers 2017).

Abschließend wird derzeit an gemeinsamen Strategien zur Verstetigung, Dissemination und am Transfer der in den Entwicklungsteams entstandenen Konzepte, Formate und Materialien sowie Forschungsbefunde in die jeweiligen Bezugskontexte (Wissenschaft und Schulpraxis) gearbeitet. Neben der Teilnahme an wissenschaftlichen Tagungen, Veröffentlichungen in Fachzeitschriften und Sammelbänden (u.a. mit Praxispartnern/-innen) kommt der Bereitstellung der Lehr-Lern-Konzepte wie auch der Materialien für die hochschuldidaktische als auch schulische Praxis eine besondere Bedeutung zu. Unterrichtskonzepte und -materialien werden hierbei durch die beteiligten Lehrkräfte und Schulleitungen der jeweiligen (Campus-)Schulen umgesetzt.

5 Schlussbetrachtung

Das Kooperationsformat transdisziplinärer Entwicklungsteams wurde im Rahmen der institutionen- und phasenübergreifenden Zusammenarbeit im ZZZ-Netzwerk entwickelt und am Beispiel von acht Pilotprojekten etabliert. Die Bezugnahme auf den Transdisziplinaritätsdiskurs erweist sich hierbei nicht nur an die, im Kontext der phasenübergreifenden Lehrkräftebildung verhandelten, Ansätze Hybrider Räume, CoP und RPPs als hoch anschlussfähig, sondern eröffnet gleichzeitig Impulse für die kritische Diskussion und konzeptionelle Weiterentwicklung der kooperativen Lehrkräftebildung.

Ausgehend von einer expliziten Problemlöseorientierung in Bezug auf disziplinen-, professions-, institutionen-, und organisationsübergreifende Herausforderungen wird systematisch nach Voraussetzungen und Gelingensbedingungen multilateraler Kooperationen gefragt. Anstelle statischer Prozessvorgaben verweisen Arbeiten zur transdisziplinären Forschung und Entwicklung auf grundlegende Gestaltungsprinzipien, die sich entlang der Themenkomplexe *Problemlöseorientierung*, *Multiperspektivität*, *Partizipation* und *(Re-)Integration* durch Ko-Konstruktion und gemeinsames Lernen entfalten. Die sich daraus ergebenden Anforderungen eines idealtypischen Prozesses transdisziplinärer Forschung und Entwicklung bieten konkrete Orientierungspunkte für die Gestaltung transdisziplinärer Teams.

Gleichzeitig wurde mit Blick auf die acht Entwicklungsteams deutlich, dass diese Anforderungen hinsichtlich der jeweiligen Ausgangslagen und Spezifika adaptiert und austariert werden müssen. An der Variationsbreite hinsichtlich der Anzahl sowie status- und berufsgruppenspezifischer Heterogenität, der Entwicklungsteam-spezifischen Arbeitsorganisation sowie der unterschiedlichen Zielsetzungen und Produkte wird die Plastizität des Konzepts deutlich. Diese gewährt einerseits die Herstellung einer notwendigen Gegenstandsangemessenheit, die für eine zielführende Problemorientierung als konstitutiv zu betrachten ist. Andererseits erlaubt sie somit auch die erforderliche Flexibilität, um in andere Anwendungskontexte übertragen bzw. adaptiert werden zu können.

Mit Bezug auf die in Kap. 3 skizzierte konzeptionelle Rahmung lässt sich die konkrete Umsetzung in den acht Entwicklungsteams des ZZL-Netzwerks kritisch reflektieren. Die Entwicklungsteams zeichnen sich insgesamt durch eine strukturelle Dominanz wissenschaftlicher Akteure/-innen aus. Dies findet zum einen seinen Ausdruck in der inhaltlichen Ausrichtung der Entwicklungsteamarbeit entlang der drei Handlungsfelder, die federführend durch Wissenschaftler/-innen geprägt wurde. Hierbei ist jedoch zu berücksichtigen, dass die Themenwahl an für die Lehrkräftebildung in Deutschland insgesamt als zentral und verbindlich anzusehenden Herausforderungen orientiert ist, die somit auch für die regionalen Partnerorganisationen von hoher Relevanz einzustufen sind.

Zum anderen nehmen die beteiligten Professoren/-innen, aber vor allem die wissenschaftlichen Mitarbeiter/-innen innerhalb der Entwicklungsteams fokale Rollen und Funktionen, bspw. durch allgemeine Koordinationsaufgaben sowie Sitzungsmoderation und -leitung, ein. Hinsichtlich der Produktebene zeigt sich, dass in allen Entwicklungsteams Seminarkonzepte für die universitäre Lehre konzipiert, pilotiert, evaluiert und revidiert werden. Ebenfalls werden für die schulpädagogische Praxis korrespondierende Unterrichtskonzepte, Materialien und Handreichungen entwickelt und erprobt. Es ist jedoch anzumerken, dass dies nicht durchgängig im selben Umfang und derselben Systematik erfolgt. Dennoch lässt sich aus dieser strukturellen Asymmetrie nicht per se auf eine Verletzung des Partizipationsanspruchs transdisziplinärer Prozesse schließen. Vorläufige Befunde der Begleitforschung indizieren, dass die beteiligten Akteure/-innen, unabhängig von ihrer Status- und Berufsgruppe, die epistemische, soziale und organisationale Integration in den Entwicklungsteams als sehr hoch einschätzen und ebenso bekunden, aus der Zusammenarbeit in Bezug auf die Arbeit der jeweiligen Herkunftsorganisation zu profitieren (Straub/Kulin 2017).

Im Kontrast zum dezidierten Entwicklungsfokus der Kooperationen im ZZL-Netzwerk, ist der transdisziplinäre Forschungsanspruch nur bedingt eingelöst. Im Rahmen des vorliegenden Beitrags konnte lediglich angerissen werden, dass Forschung im konventionellen Sinne nach wie vor den wissenschaftlichen Akteuren/-innen vorbehalten ist, gleichwohl sich Charakteristiken parti-

zipativer Forschung nachzeichnen lassen. Eine eingehende Klärung dieses Sachverhalts muss allerdings an anderer Stelle erfolgen.

Das Konzept transdisziplinärer Entwicklungsteams stellt insgesamt einen vielversprechenden Ansatz für die institutionen- und phasenübergreifende Kooperation in der Lehrkräftebildung dar. Anhand der im ZZL-Netzwerk etablierten Entwicklungsteams konnten Gestaltungsmöglichkeiten und Gelingensbedingungen transdisziplinärer Zusammenarbeit sichtbar gemacht werden. Zudem wurden konkrete Erfahrungswerte sowie Reflexionen zur Disposition gestellt. Somit konnte zur theoretisch fundierten Diskussion zentraler Kooperationsansätze in der Lehrkräftebildung beigetragen werden. Darüber hinaus bedarf es jedoch weiterer empirisch abgesicherter Studien, um die epistemischen, sozialen und organisationalen Implikationen transdisziplinärer Zusammenarbeit mit Blick auf Innovationen in der Lehrkräftebildung zu elaborieren und darauf aufbauend Vorschläge für deren konzeptionelle Weiterentwicklung und konstruktive Begleitung zu erarbeiten.

6 Literatur

- Altrichter, Herbert/Durdel, Anja/Fischer-Münnich, Christiane (2017): Qualitätsoffensive Lehrerbildung. Ein Blick ins Umfeld. http://www.ramboll.de/~media/Files/RDE/Management-Consulting/Studien_Handreichungen/qlb_umfeldbericht_kurzf_ramboll_barrierefrei.pdf [Zugriff: 07.12.2017].
- Altrichter, Herbert/Feindt, Andreas/Zehetmeier, Stefan (2014): Lehrerinnen und Lehrer erforschen ihren Unterricht. Aktionsforschung. In: Terhart, E./Bennewitz, H./Rotthland, M. (Hrsg.): Handbuch der Forschung zum Lehrerberuf. Münster [u.a.]: Waxmann, S. 285–307.
- Artelt, Cordula et al. (2001): PISA 2000. Zusammenfassung zentraler Befunde. Max-Planck-Institut für Bildungsforschung, Berlin.
- Bammer, Gabriele (2015): Toolkits for Transdisciplinarity. In: GAIA – Ecological Perspectives for Science and Society 24, 3, S. 149.
- Baumert, Jürgen/Kunter, Mareike (2006): Stichwort: Professionelle Kompetenz von Lehrkräften. In: Zeitschrift für Erziehungswissenschaft 9, 4, S. 469–520.
- Baumert, Jürgen/Kunter, Mareike (2011): Das Kompetenzmodell von COACTIV. In: Kunter, Mareike/Baumert, Jürgen/Blum, Werner (Hrsg.): Professionelle Kompetenz von Lehrkräften. Ergebnisse des Forschungsprogramms COACTIV. Münster: Waxmann, S. 29–53.
- Bergmann, Matthias/Schramm, Engelbert (2008): Grenzüberschreitung und Integration. Die formative Evaluation transdisziplinärer Forschung und ihre Kriterien. In: Bergmann, Matthias/Schramm, Engelbert (Hrsg.): Transdisziplinäre Forschung. Integrative Forschungsprozesse verstehen und bewerten. Frankfurt/Main: Campus-Verl., S. 149–173.

- Bernstein, Jay Hillel (2015): Transdisciplinarity: A Review of its Origins, Development, and Current Issues. In: *Journal of Research Practice* 11, p. 1.
- Brewer, Garry (1999): The Challenges of Interdisciplinarity. In: *Policy Science* 32, pp. 327–337.
- Checkland, Peter (2000): Soft Systems Methodology. *Soft Systems Methodology, a 30-Year Retrospective*. In: *Systems Research and Behavioral Science* 17, pp. 11–58.
- Coburn, Cynthia E./Penuel, William R. (2016): Research–Practice Partnerships in Education. In: *Educational Researcher* 45, 1, pp. 48–54.
- Defila, Rico/Di Giulio, Antonietta/Scheuermann, Michael (2006): *Forschungsverbundmanagement. Handbuch für die Gestaltung inter- und transdisziplinärer Projekte*. Zürich: vdf Hochschulverl.
- Dizinger, Vanessa/Fussangel, Katrin/Böhm-Kasper, Oliver (2011): Interprofessionelle Kooperation an Ganztagschulen aus der Perspektive der Lehrkräfte. Wie lässt sie sich erfassen und wie wird sie im schulischen Belastungs- und Beanspruchungs-Geschehen bewertet? In: Speck, Karsten/Olk, Thomas/Böhm-Kasper, Oliver/Stolz, Heinz-Jürgen/Wiezorek, Christine (Hrsg.): *Ganztags schulische Kooperation und Professionsentwicklung. Studien zu multiprofessionellen Teams und sozialräumlicher Vernetzung. Studien zur ganztägigen Bildung*. Weinheim, Basel: Beltz Juventa, S. 114–127.
- Döbrich, Peter et al. (2003): *Attracting, Developing and Retaining Effective Teachers. Supplement to the Country Background Report for the Federal Republic of Germany*. <http://www.oecd.org/education/school/30100518.pdf>.
- Drexhage, Julia et al. (2016): The Connected Classroom. Using Video Conferencing Technology to Enhance Teacher Education. In: *Reflecting Educational Journal* 10, 1, pp. 70–88.
- Elzinga, Aant (2008): Participation. In: Hirsch-Hadorn, Gertrude et al. (Hrsg.): *Handbook of Transdisciplinary Research*. Dordrecht: Springer Science + Business Media B.V, pp. 345–359.
- Felt, Ulrike et al. (2011): The Problem Multiple. Constructing ‘the Research Problem’ in Transdisciplinary Project Contexts. In: Hofstätter, B./Getzinger, G. (Hrsg.): *Conference Proceedings 10th Annual IAS-STIS Conference*.
- Felt, Ulrike/Fochler, Maximilian (2012): Re-ordering Epistemic Living Spaces: On the Tacit Governance Effects of the Public Communication of Science. In: Rödder, Simone/Franzen, Martina/Weingart, Peter (Hrsg.): *The Sciences’ media connection -public communication and its repercussions. Untersuchung zum reflektierten Handeln in Profession und Ehrenamt. Sociology of the Sciences Yearbook, Band 28*. Dordrecht: Springer Science + Business Media B.V, pp. 133–154.
- Fölling-Albers, Maria/Hartinger, Andreas/Mörzl-Hafizovic, Dzenana (2004): Situiertes Lernen in der Lehrerbildung. In: *Zeitschrift für Pädagogik* 50, 5, S. 727–747.
- Fraefel, Urban/Bernhardsson-Laros, Nils (2016): Das Prinzip der Hybridität beim Aufbau professionellen Handlungswissens in Hochschulstudiengängen. „Third Space“ als offenes Kooperations- und Diskursfeld. In: *Jahrbuch für allgemeine Didaktik*, S. 99–114.
- Funtowicz, Silvio O./Ravetz, Jerome R. (1993): Science for the Post-Normal Age. In: *Futures* 25, 7, pp. 739–755.
- Fussangel, Kathrin (2008): *Subjektive Theorien von Lehrkräften zur Kooperation. Eine Analyse der Zusammenarbeit von Lehrerinnen und Lehrern in Lerngemeinschaften*.

- Dissertation. Wuppertal: Bergische Universität Wuppertal/Fachbereich Bildungs- und Sozialwissenschaften.
- Gibbons, Michael et al. (2007): *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*. Reprinted. London: Sage Publ.
- Gorodetsky, Malka/Barak, Judith (2008): *The Educational-Cultural Edge. A Participative Learning Environment for Co-Emergence of Personal and Institutional Growth*. In: *Teaching and Teacher Education* 24, 7, S. 1907–1918.
- Gräsel, Cornelia (2011): *Die Kooperation von Forschung und Lehrer/innen bei der Realisierung didaktischer Innovationen*. In: Einsiedler, Wolfgang (Hrsg.): *Unterrichtsentwicklung und didaktische Entwicklungsforschung*. Bad Heilbrunn: Klinkhardt, S. 88–101.
- Gräsel, Cornelia/Fussangel, Kathrin/Pröbstel, Christian (2006): *Lehrkräfte zur Kooperation anregen – eine Aufgabe für Sisyphos?* In: *Zeitschrift für Pädagogik* 52, 2, S. 205–219.
- Gräsel, Cornelia/Parchmann, Ilka (2004): *Implementationsforschung – oder: der steinige Weg, Unterricht zu verändern*. *Research on Implementation: The Problems of Changing Teaching and Learning*. In: *Unterrichtswissenschaften* 32, 2, S. 196–214.
- Gröschner, Alexander (2015): *Praxisphasen im Lehramtsstudium. Ausgewählte Befunde zu Wirksamkeit und Gelingensbedingungen*. In: Barsch, Sebastian/Dziak-Mahler, Myrle/Hoffmann, Margarethe/Ortmanns, Peter (Hrsg.): *Fokus Praxissemester: Das Kölner Modell kritisch beleuchtet – Werkstattberichte. Materialien zum Praxissemester in der Ausbildungsregion Köln, Band 9*. Köln, S. 41–49.
- Hennessy, Sara (2014): *Bridging between Research and Practice. Supporting Professional Development through Collaborative Studies of Classroom Teaching with Technology*. Professional Learning. Rotterdam: SensePublishers.
- Hericks, Uwe (2004): *3.4 Verzahnung der Phasen der Lehrerbildung*. In: Blömeke, Sigrid/Reinhold, Peter/Tulodziecki, Gerhard/Wildt, Johannes (Hrsg.): *Handbuch Lehrerbildung*. Bad Heilbrunn/Obb.: Klinkhardt, S. 301–311.
- Hirsch Hadorn, Gertrude et al. (2008): *The Emergence of Transdisciplinarity as a Form of Research*. In: Hirsch-Hadorn, G. et al. (Hrsg.): *Handbook of Transdisciplinary Research*. Dordrecht: Springer Science + Business Media B.V, pp. 19–39.
- Jahn, Thomas/Bergmann, Matthias/Keil, Florian (2012): *Transdisciplinarity. Between Mainstreaming and Marginalization*. In: *Ecological Economics* 79, pp. 1–10.
- Jimenez-Silva, M./Olson, K. (2012): *A Community of Practice in Teacher Education: Insights and Perceptions*. In: *International Journal of Teaching and Learning in Higher Education* 24, 3, pp. 335–348.
- Klein, Julie T. (2010): *A Taxonomy of Interdisciplinarity*. In: Frodeman, Robert/Klein, Julie Thompson/Pacheco, Roberto C.S. (Hrsg.): *The Oxford Handbook of Interdisciplinarity*. 1. ed. Oxford: Oxford Univ. Press, pp. 15–30.
- Klein, Julie Thompson (2014): *Discourses of Transdisciplinarity. Looking Back to the Future*. In: *Futures* 63. pp. 68-74.
- Klieme, Eckhard et al. (2007): *Zur Entwicklung nationaler Bildungsstandards. Eine Expertise*. https://www.bmbf.de/pub/Bildungsforschung_Band_1.pdf [Zugriff: 01.09.2017].
- Klieme, Eckhard (2011): *Bildungsstandards und Kompetenzorientierung. Mehr Transparenz und Eigenverantwortung*. In: *Schule NRW* 63, 2, S. 54–58.
- KMK, Kultusministerkonferenz (2005): *Eckpunkte für die gegenseitige Anerkennung von Bachelor- und Masterabschlüssen in Studiengängen, mit denen die*

- Bildungsvoraussetzungen für ein Lehramt vermittelt werden. http://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2005/2005_06_02-Bachelor-Master-Lehramt.pdf [Zugriff: 21.09.2018].
- KMK, Kultusministerkonferenz (2014): Standards für die Lehrerbildung: Bildungswissenschaften. Beschluss der Kultusministerkonferenz vom 16.12.2014. http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2004/2004_12_16-Standards-Lehrerbildung.pdf [Zugriff: 21.09.2018]
- Kolleck, Nina (2014): Innovations through Networks. Understanding the Role of Social Relations for Educational Innovations. In: *Zeitschrift für Erziehungswissenschaft* 17, S5, S. 47–64.
- Kolleck, Nina et al. (Hrsg.) (2016): Traditionen, Zukünfte und Wandel in Bildungsnetzwerken. Netzwerke im Bildungsbereich, Band 8. Münster, New York: Waxmann.
- Lang, Daniel J. et al. (2012): Transdisciplinary research in sustainability science. Practice, principles, and challenges. In: *Sustainability Science* 7, S1, pp. 25–43.
- Lave, Jean/Wenger, Etienne (2011): *Situated Learning. Legitimate Peripheral Participation*. Reprint. *Learning in Doing*. Cambridge: Cambridge Univ. Press.
- Lindmeier, Christian/Lütje-Klose, Birgit (2015): Inklusion als Querschnittsaufgabe in der Erziehungswissenschaft. In: *Erziehungswissenschaft* 26, 51, S. 7–16.
- Merkens, Hans (2005): Zentren für Lehrerbildung: Eine Neuerung mit Zukunft. In: Merkens, H. (Hrsg.): *Lehrerbildung: Zentren für Lehrerbildung*. Schriftenreihe der DGfE. Wiesbaden: VS Verlag für Sozialwissenschaften, S. 9–13.
- Messner, Helmut (2012): Leitlinien einer phasenübergreifenden Professionalisierung der Lehrerbildung. In: Bosse, Dorit/Criblez, Lucien/Hascher, Tina (Hrsg.): *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz*. Teil 1: Analysen, Perspektiven und Forschung. Immenhausen: Prolog, S. 63–92.
- Mitchell, Cynthia/Cordell, Dana/Fam, Dena (2015): Beginning at the End. The Outcome Spaces Framework to Guide Purposive Transdisciplinary Research. In: *Futures* 65, pp. 86–96.
- Mittelstraß, Jürgen (2003): *Transdisziplinarität. Wissenschaftliche Zukunft und institutionelle Wirklichkeit*. Konstanzer Universitätsreden 214. Konstanz: UVK Univ.-Verl.
- Monitor Lehrerbildung (2016): *Qualitätsoffensive Lehrerbildung – zielgerichtet und nachhaltig?!* <https://www.monitor-lehrerbildung.de/export/sites/default/.content/Downloads/Qualitaetsoffensive-Lehrerbildung-002.pdf> [Zugriff: 21.09.2018]
- Müller-Fohrbrodt, Gisela/Cloetta, Bernhard/Dann, Hanns-Dietrich (1978): *Der Praxischock bei jungen Lehrern. Formen, Ursachen, Folgerungen; eine zusammenfassende Bewertung theoretischer und empirischer Erkenntnisse*. 1. Aufl. Lehrerbildung und -weiterbildung. Stuttgart: Klett.
- Neuhauser, Linda/Pohl, Christian (2015): Integrating Transdisciplinarity and Translational Concepts and Methods into Graduate Education. In: Gibbs, Paul (Hrsg.): *Transdisciplinary Professional Learning and Practice*. Cham: Springer International Publishing, pp. 99–120.
- Nowotny, Helga/Scott, Peter/Gibbons, Michael (2001): *Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty*. 1. Aufl. Cambridge: Polity Press.
- Nowotny, Helga/Scott, Peter/Gibbons, Michael (2003): Introduction: ‘Mode 2’ Revisited: The New Production of Knowledge. In: *Minerva* 41, 3, pp. 179–194.

- Penuel, William R. et al. (2015): Conceptualizing Research–Practice Partnerships as Joint Work at Boundaries. In: *Journal of Education for Students Placed at Risk (JESPAR)* 20, 1-2, pp. 182–197.
- Reusser, Kurt (2005): Problemorientiertes Lernen. Tiefenstrukturen, Gestaltungsformen, Wirkung. In: *Beiträge zur Lehrerbildung* 23, 2, S. 159–182.
- Reusser, Kurt (2014): Kompetenzorientierung als Leitbegriff der Didaktik. In: *Beiträge zur Lehrerinnen- und Lehrerbildung* 32, 3, S. 325–339.
- Riedl, Alfred et al. (2018): Masterstudiengang mit integriertem Vorbereitungsdienst in der Metall- und Elektrotechnik. Berufliche Lehrerbildung phasenübergreifend gestalten. In: *Journal of Technical Education* 6, 2, S. 79–89.
- Scholz, Roland W. (2001): Mutual Learning as a Basic Principle of Transdisciplinarity. In: Klein, J. T. et al. (Hrsg.): *Transdisciplinarity: Joint Problem Solving among Science, Technology, and Society. An Effective Way for Managing Complexity. Schwerpunktprogramm Umwelt / Programme Prioritaire Environnement / Priority Programme Environment*. Basel: Birkhäuser Basel, pp. 13–17.
- Scholz, Roland W./Steiner, Gerald (2015): The real type and ideal type of transdisciplinary processes. Part I—theoretical foundations. In: *Sustainability Science* 10, 4, S. 527–544.
- Sim, Cheryl (2006): Preparing for Professional Experiences – Incorporating Pre-Service Teachers as “Community of Practice”. In: *Teaching and Teacher Education. An International Journal of Research and Studies* ; 22, 1, pp. 76–83
- Straub, Robin/Kulin, Sabrina (2017): Transdisziplinäre Entwicklungsteams in der Lehrer_innenbildung. Befunde einer Fallstudie. Vortrag auf der Jahrestagung der Arbeitsgruppe für Empirisch-Pädagogische Forschung (AEPF). Tübingen.
- Terhart, Ewald (2000): Perspektiven der Lehrerbildung in Deutschland. Abschlussbericht der von der Kultusministerkonferenz eingesetzten Kommission. Beltz Pädagogik. Weinheim: Beltz.
- Terhart, Ewald (2005): Zentren für Lehrerbildung: systematische Probleme, institutionelle Widersprüche, praktische Schwierigkeiten. In: Merkens, Hans (Hrsg.): *Lehrerbildung: Zentren für Lehrerbildung*. Schriftenreihe der DGfE. Wiesbaden: VS Verlag für Sozialwissenschaften, S. 15–31.
- Unger, Hella von (2014): *Partizipative Forschung. Einführung in die Forschungspraxis*. Lehrbuch. Wiesbaden: Springer VS.
- Villiger, Caroline (2015): Lehrer(innen)bildung zwischen Theorie und Praxis: Erörterungen zu einer ungelösten Problematik. Ansprüche und Möglichkeiten in der Lehrer(innen)bildung. In: Villiger, Caroline/Trautwein, Ulrich (Hrsg.): *Zwischen Theorie und Praxis. Ansprüche und Möglichkeiten in der Lehrer(innen)bildung*. Münster [u.a.]: Waxmann, S. 9–17.
- Vilsmaier, Ulli et al. (2015): Case-based Mutual Learning Sessions. Knowledge integration and transfer in transdisciplinary processes. In: *Sustainability Science* 10, 4, pp. 563–580.
- Vilsmaier, Ulli/Brandner, Vera/Engbers, Moritz (2017): Research In-between. The Constitutive Role of Cultural Differences in Transdisciplinarity. In: *Transdisciplinary Journal of Engineering & Science* 8, 1, S. 169–179.
- Waschewski, Tina (2018): Rechtschreibunterricht innovieren. Wie die Zusammenarbeit in einer „Community of Practice“ die Unterrichtspraxis von Lehrpersonen verändert. In: Riegler, Susanne/Weinhold, Swantje (Hrsg.): *Rechtschreibung*

- unterrichten. *Lehrerforschung in der Orthographiedidaktik*. Berlin: Schmidt, Erich, S. 129–147.
- Wenger, Etienne (2000): *Communities of Practice and Social Learning Systems*. In: *Organization* 7, 2, pp. 225–246.
- Wenger, Etienne/McDermott, Richard/Snyder, William M. (2002): *Cultivating Communities of Practice*. Boston: Harvard Business School Press.
- Weyland, Ulrike (2012): *Expertise zu den Praxisphasen in der Lehrerbildung in den Bundesländern*. <https://li.hamburg.de/contentblob/3305538/70560ef5e16d6de60d5d7d159b73322f/data/pdf-studie-praxisphasen-in-der-lehrerbildung.pdf;jsessionid=ECDA37807061685394FEC442F9D8BA07.liveWorker2> [Zugriff: 21.09.2018].
- Wissenschaftsrat (2008): *Empfehlungen zur Qualitätsverbesserung von Lehre und Studium*. <https://www.wissenschaftsrat.de/download/archiv/8639-08.pdf> [Zugriff: 21.09.2018].
- Zeichner, Ken (2010): *Rethinking the Connections Between Campus Courses and Field Experiences in College- and University-Based Teacher Education*. In: *Journal of Teacher Education* 61, 1-2, pp. 89–99.



Appendix III: Study C - Transdisciplinary Integration in Teacher Education

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A transdisciplinary evaluation framework for the assessment of integration in boundary-crossing collaborations in teacher education

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ABSTRACT

This study provides a) an evaluative framework for boundary-crossing collaboration in teacher education which is inspired by the discourse of transdisciplinarity. In addition, it offers b) empirical insights about so-called Transdisciplinary Development Teams, which comprise practitioners, researchers, and student teachers. The framework bases on (1) epistemic, (2) social, and (3) organisational integration characteristics such as (1a) *mutual learning*, (1b) *knowledge integration*, (2a) *perceived trustworthiness*, (2b) *appreciation within the team*, and (3a) *collective ownership of goals*. Drawing on a written survey with $n = 62$ participants, the empirical study provides findings on three research questions. First, all dimensions of integration characteristics have been rated high on average. Second, the results of a one-way ANOVA establish that the main actor groups perceive the work in Transdisciplinary Development Teams as integrative with regard to previously stated characteristics. Third, the analysis of a manifest path model substantiates theoretically assumed effect relationships. Subsequently, transdisciplinary dimensions of integration characteristics appear suitable for assessing boundary-crossing collaboration in teacher education.

1. Introduction

The advancement of teacher education has been outlined recurrently as a boundary-crossing challenge calling for collaborative formats among stakeholders from various institutions and professional backgrounds, for instance, practitioners, researchers, and student teachers (Straub & Vilsmaier, 2020; Hartmann & Decristan, 2018; Lillejord & Børte, 2016). Advantages of such collaborations are seen in their potentials for a) the development and implementation of didactical innovations (Gräsel, 2011), b) professional development of (prospective) teachers and teacher educators (Postholm, 2016) as well as c) collective capacity building and institutional change (Fullan, 2016). Thus, boundary-crossing collaborations have to be understood as a crucial factor to promote effectiveness and innovative capabilities in teacher education systems.

These considerations are of particular importance with regard to the German context. Due to its loosely-coupled, consecutive, and three-phased model (Kotthoff, 2011), the German teacher education system counts as highly specialised but also institutionally fragmented by international comparison (Blömeke, 2014; European

Commission/EACEA/Eurydice, 2015). The first phase at universities aims, in contrast to other European countries, at the concurrent acquisition of subject-related content knowledge as well as knowledge in pedagogies, learning psychology, and educational sciences. The second phase comprises the preparatory service at teacher education institutes (German: 'Studienseminare') and schools. It focuses on practical education in genuine classroom settings. The third phase refers to advanced professional development during the teaching career. Therefore, boundary-crossing coordination and collaboration at the organisational, personal, and curricular level are key factors in pursuit of further integration and coherence (Hellmann, 2018; Hericks, 2004).

Against this background, an increasing number of collaborative formats have been established at various institutional intersections between university-based teacher education and school practice (Kleemann, Jennek, & Vock, 2019; Villiger & Trautwein, 2015). Such collaborations are located predominantly within the context of practical seminars and school placements (Pilypaitytė & Siller, 2018) as well as school development and evaluation projects (Alpert & Bechar, 2007).

However, despite of this vibrant discourse and the increasing amount of studies, further conceptual propositions and empirical insights are

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needed to substantiate the integrative potentials and to unravel underlying effect mechanisms of boundary-crossing collaborations. The present article addresses this research gap by proposing a) an evaluative framework inspired by the discourse of transdisciplinarity and b) by offering empirical insights about a boundary-crossing collaborative format termed Transdisciplinary Development Teams (TDTs).

2. Theoretical background and research context

2.1. Introducing transdisciplinarity

Transdisciplinarity stands for an integrative mode of research and development which highlights the interactive interrelation of various sources of expertise across professional and institutional boundaries in order to co-construct solutions for both, the academic and the practical field (Hirsch Hadorn et al., 2008; Klein, 2014; Scholz & Steiner, 2015).¹ This allows for generating ‘socially robust knowledge’ and hands-on solutions for complex challenges in everyday practice. The term ‘socially robust knowledge’ was introduced by Nowotny, Scott, and Gibbons (2001, p. 166) and refers to the assumption that transdisciplinary processes promote the integration of scholarly bodies of knowledge as well as practical expertise. This is supposed to have beneficial effects on the ‘legitimacy, ownership, and accountability’ (Lang et al., 2012, p. 26) of innovative approaches at professional and organisational boundaries. In this way, transdisciplinary processes address both, scientific credibility and practical relevance (Lang et al., 2012; Vilsmaier et al., 2015).

In accordance with that, integration has to be understood as a paramount requirement for transdisciplinary collaboration. However, due to the fact that transdisciplinarity addresses research and development processes across professional and institutional boundaries, Jahn, Bergmann, and Keil (2012) and Lang et al. (2012) advocate for a multi-dimensional understanding of integration. In that respect, an adapted version of the original framework will be proposed in this article that focuses on (1) epistemic, (2) social, and (3) organisational requirements for boundary-crossing collaboration.

2.2. Dimensions of integration: epistemic, social, and organisational

The following sections provide a compact outline on (1) epistemic, (2) social, and (3) organisational dimensions of integration and introduce selected constructs for measurement accordingly. Epistemic integration, for instance, refers to (1a) *mutual learning* and (1b) *knowledge integration*. Social integration is reflected in terms of (2a) *perceived trustworthiness* and (2b) *appreciation within the team*. Finally, organisational integration refers to (3a) *collective ownership of goals*.

2.2.1. Epistemic integration: mutual learning and knowledge integration

The epistemic core of transdisciplinarity is commonly understood as processes of *mutual learning* and *knowledge integration* (Jahn et al., 2012; Scholz & Steiner, 2015; Vilsmaier et al., 2015). However, as the following definitions indicate, both characteristics are used in a broad sense and rather interchangeably so far. *Mutual learning* is understood as a ‘basic process of exchange, generation, and integration of existing or newly developing knowledge’ (Scholz, 2001, p. 118) and ‘allow for combining scientific insights with knowledge gained in non-scientific contexts’ (Vilsmaier et al., 2015, p. 564). Therefore, mutual learning has to be understood as a co-constructive process which expresses itself, for instance, in terms of joint development of teaching concepts and materials (van Schaik, Volman, Admiraal, & Schenke, 2019). In addition, *knowledge integration* is characterised by the exchange of information and knowledge in order to develop a shared understanding and

common knowledge base about joint research and development issues, working styles, and methodologies as well as goals and outcomes (Godemann, 2008).

In order to operationalise these characteristics more differentially, we argue that *mutual learning* is a behavioural capacity that supports *knowledge integration*. In alignment with that, *mutual learning* comprises aspects of exchange and co-construction among actors from different backgrounds, while *knowledge integration* highlights the establishment of shared understandings and common ground for joint research and development processes.

2.2.2. Social integration: perceived trustworthiness and appreciation within the team

In alignment with the concept of dimensions of integration, epistemic processes that base on interactive exchange and co-elaboration of new knowledge objects, are embedded in social and organisational relations. Especially in team-based research and development settings, trust-based and appreciative relationships have been outlined as powerful influencing factors (Hedges, 2010; Sewell, Cody, Weir, & Hansen, 2018).

Perceived trustworthiness refers to the positive expectation towards the benevolent behaviour of others, which then allow engaging in interactions under conditions of uncertainty (Luhmann, 2017). In accordance with this, various contributions highlight the constituting role of trusting relationships in professional pedagogical settings (Bartmann, Pfaff, & Welter, 2012), in school-university partnerships (Sewell et al., 2018), and in educational innovation networks (Kolleck & Bormann, 2014). Moreover, especially in transdisciplinary settings, *appreciation within the team* in terms of ‘accepting the otherness of the other’ (Scholz & Steiner, 2015, p. 532) and the ‘recognition of difference’ (Hedges, 2010, p. 309) are understood as a constituting characteristic in order to establish reliable working relationships (Kulin, 2019).

The appreciation of contributions from actors with diverse backgrounds is considered essential for co-constructive processes. Esteeming behaviour articulates itself in openness towards different opinions and by feeling safe and encouraged to engage also in controversial debates (Carmeli & Gittel, 2009). On this basis, it is assumed that *perceived trustworthiness* and *appreciation within the team* have a positive effect on the epistemic processes of *mutual learning* and *knowledge integration*.

2.2.3. Organisational integration: collective ownership of goals

Finally, integrative research and development calls for high levels of participation and shared ownership of processes and outcomes (Elzinga, 2008; Lang et al., 2012). Therefore, actors across different organisations and professions need to establish arrangements that not only allow but encourage active involvement (Bronstein, 2002). Participatory organisational arrangements are understood to level power asymmetries and thus provide equal opportunities to express experiences and needs. Against this backdrop, it is assumed that *collective ownership of goals*, understood as the committed involvement in the decision-making process and active participation, moderates the effect from *mutual learning* on *knowledge integration*.

2.2.4. Theoretical framework of transdisciplinary dimensions of integration

Based on the previous outline, Fig. 1 shows a theoretical framework for transdisciplinary dimensions of integration.

2.3. Evaluation context

In order to provide further empirical insights, the outlined evaluative framework was applied to the context of a research and development project located in Lower Saxony, Germany. The project’s overarching objective was to generate and establish advancements in school practice and initial teacher education at a regional level through boundary-crossing collaborations. In order to do so, since 2016 eight so-called TDTs have been formed comprising representatives from across the

¹ The article draws in particular on the so-called ‘joint problem solving’ discourse of transdisciplinarity. For a comprehensive overview see among others Bernstein (2015), Hirsch Hadorn et al. (2008), and Klein (2014).

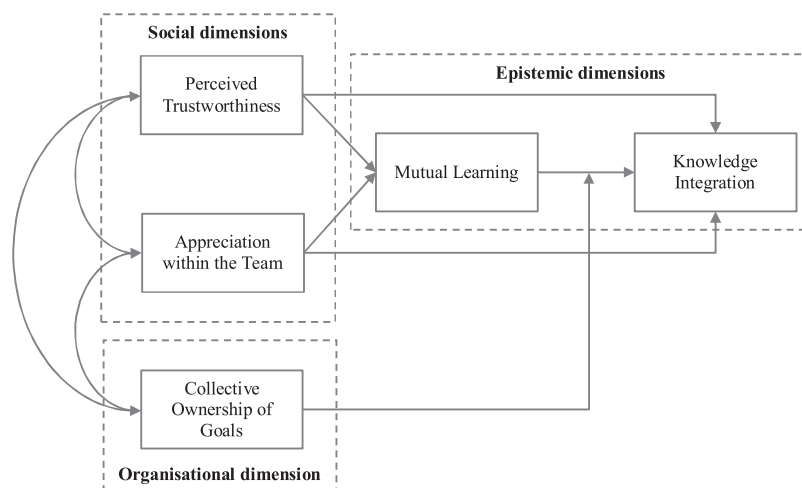


Fig. 1. Theoretical Framework for Transdisciplinary Integration comprising Epistemic, Social, and Organisational Dimensions.

three-staged teacher education system (Straub & Dollereider, 2019). The TDTs address pressing ‘hot topics’ in teacher education such as competence-oriented instruction, inclusive schooling, mentoring pre-service teachers, and maintaining teachers’ health. In alignment with focal principles of transdisciplinarity, the TDTs aim to provide outcomes for a wide range of stakeholder groups. Therefore, each team jointly co-constructs and revises innovative teaching arrangements and materials for both, university-based teacher education as well as local schools.

The TDT concept is understood as a collaborative approach to foster innovation and educational change in school-based teaching and university-based teacher education (Straub & Vilsmaier, 2020). In that way, it resonates with other pertinent conceptualisations such as *Third Space* (Zeichner, 2010) or *Research-Practice Partnerships* (Coburn & Penuel, 2016). TDTs highlight, for instance, the necessity for mutual recognition as well as comprehensive negotiations and shared decision-making processes, which are typical features for *Third Spaces* (Hedges, 2010). On the other hand, TDTs try to balance the dialogue-based openness of *Third Spaces* with programmatic principles of Research-Practice Partnerships (Coburn & Penuel, 2016; Penuel & Gallagher, 2017). In this regard, TDTs are committed to the following characteristics: 1) pursuing a long-term orientation, 2) fostering practical advancements in school practice and initial teacher education, 3) integrating a multi-stakeholder perspective, 4) applying intentional cooperation strategies, and 5) engaging in research-based development (Straub, Dollereider, Ehmke, Leiss, & Schmidt, 2020).

In practice, the TDTs comprise a wide range of stakeholder groups, which are situated in the context of initial teacher education for primary or lower-secondary schools. Each team consists of at least representatives from schools and university, which are understood as focal institutions representing educational practice and research respectively. In addition, there are also further stakeholder groups involved such as student teachers, teacher educators from teacher education institutes as well as partners from educational authorities and extra-curricular institutions. The factual TDT composition, team size, and work organisation vary in accordance with the problem framing and objectives, respectively (Straub & Dollereider, 2019).

3. Empirical research questions

Against the theoretical outline, the following empirical research questions have been analysed in this study.

- 1 How do the team members assess the cooperation in the TDTs with regard to the dimensions of integration characteristics?

- 2 Does the assessment of the dimensions of integration characteristics differ between focal groups of actors (practitioners, researchers, and student teachers)?
- 3 Does the empirical data in this study support the theoretically outlined effect relationships for the dimensions of integration characteristics (see Fig. 2)?

With respect to research question (3), Fig. 2 shows a theoretical model for effect relationships among transdisciplinary dimensions of integration characteristics.

The relationships depicted in Fig. 2 reflect the following hypotheses:

- H1: *Mutual learning* has a positive effect on *knowledge integration*.
- H2: The effect of *mutual learning* on *knowledge integration* is moderated by *collective ownership of goals* indicating the importance of participatory organisational principles.
- H3: *Perceived trustworthiness* has a positive effect on *mutual learning*.
- H4: *Appreciation within the team* has a positive effect on *mutual learning*.
- H5: *Perceived trustworthiness* has a positive effect on *knowledge integration*.
- H6: *Appreciation within the team* has a positive effect on *knowledge integration*.

4. Methodology

In order to answer the previously stated research questions, a written survey was conducted in the context of the TDTs. The survey focused on the dimensions of integration characteristics as outlined in Section ‘Dimensions of Integration: Epistemic, Social, and Organisational’.

4.1. Sample description

The survey population was defined as the total of TDT members who were participating at least at five TDT meetings at the time of the survey. A full survey was conducted with the resulting $N = 77$ participants. Due to an overall response rate of 80.5 %, a factual sample size of $n = 62$ was realised. Table 1 provides a compact outline of key characteristics describing the overall composition of the TDTs.

The category *actor groups* comprises focal actor groups represented in the sample: *practitioners* (51.6 %), *researchers* (25.8 %), *student teachers* (16.1 %), and *extra-mural partners, and public authorities* (6.5 %). The actual variety of educational backgrounds, organisational affiliations and vocational status are in fact much more diverse. Especially, the subgroup *practitioners* comprises teachers, principals, and teacher

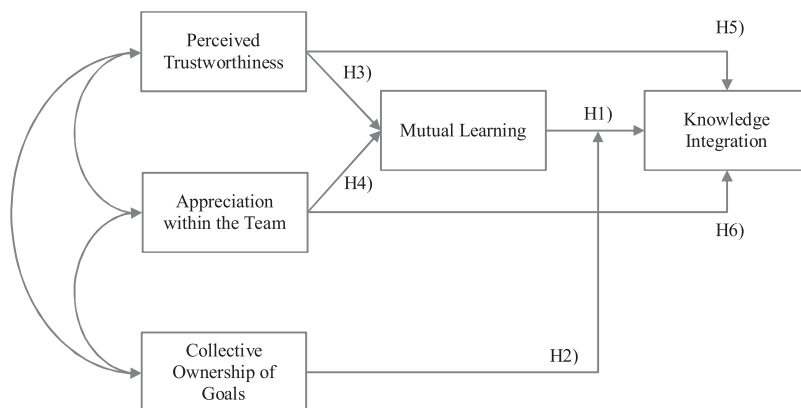


Fig. 2. Effect Relationships between Epistemic, Social, and Organisational Dimensions of Integration Characteristics.

Table 1
Sample Characteristics.

Characteristics	n	%
Actor groups		
Practitioners	32	51.6
Researchers	16	25.8
Student teachers	10	16.1
Extra-mural partners and public authorities	4	6.5
Sex		
Male	14	23.3
Female	46	76.7
Age groups (age in years)		
<30	16	26.7
30–39	18	30.0
40–49	19	31.7
>49	7	11.7
Professional experience (in years)		
0–3	14	22.6
>3–6	14	22.6
>6–10	11	17.7
>10–15	9	14.5
>15	14	22.6
Team size per DT		
Competence-Oriented Mathematics Didactics	8	10.4
Competence-Oriented Music Didactics	6	7.8
Competence-Oriented German Didactics	22	28.6
Competence-Oriented Basic Social and Science Studies	12	15.6
Implementing Inclusion Professionally	7	9.1
Teaching in inclusive English Settings	12	15.6
Mentoring in Practical Studies	4	5.2
Teachers' Health	6	7.8

Note. DT = Development Team. Column n and % refer to valid values only.

educators. The latter are usually experienced teachers who are responsible for preparatory service at teacher education institutes and schools.

The category *researchers* refers to professors and research assistants at the university. *Student teachers* refers to one of the main target groups for the TDTs activities and thus are an important stakeholder group for advancements in teacher education. However, at the time of the survey student teachers participated directly in only two out of eight TDTs which explains their comparably small number in the sample. The category *extra-mural partners and public authorities* refers to partners from local educational institutions, foundations, and public administration. Despite the fact, that they are also considered an important actor group for the joint work in the TDTs, their small number made it not feasible to consider them within the analysis.

With respect to sex, the sample corresponds fairly with active

teachers in Lower Saxony in 2016 (male = 27.9 % and female = 72.1 %; MK Niedersachsen, 2018). The *age groups* represented in the TDTs cover the full range from under 30 years to above 59 years. Except for participants over 49 years of age over (11.7 %), the age groups are approximately uniformly distributed. This corresponds also with the overall teacher composition in Lower Saxony (MK Niedersachsen, 2018). In addition, the *professional experience* is likewise approximately equally distributed and reflects various levels of expertise from novice to experienced professionals. Finally, *team size* visualises the variability according to the number of team members (n_i between 4 and 22). In addition, there have been no mandatory requirements for team composition, except for the participation of researchers and teachers, in order to allow for independent and self-reliant team dynamics.

4.2. Survey instrument

A standardised questionnaire used in this study addressed all active TDT members at the time of the survey. Cognitive pre-tests have been conducted prior to the data collection in order to ensure equivalence of meaning (Lenzner, Neuert, & Otto, 2015). This was considered especially important due to the assumed heterogeneity of team members' professional, organisational, and institutional backgrounds. In total nine interviewees participated in the pre-test and represent teachers, student teachers, research assistants, and professors. The questionnaire was modified based on the corresponding feedback.

With regard to the main survey to the members of the TDTs, the questionnaire and a return envelope were sent by mail. In addition, non-personalised reminders were sent via an email distribution list in order to improve the overall response rate.

Based on the theoretical outline, five scales have been used to operationalise the dimensions of integration characteristics. All scales were applied with a six-point Likert scale ranging from 1 = 'does not apply at all' to 6 = 'applies fully'. The questionnaire was conducted in German. Thus, the authors translated the following scales from English: *mutual learning*, *perceived trustworthiness*, *appreciation within the team*, and *collective ownership of goals*. In addition, scales with respect to *knowledge integration* and *collective ownership of goals* have been slightly adapted in order to capture collaborations across different professional backgrounds and organisational affiliations.

For covering *mutual learning* a scale developed by van den Bossche, Gijsselaers, Segers, Woltjer, and Kirschner (2011) was applied, originally labelled *team learning behaviours*. In alignment with the theoretical outline, it addresses aspects of collective learning processes in professional workgroups. The scale consists of three sub-scales: *construction*, *co-construction*, and *constructive conflict*. *Construction* addresses aspects of sharing ideas and experiences supported by active listening, whereas *co-construction* refers to the further development of these contributions by adding other perspectives and seeking in-depth clarification.

Constructive conflict comprises the ability to engage in productive discussions by addressing controversial aspects and asking critical questions. Example items for these sub-constructs are: ‘Team members are listening carefully to each other’ (construction), ‘Team members draw conclusions from the ideas that are discussed in the team’ (co-construction), and ‘Opinions and ideas of team members are verified by asking each other critical questions’ (constructive conflict). In accordance with van den Bossche et al. (2011), the sub-scales have been applied together in order to display the main construct of mutual learning as an overarching construct.

Knowledge Integration (Steinheider, Bayerl, Menold, & Bromme, 2009) aims at the establishment of shared understandings or mental models about the issue at hand, relevant methodologies, and desired outcomes. Informed by linguistic contributions by Clark and Murphy (1982), Clark (1996), Steinheider et al. (2009) distinguish between two mechanisms to generate these shared frameworks of reference and mental models: audience design and common ground. Audience design allows team members to make their own perspectives understood, whereas common ground represents joint understandings according to theoretical-conceptual, methodological, and outcome related aspects of teamwork. Example items are: ‘The team members are willing to engage oneself with other perspectives’ (audience design) and ‘The team composition from different professional backgrounds complicate the development of shared understanding for cooperation’ (common ground, inverted item). Again, both sub-scales were applied together to construct the main scale knowledge integration.

With regard to the social dimension of integration, scales for perceived trustworthiness and appreciation within the team have been applied. Perceived Trustworthiness (Costa & Anderson, 2011) provides insights about the integrity within the team and thus informs whether actors rely on their fellow team members. An example item reads: ‘In this team, people will keep their word’.

Appreciation within the team indicates to what extent the teamwork is characterised by mutual recognition. It also indicates the approval and acceptance of opinions despite their different professional backgrounds. The scale was adapted from a similar construct, psychological safety (Carmeli & Gittell, 2009), that fosters open exchange of ideas and explores alternative approaches. An example item is: ‘If someone in the team has a fundamentally different opinion, we appreciate it too’.

Finally, the organisational outline of the teamwork is captured by the scale of collective ownership of goals (Bronstein, 2002). It represents whether responsibilities to achieve the shared goals are distributed to all team members and to what extent they are participating in the decision-making processes. An example item is: ‘When team members make decisions together, they go through a process of examining alternatives’.

Table 2 shows basic scale characteristics including the total number of items and internal consistency. Due to unsatisfactory item reliability, two items have been removed from knowledge integration and one from collective ownership of goals. After adjustments, Cronbach’s alpha ranged from $\alpha = .66$ to $.88$ and indicate (barely) acceptable to good internal constancies, respectively.

Table 2
Measures, Number of Items and Cronbach’s α for Dimensions of Integration Characteristics.

Dimensions	Characteristic	No. of Items	Cronbach’s α
Epistemic	mutual learning	9	.88
	knowledge integration	6	.66
Social	perceived trustworthiness	6	.74
	appreciation within the team	4	.72
Organisational	collective ownership of goals	6	.71

4.3. Methods of analysis

In order to answer research question (1), whether the development team member assesses the cooperation as being integrative with respect to epistemic, social, and organisational dimensions of integration characteristics descriptive statistics and correlation coefficients have been calculated in IBM SPSS Statistics 25. With reference to research question (2), whether there are statistically significant differences between the actor groups according to epistemic, social, and organisational aspects of dimensions of integration, a one-way ANOVA has been conducted. In order to compose comparable groups, the analysis focuses on practitioners, researchers, and student teachers. These groups are considered to represent relevant professional backgrounds in teacher education. Moreover, Kolmogorov-Smirnov tests indicate non-normal distributed data for all characteristics, except for mutual learning, with $p < .05$. Despite that fact, the application of ANOVA was considered feasible, based on recent publications arguing that ANOVA count as robust against violation of non-normal distributed data (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010), even in the case of unbalanced groups and small sub-group sample sizes (Blanca, Alarcón, Arnau, Bono, & Bendayan, 2017). Homogeneity of variances was assessed using Levene’s tests. The resulting p -values range between $.10$ and $.60$ and indicate that equal variances could be assumed. In order to answer research question (3), a manifest path model was calculated in Mplus 7.4.

5. Findings

5.1. Assessment of dimensions of integration characteristics

5.1.1. General assessment of dimensions of integration characteristics

Table 3 shows descriptive statistics and correlation coefficients for the dimensions of integration characteristics within the overall sample. All variables had high mean values and reached the theoretical maximum of 6. The minimum values were all above the theoretical middle of 3.5, except for collective ownership of goals ($Min = 2.83$). In addition, the values for standard deviation indicate moderate to high differences in response behaviour. Especially, the standard deviation for collective ownership of goals with $SD = .70$ is considered high. The correlation coefficients indicate medium to high correlations with r ranging between $.38$ and $.68$.

According to research question (1), the high values for the dimensions of integration characteristics indicate that the TDT members assess the collaboration to be integrative with respect to its epistemic, social, and organisational facets. In general, this provides some empirical evidence that the given collaborative format is considered suitable for cultivating boundary-crossing endeavours in teacher education.

5.1.2. Group differences for dimensions of integration characteristics

In order to answer research question (2), whether the main actor groups practitioners, researchers, and student teachers show differences according to their assessment of the dimensions of integration characteristics, a one-way ANOVA has been calculated. Table 4 shows that there are no statistically significant differences to be found, with p -values $> .05$. This result is also reflected through the effect sizes, which indicate none to small effects with ω^2 between $.01$ and $.02$.

Nonetheless, further inspection of multiple post-hoc comparisons suggests some descriptive differences between the actor groups (see Table 5). This allows for a tentative discussion of practical implications for the analysed TDTs.

In general, the assessments of mutual learning, knowledge integration, and perceived trustworthiness tend to follow a similar pattern: there are no differences between practitioners and researchers while the differences between practitioners and student teachers as well as researchers and student teachers are small to medium. In some more detail, there is no difference between practitioners and researchers according to mutual learning ($d_s = |0.02|$), while student teachers and researchers ($d_s = |0.68|$)

Table 3
Descriptive Statistics and Correlation Coefficients for Dimensions of Integration Characteristics.

Characteristic	Min	Max	M	SD	(1)	(2)	(3)	(4)	(5)
(1) Mutual learning	3.67	6.00	5.37	.53	-				
(2) Knowledge integration	4.17	6.00	5.12	.50	.68	-			
(3) Perceived trustworthiness	4.00	6.00	5.27	.56	.67	.51	-		
(4) Appreciation within the team	3.75	6.00	5.28	.57	.65	.54	.52	-	
(5) Collective ownership of goals	2.83	6.00	4.86	.70	.39	.51	.38	.52	-

Notes. Min = Minimum, Max = Maximum, M = Mean, SD = Standard Deviation.

Table 4
Means, Standard Deviations, and One-Way ANOVA for Dimensions of Integration Characteristics.

Measure	Practitioners (n = 30)		Researchers (n = 16)		Students (n = 10)		F(2,55)	p	ω^2
	M	SD	M	SD	M	SD			
Mutual learning	5.33	.54	5.34	.53	5.66	.32	1.66	.20	.02
Knowledge integration	5.09	.47	5.1	.48	5.33	.57	0.95	.39	.00
Perceived trustworthiness	5.25	.50	5.2	.63	5.52	.49	1.19	.31	.01
Appreciation within the team	5.21	.62	5.45	.43	5.45	.47	1.39	.26	.01
Collective ownership of goals	4.95	.62	4.63	.83	5.07	.64	1.61	.21	.02

Note. ω^2 = omega squared.

Table 5
Post-hoc Analysis for Group Differences according to Dimensions of Integration Characteristics.

	comparison	MD	df	t	p	ds
Mutual learning	1 & 2	-0.01	44	-0.08	1.00	-0.02
	2 & 3	-0.32	24	-1.68	.39	-0.68
	3 & 1	0.33	38	1.80	.25	0.66
Knowledge integration	1 & 2	-0.01	44	-0.07	1.00	-0.02
	2 & 3	-0.23	24	-1.10	.76	-0.44
	3 & 1	0.24	38	1.32	.18	0.48
Perceived trustworthiness	1 & 2	0.05	44	0.32	1.00	0.10
	2 & 3	-0.32	24	-1.36	.44	-0.55
	3 & 1	0.26	38	1.46	.55	0.53
Appreciation within the team	1 & 2	-0.24	44	-1.41	.46	-0.44
	2 & 3	0.00	24	0.02	1.00	0.01
	3 & 1	0.24	38	1.13	.69	0.41
Collective ownership of goals	1 & 2	0.32	44	1.48	.42	0.46
	2 & 3	-0.44	24	-1.44	.35	-0.58
	3 & 1	0.12	38	0.54	1.00	0.20

Notes. Numbers in the column 'comparison' indicate actor groups with 1 = practitioners, 2 = researchers, and 3 = student teachers. MD = mean difference; ds = Cohen's d with pooled standard deviation.

as well as student teachers and practitioners ($d_s = |0.66|$) show medium effect sizes, respectively. With regard to *knowledge integration*, there is again no difference between practitioners and researchers to be found ($d_s = |0.02|$). However, there are small differences between student teachers and researchers ($d_s = |0.44|$) as well as between student teachers and practitioners ($d_s = |0.48|$). Similar applies for *perceived trustworthiness*, where practitioners and researchers show no differences ($d_s = |0.10|$), while student teachers and researchers ($d_s = |0.55|$) show medium differences just as student teachers and practitioners ($d_s = |0.53|$).

This pattern does not hold true for the assessment of *appreciation within the team* and *collective ownership of goals*, however. Regarding *appreciation within the team*, the assessment by researchers and student teachers are presumably the same ($d_s = |0.01|$), while practitioners and researchers show small differences ($d_s = |0.44|$) as well as practitioners and student teachers ($d_s = |0.41|$).

Finally, concerning *collective ownership of goals*, all groups show some

differences from another. In detail, there is a small difference between practitioners and student teachers ($d_s = |0.20|$). There is also a small to medium difference between practitioners and researchers ($d_s = |0.46|$), while the difference between researchers and student teachers is again medium ($d_s = |0.58|$).

Subsequently, the overall ANOVA suggests that there are no fundamental differences in the assessment of the dimensions of integration characteristics to be found. This substantiates the underlying assumption that TDTs are a collaborative format which allow relevant actor groups such as practitioners, researchers, and student teachers to participate at the epistemic, social, and organisational level. However, post-hoc testing provides some further insights for the practical implementation of TDT work.

5.2. Effect relationships among dimensions of integration characteristics

With respect to research question (3), the effect relationships between epistemic, social, and organisational dimensions of integration characteristics, a manifest path model was calculated (see Fig. 3). All variables show standardised values and base on a bootstrapping method with 10,000 replications. In order to calculate a moderation effect between *mutual learning* and *collective ownership of goals* on *knowledge integration* centred mean values have been used. The model fit indicators are considered acceptable with $\chi^2(4) = 4.60$; $p = .33$, $n = 60$; RMSEA = .05; CFI = .99; TLI = .99; SRMR = .06.

According to hypothesis H1, the model indicates that *mutual learning* has a positive effect on *knowledge integration* ($\beta_1 = .57$, $p < .01$). In alignment with hypothesis H2, this relation is positively moderated by *collective ownership of goals*. The effect from *collective ownership of goals* on *knowledge integration* is considered medium ($\beta_2 = .31$, $p < .05$), while the interaction effect between *collective ownership of goals* and *mutual learning* on *knowledge integration* tend to be small ($\beta_2, \text{interact} = .16$, $p < .05$). Moreover, with respect to hypotheses H3 and H4 *perceived trustworthiness* ($\beta_3 = .46$, $p < .05$) and *appreciation within the team* ($\beta_4 = .42$, $p < .05$) have a medium effect on *mutual learning*.

For hypotheses H5 and H6, the findings indicate a slightly differing picture. The direct effects on *knowledge integration* are none for both, *perceived trustworthiness* ($\beta_{5, \text{direct}} = -.02$, $p > .05$) and *appreciation within the team* ($\beta_{6, \text{direct}} = .02$, $p > .05$). However, the results of a mediation analysis (see Table 6) show that both social integration characteristics have indirect effects on *knowledge integration*. These effects are fully mediated by *mutual learning*. For *perceived trustworthiness*, the resulting total effect is considered small ($\beta_{5, \text{total}} = .24$, $p < .05$). This holds also

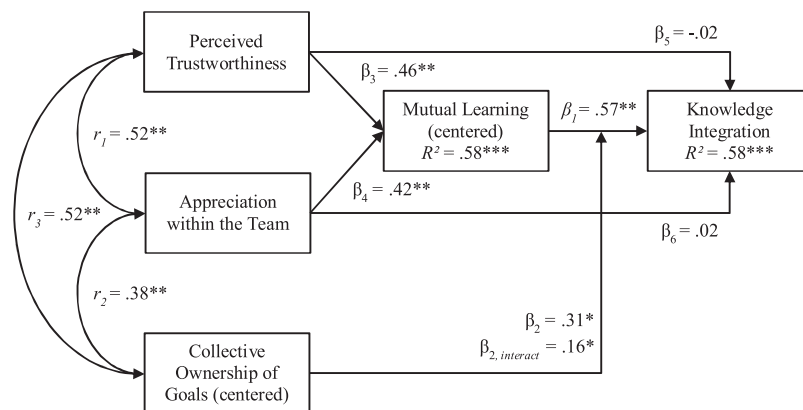


Fig. 3. Manifest Path Model on Effect Relationships between Epistemic, Social, and Organisational Dimension of Integration Characteristics. Note. r = correlation factor, β = standardised regression coefficient, R^2 = explained variance, * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

Table 6
Standardised Regression Coefficients for Dimensions of Integration Characteristics.

	β_{direct}	$\beta_{indirect}$	β_{total}
(1) on (3) mediated by (4)	-.02	.26**	.24*
(2) on (3) mediated by (4)	.02	.24**	.25*

Notes. The numbers in brackets refer to respective dimensions of integration characteristics: (1) = perceived trustworthiness, (2) = appreciation within the team, (3) = knowledge integration, and (4) = mutual learning.
* = $p < .05$.
** = $p < .01$.

true for *appreciation within the team* ($\beta_{6, total} = .25, p < .05$).

Finally, the explained variance of 58 % for both dependent variables *mutual learning* and *knowledge integration* is considered high.

6. Discussion and outlook

This study contributes to the research on and development of collaborative formats at the boundary of school practice and initial teacher education. First, an evaluative framework for the assessment of boundary-crossing collaboration was developed that is inspired by the ‘joint problem-solving’ discourse of transdisciplinarity. Second, the application of this framework to the TDTs empirically substantiates its potentials for the analysis of collaborative formats among practitioners, researchers, and student teachers. Third, the study also offers implications for further research and practice of boundary-crossing collaboration in school-based teaching and university-based teacher education. The following subsections provide further discussion and outlook on these issues.

6.1. Scientific significance of the study

6.1.1. Theoretical contributions

Despite the increasing attention towards boundary-crossing collaborations in school-based teaching and initial teacher education, especially quantitative evaluative frameworks have been missing so far. The present study addresses this research gap by offering a theoretical framework that draws on the discourse of transdisciplinarity. With respect to teacher education, transdisciplinarity has been primarily discussed in the context of education for sustainable development and in the field of ‘Basic Social and Science Studies’, a teaching subject at German and Swiss primary schools (Bürgener & Barth, 2018; Künzli David, Gysin, & Bertschy, 2016). In this way, the study also focuses on the application of transdisciplinarity in particular with regard to the

analysis of boundary-crossing collaborations in school practice and initial teacher education.

The evaluative framework was in particular inspired by the multi-dimensional understanding of integration (Jahn et al., 2012; Lang et al., 2012) as a constituting factor for in-depth collaboration and co-constructive processes among different actor groups such as practitioners, researchers, and student teachers. In accordance with that understanding, the framework combines (1) epistemic, (2) social, and (3) organisational dimensions of integration characteristics, which have been operationalised in terms of (1a) *mutual learning*, (1b) *knowledge integration*, (2a) *perceived trustworthiness*, (2b) *appreciation within the team*, and (3a) *collective ownership of goals*.

Subsequently, the study contributes according to three theoretical aspects. First, this generic multi-dimensional integration perspective is compatible with pertinent conceptualisations for boundary-crossing collaboration in school practice and university-based teacher education such as, for instance, Research-Practice Partnerships (Straub & Dollereeder, 2019; Straub et al., 2020). Second, however, it exceeds the current state of the discussion by drawing the attention towards the systematic analysis of different yet equally relevant dimensions of integration for collaboration among different stakeholder groups in school-based teaching and university-based teacher education. Third, the study used concrete measurement constructs that allowed to further differentiate their interdependencies on a theoretical and empirical level as well.

6.1.2. Empirical insights

The combined findings on research questions (1) and (2) indicate that the TDTs promote integrative collaboration across institutional and organisational boundaries in school practice and initial teacher education. This substantiates also the theoretical conceptualisation of TDT including its programmatic focus and guiding principles (Straub & Vilsmaier, 2020; Straub et al., 2020).

First, based on the high average approval rates (questions 1) the team members consider the boundary-crossing teamwork as integrative with respect to all epistemic, social, and organisational dimensions of integration characteristics. In accordance with that, it can be assumed that the joint development of teaching concepts and materials bases on a shared understanding and co-constructive processes. Moreover, the findings suggest that teamwork was also supported by trusting and appreciative relationships and based on shared decision-making and responsibility (*collective ownership of goals*).

Second, the results on research question (2) indicate that none of the focal actor groups were systematically neglected or shut out throughout the teamwork. In alignment with basic assumptions of transdisciplinarity, this is understood as a crucial indicator for participation

on an equal footing and the co-construction of 'socially robust knowledge' (Nowotny et al., 2001). In consequence, this indicates that the teaching concepts and materials developed within the TDTs are more likely to balance quality criteria in academia (scientific credibility) as well as the practical field (practical relevance).

Finally, findings related to research question (3) empirically substantiated assumed effect relationships in the TDT context. In this way, the study helps to further differentiate the theoretical understanding of relevant impact factors and their interrelation for boundary-crossing collaboration. In particular, *mutual learning* and *knowledge integration* are often used interchangeably (Scholz, 2001; Vilsmaier et al., 2015), which especially hampers empirical analyses. Thus, the conceptual distinction between *mutual learning* as a behavioural capacity that effects *knowledge integration* provides a more differentiated perspective on the epistemic process. In addition, various approaches in teacher education highlight the relevance of social factors, especially mutual trust, as a prerequisite for co-constructive collaboration (Hedges, 2010; Sewell et al., 2018). However, to the authors' knowledge, the interrelation between *trust* and *appreciation* and their effect on epistemic characteristics, such as *mutual learning* and *knowledge integration*, have not been quantitatively analysed so far. This holds also true for the moderating influence of *collective ownership of goals* in terms of participation and shared decision-making. In that way, the study helped to differentiate the effect relationships between focal dimensions of integration characteristics.

6.2. Implications for practice

The supplementing results of the multiple post-hoc comparisons indicate tentative implications for the current practice of the TDT work. First, student teachers show the highest mean values on all dimensions of integration characteristics in comparison to researchers and practitioners. This is understood as student teachers' approval of teaching arrangement which offer learning opportunities relating academic knowledge with practical expertise (Straub & Waschewski, 2019). This interpretation resonates in particular with student teachers' persistent call for more practical studies during initial teacher education (Messner, 2012; Terhart, 2000), which is also a significant driving force for recent reforms pointing at the expansion of practical elements in the first phase in teacher education in Germany (KMK, 2005; Weyland, 2012).

Moreover, practitioners and researchers share similar perceptions according to *mutual learning*, *knowledge integration*, and *perceived trustworthiness*. This can be seen as another clue that TDTs allow (at least to some extent) to mitigate potential status hierarchies and power asymmetries. Moreover, it supports the claim that both actor groups with advanced professional experience benefit likewise from mutual exchange and co-constructive process. This also implies a mutual recognition of practical expertise and scholarly knowledge.

However, the differing picture with respect to *appreciation within the team* and *collective ownership of goals* requires further inquiries. A tentative explanation points to some inherent asymmetries in organisational structures and teamwork dynamics in the TDTs (Straub & Vilsmaier, 2020). Due to the restricted time budgets and the generally resource-intensive teamwork, the majority of organisational, and administrative tasks in terms of meeting preparations, moderation, and documentation lies within the responsibilities of the researchers, especially the research assistants. On the one hand, this results in additional workload whereas, on the other hand, it puts them into a stronger decision-making position (Straub, Spöhrer, & Meimerstorf, 2019). It is assumed that practitioners attribute these differences with respect to a slightly lesser perception of *appreciation within the team*, while researchers articulate the differences in workload with respect to lower ratings of *collective ownership of goals*.

In alignment with the general empirical findings of this study, we draw the tentative conclusion that the TDT work is considered integrative with regard to all dimensions of integration characteristics

despite the structural asymmetries within the particular research and development context. To our understanding that is an important insight, since the realisation of boundary-crossing collaborations and its constraints root predominantly in the unequal availability and distribution of resources and capacities (Straub & Vilsmaier, 2020). In that way, the TDT work is understood as an illustrating example for co-constructive collaboration on an equal footing among unequal actors in terms of different expertises, professional obligations, and available time budgets. This reflects on the practical level on how the TDT concept mitigates tensions between the aspirations of openness for multi-stakeholder participation (Third Space) and pragmatic problem-solving orientation (RPPS) (Straub & Vilsmaier, 2020; Straub & Dollereeder, 2019).

Inspired by these considerations, a more general proposition is to utilise the epistemic, social and organisational dimensions of integration characteristics not only for summative evaluation but also to stimulate self-reflection during the TDT work. For this purpose, they could be integrated into a jointly composed 'code of conduct' that provides orientation for biannual or annual team meetings in order to reflect on a meta level about the TDTs' performance. This resonates highly with the requirement of RPPs to establish structures and processes that foster cooperative interactions (Straub et al., 2020; Coburn & Penuel, 2016).

6.3. Further research

Despite the theoretical contributions and empirical insights, this study faces some methodical issues typically related to research and development in highly contextualised settings. Boundary-crossing collaborative formats such as the TDTs are locally-bound, context-specific, and resource-intensive which results in a limited number of participating actors and limited sample sizes, respectively. Co-constructive collaboration also requires high degrees of freedom concerning decision-making processes and the design of didactical advancements. In addition, long-term collaboration in inter-organisational settings rely heavily on voluntary commitment which is potentially vulnerable to effects of self-selection and social-desirability.

Methodological suggestions in order to bypass these effects refer usually to randomised controlled trials (RCT) and the use of more objective measures (observations or tests) instead of self-declared attitude surveys (Prenzel, 2010). The application of randomised research designs, however, contradict required voluntary commitment and degrees of freedom. Thus, we discuss alternative suggestions that improve the robustness of the research design and allow for more differentiated research findings.

- 1) Despite the fact that the particular research context of the TDTs has to be considered quite comprehensive for a project-based and yet long-term collaborative format in terms of involved actors, the factual sample size of $n = 62$ participants still remains a limiting factor for the application of advanced quantitative analyses. A pragmatic approach to mitigating that issue is to increase the data base by applying the proposed evaluative framework to research and development settings similar to the TDTs. This would also allow making comparisons between the different sites in a quasi-experimental multiple-group design (Cohen, Manion, & Morrison, 2018).
- 2) In order to mitigate ceiling effects and effects of social-desirability it appears promising to apply an item response theory perspective for the development of measurement instrument (Wilson, 2005). Recent studies indicate that positive effects on psychometric measurement properties are also applicable in the case of self-reported attitude assessment (Boone, Staver, & Yale, 2014). In contrast to classical test theory, this also allows to take the difficulty or intensity of the measurement items into account. In addition, the careful reformulation of the items with regard to the prevalence of behavioural aspects instead of directly addressing the intensity of underlying

attitude constructs might have positive impact on measurement quality (Eid & Schmidt, 2014).

- 3) Despite the overall high approval rates concerning the dimensions of integration characteristics, it is reasonable to assume that especially complex collaborative settings imply also challenging issues which have to be overcome with collective efforts. Thus, further research is needed to differentiate success factors and potentials on the one hand as well as hampering factors and challenges on the other hand. An equally suitable and economic approach to elaborate on both, is to apply standardised questions with open response formats asking for the three most successful as well as the three most challenging aspects of the development team work. For the analysis of the resulting answers, the application of structuring qualitative content analysis seems appropriate (Kuckartz, 2016). In addition, the application of the dimensions of integrations characteristics as deductive category system allows for triangulation strategies or mixed-methods research designs (Kuckartz, 2014).
- 4) Finally, the present study focused exclusively on the analysis of dimensions of integration characteristics. Thus, further research is needed to link the evaluative framework to outcome related measures indicating, for instance, satisfaction with collaborative teamwork, its usage and usefulness of the developed concepts and materials as well as the wider impact on the involved reference systems, university-based teacher education and school-based teaching.

Declaration of Competing Interest

The authors report no declarations of interest.

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References

- Alpert, B., & Bechar, S. (2007). Collaborative evaluation research: A case study of teachers' and academic researcher's teamwork in a secondary school. *Studies in Educational Evaluation*, 33(3–4), 229–257. <https://doi.org/10.1016/j.stueduc.2007.07.003>.
- Bartmann, S., Pfaff, N., & Welter, N. (2012). Vertrauen in der erziehungswissenschaftlichen Forschung [Trust in Educational Research]. *Zeitschrift Für Pädagogik*, 58(6), 772–783.
- Bernstein, J. H. (2015). Transdisciplinarity: A review of its origins, development, and current issues. *Journal of Research Practice*, 11(1). <http://jrp.icaap.org/index.php/jrp/article/view/510/412>.
- Blanca, M. J., Alarcón, R., Arnau, J., Bono, R., & Bendayan, R. (2017). Non-normal data: Is ANOVA still a valid option? *Psicothema*, 29(4), 552–557. <https://doi.org/10.7334/psicothema2016.383>.
- Blömeke, S. (2014). Forschung zur Lehrerbildung im internationalen Vergleich [Research in Teacher Education in International Comparison]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrerberuf* (pp. 441–467). Waxmann.
- Rating scale surveys. In Boone, W. J., Staver, J. R., & Yale, M. S. (Eds.), *Rasch analysis in the human sciences*, (pp. 21–46). (2014) (pp. 21–46). Springer. https://doi.org/10.1007/978-94-007-6857-4_2.
- Bronstein, L. R. (2002). Index of interdisciplinary collaboration. *Social Work Research*, 26(2), 113–126. <https://doi.org/10.1093/swr/26.2.113>.
- Bürgener, L., & Barth, M. (2018). Sustainability competencies in teacher education: Making teacher education count in everyday school practice. *Journal of Cleaner Production*, 174, 821–826. <https://doi.org/10.1016/j.jclepro.2017.10.263>.
- Carmeli, A., & Gittel, J. H. (2009). High-quality relationships, psychological safety, and learning from failures in work organizations. *Journal of Organizational Behavior*, 30(6), 709–729. <https://doi.org/10.1002/job.565>.
- Clark, H. H. (1996). *Using language*. Cambridge Univ. Press.
- Clark, H. H., & Murphy, G. L. (1982). Audience design in meaning and reference. *Advances in Psychology*, 9, 287–299. [https://doi.org/10.1016/S0166-4115\(09\)60059-5](https://doi.org/10.1016/S0166-4115(09)60059-5).
- Coburn, C. E., & Penuel, W. R. (2016). Research–practice partnerships in education: Outcomes, dynamics, and open questions. *Educational Researcher*, 45(1), 48–54. <https://doi.org/10.3102/0013189X166631750>.
- Experiments. In Cohen, L., Manion, L., & Morrison, K. (Eds.), *Research methods in education*, (pp. 391–426). (2018) (pp. 391–426). Routledge.
- Costa, A. C., & Anderson, N. (2011). Measuring trust in teams: Development and validation of a multifaceted measure of formative and reflective indicators of team trust. *European Journal of Work and Organizational Psychology*, 20(1), 119–154. <https://doi.org/10.1080/13594320903272083>.
- Eid, M., & Schmidt, K. (2014). *Testtheorie und Testkonstruktion [Test theory and Test construction]*. Hogrefe: Bachelorstudium Psychologie.
- Elzinga, A., et al. (2008). Participation. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, & C. Pohl (Eds.), *Handbook of transdisciplinary research* (pp. 345–359). Springer Science + Business Media B.V.
- European Commission/EACEA/Eurydice. (2015). *The teaching profession in Europe: Practices, perceptions, and policies: Eurydice report*. <https://doi.org/10.2797/031792>.
- Fullan, M. (2016). *The NEW meaning of educational change* (fifth edition). Routledge; Ontario Principals' Council: Teachers College Press.
- Godemann, J. (2008). Knowledge integration: A key challenge for transdisciplinary cooperation. *Environmental Education Research*, 14(6), 625–641. <https://doi.org/10.1080/13504620802469188>.
- Gräsel, C. (2011). Die Kooperation von Forschung und Lehrer/innen bei der Realisierung didaktischer Innovationen [The Cooperation between Researchers and Teachers in The Realisation of Didactical Innovations]. In W. Einsiedler (Ed.), *Unterrichtsentwicklung und didaktische Entwicklungsforschung* (pp. 88–101). Klinkhardt.
- Hartmann, U., & Decristan, J. (2018). Brokering activities and learning mechanisms at the boundary of educational research and school practice. *Teaching and Teacher Education*, 74, 114–124. <https://doi.org/10.1016/j.tate.2018.04.016>.
- Hedges, H. (2010). Blurring the boundaries: Connecting research, practice and professional learning. *Cambridge Journal of Education*, 40(3), 299–314. <https://doi.org/10.1080/0305764X.2010.502884>.
- Hellmann, K. A. (2018). Kohärenz in der Lehrerbildung – Theoretische Konzeptionalisierung [Coherence in teacher education – theoretical conceptualization]. In K. A. Hellmann, J. Kreutz, M. G. Schwichow, & K. Zaki (Eds.), *Research. Kohärenz in der Lehrerbildung: Theorien, Modelle und empirische Befunde* (pp. 9–30). Springer VS.
- Hericks, U. (2004). 3.4 Verzahnung der Phasen der Lehrerbildung [3.4 Interlinking of the Phases in Teacher Education]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 301–311). Klinkhardt.
- Hirsch Hadorn, G., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffmann-Riem, H., Joye, D., Pohl, C., et al. (2008). The emergence of transdisciplinarity as a form of research. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann, & E. Zemp (Eds.), *Handbook of transdisciplinary research* (pp. 19–39). Springer Science + Business Media B.V.
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>.
- Kleemann, K., Jennek, J., & Vock, M. (Eds.). (2019). *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern [Supporting Cooperation of University and School: Strengthen Schools, Improve Teacher Education]*. Verlag Barbara Budrich.
- Klein, J. T. (2014). Discourses of transdisciplinarity: Looking back to the future. *Futures*, 63, 68–74. <https://doi.org/10.1016/j.futures.2014.08.008>.
- KMK. (2005). *Eckpunkte für die gegenseitige Anerkennung von Bachelor- und Masterabschlüssen in Studiengängen, mit denen die Bildungsvoraussetzungen für ein Lehramt vermittelt werden [Key Issues of the Mutual Recognition of Bachelor and Master Degree Programmes in Courses of Study that are intended to convey the Educational Prerequisites of Teaching]*. http://www.kmk.org/fileadmin/user_upload/veroeffentlichungen_beschluesse/2005/2005_06_02-Bachelor-Master-Lehramt.pdf.
- Kolleck, N., & Bormann, I. (2014). Analyzing trust in innovation networks: Combining quantitative and qualitative techniques of Social Network Analysis. *Zeitschrift Für Erziehungswissenschaft*, 17(S5), 9–27. <https://doi.org/10.1007/s11618-014-0551-0>.
- Kotthoff, H.-G. (2011). Between excellence and equity: The case of the German education system. *Revista Española De Educación Comparada*, 18(0), 27–61.
- Kuckartz, U. (2014). *Mixed Methods: Methodologie, Forschungsdesigns und Analyseverfahren [Mixed Methods: Methodology, Research Designs and Applications]*. Springer VS. <https://doi.org/10.1007/978-3-531-93267-5>.
- Kuckartz, U. (2016). *Qualitative Inhaltsanalyse: Methoden, Praxis, Computerunterstützung [Qualitative Content Analysis: Methods, Practice, Computational Support]* (3., überarbeitete Auflage). *Grundlagentexte Methoden*. Beltz Juventa.
- Künzli David, C., Gysin, S., & Bertschy, F. (2016). Sachunterricht als inter- und transdisziplinär konstituiertes Fach: Ansprüche an die Unterrichtsgestaltung und Überlegungen im Hinblick auf die Lehrerinnen- und Lehrerbildung [‘Sachunterricht’ as an Inter- and Transdisciplinary Constituted Subject]. *Beiträge zur Lehrerinnen- und Lehrerbildung*, 34(3), 305–316.
- Kulin, S. (2019). Beziehungen bilden als wesentliches Merkmal von Lehrer/innen-Bildung: Ein Fallbeispiel zu phasen- und institutionenübergreifenden Entwicklungsteams [Building Relationships as an Essential Characteristic of Teacher Education. A Case Study on Phase- and Institution-Crossed Development Teams.]. In U. Graf, & T. Iwers (Eds.), *Beziehungen bilden: Wertschätzende Interaktionsgestaltung in*

- pädagogischen Handlungsfeldern. *Schriftenreihe zur Humanistischen Pädagogik und Psychologie* (pp. 166–178). Klinkhardt.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., et al. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>.
- Lenzner, T., Neuert, C., & Otto, W. (2015). *Kognitives pretesting*. Mannheim: GESIS - Leibniz Institut für Sozialwissenschaften. https://doi.org/10.15465/gesis-sg_010.
- Lillejord, S., & Børte, K. (2016). Partnership in teacher education – A research mapping. *European Journal of Teacher Education*, 39(5), 550–563. <https://doi.org/10.1080/02619768.2016.1252911>.
- Luhmann, N. (2017). *Trust and power*. Polity Press.
- Messner, H. (2012). Leitlinien einer phasenübergreifenden Professionalisierung der Lehrerbildung [Guidelines of a Cross-Phased Professionalisation of Teacher Education]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 63–92).
- MK Niedersachsen. (2018). *Die niedersächsischen allgemein bildenden Schulen in Zahlen: Stand: Schuljahr 2016/2017 [The Schools of Lower-Saxony in Numbers]*. https://www.mk.niedersachsen.de/download/135872/Broschuere_2016_2017_Die_niedersaechsischen_allgemein_bildenden_Schulen_in_Zahlen.pdf.
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking science: Knowledge and the public in an age of uncertainty (1. Aufl.)*. Polity Press.
- Penuel, W. R., & Gallagher, D. J. (2017). *Creating research-practice partnerships in education*. Harvard Education Press.
- Hybrid Spaces – Zusammenarbeit zwischen Universität, Schulen und Studienseminaren zum Zweck der Lehrprofessionalisierung [Hybrid Spaces – cooperation between university, schools and study seminars for the purpose of teacher professionalization]. In Pilypaitytė, L., & Siller, H.-S. (Eds.), *Schulpraktische Lehrprofessionalisierung als Ort der Zusammenarbeit*, (pp. 1–12). (2018) (pp. 1–12). Springer VS.
- Postholm, M. B. (2016). Collaboration between teacher educators and schools to enhance development. *European Journal of Teacher Education*, 39(4), 452–470. <https://doi.org/10.1080/02619768.2016.1225717>.
- Prenzel, M. (2010). Geheimnisvoller Transfer? Wie Forschung der Bildungspraxis nützen kann [Mystical Transfer? How Research can be Useful in the Educational Practice]. *Zeitschrift Für Erziehungswissenschaft*, 13(1), 21–37. <https://doi.org/10.1007/s11618-010-0114-y>.
- Schmider, E., Ziegler, M., Danay, E., Beyer, L., & Bühner, M. (2010). Is it really robust? *Methodology*, 6(4), 147–151. <https://doi.org/10.1027/1614-2241/a000016>.
- Scholz, R. W. (2001). The mutual learning sessions. In J. T. Klein, R. Häberli, R. W. Scholz, W. Grossenbacher-Mansuy, A. Bill, & M. Welter (Eds.), *Schwerpunktprogramm Umwelt / Programme Prioritaire Environnement / Priority Programme Environment. Transdisciplinarity: Joint problem solving among science, technology, and society: An effective way for managing complexity* (pp. 117–129). Birkhäuser Basel. https://doi.org/10.1007/978-3-0348-8419-8_11.
- Scholz, R. W., & Steiner, G. (2015). The real type and ideal type of transdisciplinary processes: Part I—Theoretical foundations. *Sustainability Science*, 10(4), 527–544. <https://doi.org/10.1007/s11625-015-0326-4>.
- Sewell, A., Cody, T.-L., Weir, K., & Hansen, S. (2018). Innovations at the boundary: An exploratory case study of a New Zealand school-university partnership in initial teacher education. *Asia-Pacific Journal of Teacher Education*, 46(4), 321–339. <https://doi.org/10.1080/1359866X.2017.1402294>.
- Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP) [Development and Validation of a Scale to Identify Problems of Knowledge Integration in Interdisciplinary Project Teams]. *Zeitschrift Für Arbeits- Und Organisationspsychologie A&O*, 53(3), 121–130. <https://doi.org/10.1026/0932-4089.53.3.121>.
- Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZL-Network, Leuphana University Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 57–82). Verlag: Barbara Budrich. <https://doi.org/10.3224/84742209.04>.
- Straub, R., & Vilsmaier, U. (2020). Pathways to educational change revisited – controversies and advances in the German teacher education system. *Teaching and Teacher Education*, 96, 1–13. <https://doi.org/10.1016/j.tate.2020.103140>.
- Straub, R., & Waschewski, T. (2019). Transdisziplinäre Entwicklungsteams - Lerntheoretische und didaktische Implikationen eines kooperativen Ansatzes zur Theorie-Praxis-Verzahnung in der Lehrkräftebildung [Transdisciplinary Development Teams - Learning Theoretical and Didactical Implications of a Cooperative Approach to the Interlinking in Teacher Education]. In BMBF (Ed.), *Verzahnung von Theorie und Praxis im Lehramtsstudium: Erkenntnisse aus Projekten der „Qualitätsoffensive Lehrerbildung“* (pp. 63–73). Retrieved from: https://www.bmbf.de/upload_filestore/pub/Verzahnung_Theorie_Praxis_Lehramtsstudium_Erkenntnis_e_QLB.pdf.
- Straub, R., Spöhrer, S., & Meimerstorff, L. (2019). Disziplinen- und phasenübergreifende Kooperation für die Lehrkräftebildung fruchtbar machen: Einsichten aus dem Entwicklungsteam TIES im Kontext inklusiven Englischunterrichts [How to make interdisciplinary and cross-phase cooperation fruitful for teacher education]. In C. Blume, D. Gerlach, N. Benitt, S. Eßer, B. Roters, J. Springob, & T. Schmidt (Eds.), *Perspektiven inklusiven Englischunterrichts: Gemeinsam lehren und lernen*. Retrieved from: <https://inklusive-englischunterricht.de/2019/08/disziplinen-und-phasenuebergreifende-kooperation-fuer-die-lehrkraeftebildung-fruchtbar-machen/>.
- Straub, R., Dollereider, L., Ehmke, T., Leiss, D., & Schmidt, T. (2020). Research-Practice Partnerships in der Lehrkräftebildung: Potenziale und Herausforderungen am Beispiel institutionen- und phasenübergreifender Entwicklungsteams des ZZL-Netzwerks [Research-practice partnerships in teacher education: Potentials and challenges]. *Beiträge Zur Lehrerinnen- Und Lehrerbildung*, 38(1), 138–149.
- Terhart, E. (2000). *Perspektiven der Lehrerbildung in Deutschland: Abschlussbericht der von der Kultusministerkonferenz eingesetzten Kommission*. Beltz Pädagogik. Beltz.
- van den Bosche, P., Gijsselaers, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>.
- van Schaik, P., Volman, M., Admiraal, W., & Schenke, W. (2019). Approaches to co-construction of knowledge in teacher learning groups. *Teaching and Teacher Education*, 84, 30–43. <https://doi.org/10.1016/j.tate.2019.04.019>.
- Villiger, C., & Trautwein, U. (Eds.). (2015). *Zwischen Theorie und Praxis: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung [Inbetween Theory and Practice. Demands and Possibilities in Teacher Education]*. Waxmann.
- Vilsmaier, U., Engbers, M., Luthardt, P., Maas-Deipenbrock, R. M., Wunderlich, S., & Scholz, R. W. (2015). Case-based Mutual Learning Sessions: Knowledge integration and transfer in transdisciplinary processes. *Sustainability Science*, 10(4), 563–580. <https://doi.org/10.1007/s11625-015-0335-3>.
- Weyland, U. (2012). *Expertise zu den Praxisphasen in der Lehrerbildung in den Bundesländern [Expertise in Practical Phases of the Teacher Education in the Länder]*. <https://li.hamburg.de/contentblob/3305538/70560ef5e16d6de60d5d7d159b73322f/data/pdf-studie-praxisphasen-in-der-lehrerbildung.pdf?sessionid=45499CC1240EB3EB38027EE816A1DBFA.liveWorker2>.
- Wilson, M. (2005). *Constructing measures: An item response modeling approach*. Lawrence Erlbaum Associates.
- Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education*, 61(1–2), 89–99. <https://doi.org/10.1177/0022487109347671>.



Appendix IV: Study D - Boundary-Crossing Collaboration as Socio-Organizational Innovation

Straub, R. & Ehmke, T. (pre-print). Boundary-Crossing Collaboration in Teacher Education: Insights from a Socio-Organizational Innovation Perspective.

This article was published as preprint.



Abstract

Over the past decades, boundary-crossing collaborations among focal stakeholder groups in teacher education (e. g. practitioners, researchers, students) have been increasingly discussed as fruitful pathways for generating integrative didactic innovations. Within this article, it will be argued that such collaborative formats resemble socio-organizational innovations in their own right, which in turn provide the necessary prerequisites for advancements in the teaching profession to be co-constructed. Moreover, empirical insights will be provided to further outline boundary-crossing collaboration from a socio-organizational innovation perspective.

In order to do so, the conceptual background of this article combines social innovation theory with an analytical framework inspired by the discourse of transdisciplinarity. Social innovation theory highlights, for instance, the transformation of social relations in order to satisfy social needs and to advocate empowerment. Transdisciplinarity stands for an integrative research and development mode which in addition fosters a multi-dimensional understanding of integration distinguishing (1) epistemic, (2) social, and (3) organizational dimensions. In-depth integration among involved stakeholder groups is again understood as a crucial requirement for successful co-construction and sustainable establishment of socio-organizational innovations. In alignment with that, focal dimensions of integration characteristics (DICs) are operationalized as (1a) mutual learning and (1b) knowledge integration, (2a) perceived-trustworthiness and (2b) appreciation within the team, and (3a) collective ownership of goals.

Based on this, an explorative study was conducted in the context of a research and development project establishing a collaborative format termed Transdisciplinary Development Teams (TDT). Aim of the study is to further investigate, a) how participating TDT members assess DICs with regards to successful and challenging aspects. In addition, it seeks to b) differentiate types of actors which are characterized by particular assessment patterns. The study employs a complementary mixed-methods design combining qualitative and quantitative approaches and utilizes a data corpus with $n = 62$ response sets. Subsequently, this article offers a genuine conceptual approach to frame boundary-crossing collaboration in teacher education. In addition, on this basis further empirical insights have been generated which provide some practical implications to support future collaborative endeavors.



1 Introduction

The discourse on boundary-crossing collaboration in teacher education has received increasing attention over the last two decades. Scholars frame such cooperative formats as powerful mechanisms for the development and transfer of didactical innovations (Einsiedler, 2010; Gräsel, 2011), while educational policy makers and practitioners considered them as integrating factors to bridge the persistently criticized gap between academic research and school practice (Hericks, 2004; Wissenschaftsrat, 2001, 14, 55). There is a growing body of literature offering theoretical frameworks, conceptual propositions and empirical studies for the design as well as the analysis of such collaborative formats (Kleemann et al., 2019; Pilypaitytė & Siller, 2018). However, few studies are investigating boundary-crossing collaboration as a genuine form of innovation in teacher education (Loogma et al., 2013; Rürup, 2013).

The present article aims to contribute to this research desiderate in two ways. First, a conceptual approach will be elaborated which allows to conceptualize this phenomenon as socio-organizational innovation. In order to do so, theoretical positions originating from social innovation theory will be critically outlined and adapted with respect to particularities in the teaching profession. Second, empirical insights will be provided focusing on the integration of focal stakeholder groups as a crucial success factor for the initiation and establishment of effective and sustainable cooperation. Hereby, the analytic framework is inspired by the discourse of transdisciplinarity. Transdisciplinarity represents an integrative research and development mode fostering the co-constructive engagement of actor groups across heterogeneous professional, organizational, and institutional backgrounds (Klein, 2014; Scholz & Steiner, 2015). Moreover, it advocates for a multi-dimensional understanding of integration that highlights the importance of (1) epistemic, (2) social, and (3) organizational dimensions of integration (Jahn et al., 2012). In alignment with that, focal dimensions of integration characteristics (DICs) have been operationalized in terms of (1a) *mutual learning* and (1b) *knowledge integration*, (2a) *perceived-trustworthiness* and (2b) *appreciation within the team*, and (3a) *collective ownership of goals* (Straub et al., 2021). Against this backdrop, an explorative study was conducted in the context of a research and development project within which collaborative formats, so-called Transdisciplinary Development Teams (TDTs), have been established. Aim of the study is to further investigate, a) how participating TDT members assess DICs with regards to successful and challenging aspects. In addition, it seeks to b) differentiate types of actors which are characterized by particular assessment patterns. The



study employs a complementary mixed-methods design combining qualitative and quantitative approaches and utilizes a data corpus with $n = 62$ response sets.

In consequence, the outcome of this article is twofold. First, it applies a genuine conceptual approach to frame boundary-crossing collaboration in teacher education from a socio-organizational perspective. In addition, further empirical insights are presented which allow differentiating types of actors based on the multi-dimensional assessment of integration in boundary-crossing collaboration.

2 The call for Boundary-Crossing Collaboration in Teacher Education

The starting point for this study is a widely acknowledged critique that teacher education in Germany is understood as highly specialized but also as institutionally and disciplinary fragmented by international comparison (Blömeke, 2014). This is particularly due to the consecutive three-phased teacher education system which comprises a) university studies, b) pre-service teacher-training, and c) advanced teacher training while being on the job (European Commission/EACEA/Eurydice, 2015, p. 34; Kotthoff, 2011; Terhart, 2004). University-based teacher education aims at the development of academic knowledge and competencies rooted in a wide range of disciplines. It comprises among others subject matter didactics, pedagogies, educational science, and psychology. Even though mandatory practical studies have been largely expanded within the study curriculum during the past two decades (Rothland & Biederbeck, 2018; Weyland, 2012), the formal responsibility for the development of practical teaching competencies lies within the second phase involving schools and teacher education colleges (German: “Studienseminare”; Lenhard, 2004). With respect to the third phase, advanced teacher training, there are no uniform standards across the federal state system in Germany. Therefore, advanced training might be conducted at training institutes affiliated at universities, as it is the case for Lower Saxony, or else at educational administration institutes.

Institutional fragmentation may also be understood as a reinforcing element of what is commonly referred to as ‘theory-practice divide’ in teacher education (Korthagen, 2007; Villiger, 2015). There are ongoing controversies that seek to provide refined conceptualizations and alternative perspectives on the interrelation between among others, “knowledge and action”, “research and experience”, “reflection and acting”, “distancing and engagement” (for a comprehensive overview see Rothland, 2020). Nonetheless, the German teacher education system in Germany continues to face ongoing criticism from various interest groups directed at the insufficient integration and coherence between academic expertise and practical skills



(Arnold, 2010; Vanderlinde & van Braak, 2010). Even worse, mutual accusations and tendencies of delimitation have become at least common knowledge within the teaching profession (Messner, 2012, p. 77). In extreme cases, the work of scholars created ‘in their ivory towers’ is considered of limited practical relevance (Broekkamp & van Hout-Wolters, 2007), while practitioners are accused of neglecting theoretical, conceptual, and empirical knowledge (Patry, 2005).

However, in contrast to these conflicting tendencies, there are also increasing calls for boundary-crossing collaboration in teacher education (Gorodetsky & Barak, 2008; Straub & Vilsmaier, 2020). These are committed to overcoming aforementioned institutional fragmentation by pooling various bodies of knowledge and expertise across the teacher education system in order to co-construct integrative advancements within the teaching profession. Fields of application for such collaborative formats refer, for instance, to university-based teacher education and teacher education colleges, schools and youth welfare representatives, and extra-curricular institutions (Boer et al., 2018; Kleemann et al., 2019).

Potential benefits from boundary-crossing collaborations are threefold: First, on an interpersonal level boundary-crossing is understood as a genuine opportunity for professional development due to processes of mutual learning and knowledge integration (Boer et al., 2018; Korthagen, 2016). Second, on an organizational and institutional level, such collaboration is understood to allow for collective capacity building and to be a driving force for organizational change (Fullan, 2016; Hartmann & Decristan, 2018). Third, the pooling of academic expertise and practical experience fosters the co-creation of didactical innovations, for instance, teaching and learning arrangements and teaching practices (Gräsel, 2011; Sewell et al., 2018). In total, boundary-crossing collaborations in teacher education are discussed as powerful mechanisms to mitigate the gap between academic research and school practice.

3 Conceptualizing Boundary-Crossing Collaboration from a Social Innovation Perspective

In the context of the present article, it is argued that boundary-crossing collaboration may be fruitfully conceptualized as social-organizational innovations which then allows co-constructing didactical innovations among focal stakeholder groups in teacher education. In order to substantiate this argument, conceptual insights from social innovation theory will be adapted to the context of teacher education.



Social innovation theory itself is located at the intersection of, and draw on, contributions from social sciences, economic analysis, and policy discourses (Mulgan, 2012). Its focal object of investigation, social innovations, is therefore framed from various (inter)disciplinary informed perspectives. These perspectives highlight a wide range of different related phenomena ranging from market-oriented social entrepreneurship, community-based initiatives to social movements as a driving force for societal change (Moulaert, MacCallum, & Hillier, 2013). However, a widely acknowledged definition by Phillis et al. (2008, p. 36) conceptualize social innovation as “a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals”. Similar to this, Moulaert, MacCallum, Mehmood et al. (2013, p. 1) state that the concept of social innovation may comprise “the creation of new products, services, organizational structures or activities that are ‘better’ or ‘more effective’” and facilitates or improves the satisfaction of needs, reconfigured social relations and empowerment, or political mobilization. With respect to these general aims, the discourse on social innovation ranges from the pragmatic improvement of social system’s effectiveness to the call for enhancement of the human condition in general (Jessop et al., 2013, p. 124). In alignment with that, the following examples resemble well-known showcase pieces for social innovation: The Grameen Bank founded by Muhammad Yunus provides micro credits to support self-employment as an effective means against poverty (Ashta et al., 2013). Another example refers to mass literacy campaigns and popular education movements in Brazil significantly inspired by the works of Paulo Freire (Fernandes et al., 2013).

More recently there is an increasing amount of studies applying the concept of social innovation with respect to educational landscapes (Kolleck, 2014) and teacher education (Loogma et al., 2013; Rürup, 2013). However, the outlined conceptualizations focused so far primarily on reconfigurations of social relations and social outcomes in terms of satisfaction of social needs for equality, participation, and empowerment. Particularly in inter-organizational collaborative settings, such aspects are inseparably interrelated with organizational issues concerning among others work flows, distribution of resources, and responsibilities as well as decision-making arrangements. Therefore, it is deemed more appropriate to frame boundary-crossing collaborations as socio-organizational innovations.

In addition, the literature on social innovations is primarily viewed as local or regional embedded grass-roots initiatives, social movements, or community-based developments (Phillis et al., 2008; Rürup, 2013). However, at least when a social innovation picks up enough



momentum to spread and to be transferred outside the spatial, organizational, and subject-related contexts of origin, it is most likely that formal institutions, administration, and policy makers have to be involved (Schubert, 2016). Moreover, boundary-crossing collaboration among educational scholars and school practitioners opens up potential pathways for interrelating bottom-up and top-down approaches in teacher education (Loogma et al., 2013). In this way, dominant topics in scientific discourses and political reform agendas, such as competence-oriented instruction and inclusive schooling may be fruitfully interrelated with the requirements and needs of the practical field.

Moreover, the generation of social innovation is commonly understood as a collective effort, which requires the negotiation of various perspectives and balancing of different requirements and needs from various stakeholder groups. On the one hand, collaborative, case-based, and action-oriented research, and development are considered as fruitful to facilitate socio-organizational innovations (Fontan et al., 2013, p. 309). It is also highlighted that the pooling of stakeholder specific intellectual resources such as expertise, experiences, and perspectives are essential in order to increase relevance and social acceptance in the target field (Peters, 2018).

Against this backdrop, this article resonates well with approaches in social innovation, which advocate a transdisciplinary perspective. According to contributions by Moulaert, MacCallum, and Hillier (2013, pp. 21–22) and Novy et al. (2013) social innovation has to be understood as path-dependent and embedded in complex multi-dimensional (e. g. social, economic, political, cultural) relations and thus calls for case-based, action-oriented, and thus transdisciplinary research methodologies.

4 Transdisciplinary Dimensions of Integration

Transdisciplinarity refers to an integrative research and development mode that advocates for the interrelation of different bodies of knowledge and ways of knowing (Klein, 2014; Straub & Vilsmaier, 2020). In this way, transdisciplinarity fosters collaboration across professional, institutional, and organizational boundaries (Hirsch-Hadorn et al., 2008; Scholz & Steiner, 2015). According to Nowotny et al. (2001) the integration of different sources of expertise and the dedication to address both, scientific as well as practical challenges, allow for the development of ‘socially robust knowledge’. The notion of ‘socially robust knowledge’, in turn, is linked to increased ‘legitimacy, ownership, and accountability’ (Lang et al., 2012, p. 26) due to the implicit requirement to serve scientific as well as practical requirements and quality



standards. Based on these assumptions, the integration of different stakeholders, such as practitioners, researchers, and students, within a shared and participative collaboration process is of paramount importance. Moreover, due to the professional, institutional, and organizational heterogeneity of collaborations in transdisciplinary contexts, a multi-dimensional understanding of integration is required (Felt, 2009; Felt & Fochler, 2012; Jahn et al., 2012; Lang et al., 2012). The present study focuses on (1) epistemic, (2) social, and (3) organizational dimensions of integration which in turn are operationalized in terms of the following DICs (Straub et al., 2021): (1a) *mutual learning* and (1b) *knowledge integration*, (2a) *perceived-trustworthiness* and (2b) *appreciation within the team*, and (3a) *collective ownership of goals*.

1) Epistemic Integration: Mutual Learning and Knowledge Integration

Transdisciplinarity highlights the integration of different bodies of knowledge and ways of knowing through mutual learning (Scholz & Steiner, 2015; Vilsmaier et al., 2015). Mutual learning comprises behavioral capacities regarding the exchange of knowledge and expertise, co-constructive behavior, and critical reflection (van den Bossche et al., 2011). In this study, mutual learning is also understood as a focal requirement for knowledge integration. Knowledge integration, again, comprises the ability to establish a mutual understanding and common knowledge base among heterogeneous stakeholder groups (Steinheider et al., 2009).

2) Social Integration: Mutual Trust and Appreciation

According to the multi-dimensional understanding of integration, mutual learning, and knowledge integration dependent on social integration. Especially in-depth and long-term collaborations among different stakeholders, such as practitioners, researchers, and students, rely heavily on trust-based and appreciative relations. Trusting relationships are characterized by a reciprocal commitment to honor mutual agreements and to engage in open and transparent communication (Costa & Anderson, 2011). In addition to trust-based relations, mutual appreciation among different stakeholder groups is understood as an important facilitating factor, that helps to mitigate potential status hierarchies and to engage on an equal footing (Carmeli & Gittell, 2009). Mutual appreciation is also a necessary condition to engage in critical debates and constructive conflict (van den Bossche et al., 2011).



3) Organizational Integration: Collective Ownership of Goals

Trust-based and appreciative relations that promote mutual learning and co-construction of shared knowledge benefit from integrative organizational arrangements. Thus, it is essential that the collaboration is characterized by participative decision-making and shared ownerships of goals (Bronstein, 2002). Participation and shared responsibilities for the achievement of shared goals are powerful mechanisms to mitigate power asymmetries and to allow for the involved stakeholder groups to express their particular perspectives and needs (Elzinga, 2008). This is also understood as crucial prerequisites for establishing necessary legitimacy and acceptance for the implementation of innovations (Lang et al., 2012).

5 Research Interests

Against this theoretical backdrop, the present study seeks to provide further empirical insights about featuring characteristics of boundary-crossing collaborations in teacher education applying a socio-organizational innovation perspective. In order to do so, an explorative study was conducted in the context of a research development project which established a collaborative format termed Transdisciplinary Development Teams (TDTs), for further details see section 6.1. In this context two main research interests will be addressed by the following research questions:

- 1) How do the involved actors assess the TDT work with respect to successful and challenging aspects of transdisciplinary DICs?
- 2) Are there different types (clusters) of TDT members which are characterized by specific sets of assessments with regards to successful and challenging aspects of transdisciplinary DICs?

The second research interest is also related to the following sub-questions:

- 2a) How do these clusters differ with respect to DICs?
- 2b) Are these clusters related to focal demographic or context-specific background variables such as sex, experience in year, or stakeholder group affiliation?

6 Methods

6.1 Research Context

The study is based on data provided in the context of a research and development project in Lower Saxony, Germany. According to the project's mission statement, the overall vision is twofold (Ehmke et al., 2018, p. 10). First, it aims to establish a space for joint discourse and



thought for various actor groups across the teacher education system, such as researchers, teachers, and student teachers to engage on an equal footing. Second, this is supposed to foster boundary-crossing collaboration regarding the development, revision, and implementation of advancements in teacher education at a regional level (Straub & Vilsmaier, 2020). Against this backdrop, eight so-called TDTs have been established to foster collaboration at the boundary of initial teacher education and school practice since 2016. Each team addresses a particular action field that represents an overarching challenge in the teaching profession and that is considered to be of relevance to the academic as well as the practical field. These action fields refer to competence-oriented instruction, inclusive schooling, mentoring student teachers during practical studies, and maintaining teachers' health (Straub & Dollereeder, 2019).

Within the boundaries of the overall action fields, the particular development teams are characterized by considerable degrees of freedom. In alignment with focal principles for transdisciplinary processes, the arrangement of a) problem-framing and team building, b) mutual learning and knowledge integration as well as c) re-integration and application of TDTs outcomes are subject to shared decision-making and negotiations processes among the involved actor groups (for a detailed discussion see Straub & Vilsmaier, 2020). In addition, participation at the TDTs based on voluntary commitment, while teachers, teacher training educators (German: "Studienseminarleitung"), and extra-curricular partners received basic expense allowance. Due to these background conditions, the particular development teams show variations with regard to team size and team composition as well as work organization and concrete development objectives (Straub et al., 2021; for a compact overview see Straub & Dollereeder, 2019). Despite these differences, the TDTs met on a regular basis, about every three to six weeks, in order to co-constructively develop, establish, and revise didactical innovations at the boundary of university-based teacher education and school-based teaching practice (see among others Scharnberg, 2019; Waschewski, 2018; ZZL-Netzwerk, 2018).

The following two examples provide some illustrating features in that regard. At the time of the survey, the TDT on 'Mentoring during Practical Studies', for instance, consisted of six team members, comprising researchers, teachers, teacher training educators, and student teachers. Together the team members aimed to jointly develop, establish, and revise the so-called 'ProMent' advanced teacher training program. The program offers various modules that prepare teachers to become mentors for student teachers during their long-term school-placements (Beckmann et al., accepted).



In contrast, the TDT on ‘Competence-Oriented Instructional Design in Basic Social and Science Studies’, consisted of twelve team members, including partners from extra-curricular institutions (Bürgener & Barth, 2018). Moreover, the TDT was closely linked to a university-based course for student teachers and addressed two main objectives (Bürgener & Barth, 2020). First, the interrelation between the TDT and the university course offered a) mutual learning opportunities for the participating actor groups and b) teaching materials applicable for school-based teaching and extra-curricular programs that have been practically tested and revised.

6.2 Sample Description

At the time of the survey, a total of $N = 77$ active team members collaborated, divided among eight development teams. In order to focus the study on factual team work settings, a cut-off criterion has been applied, according to which only those persons were considered in the survey which took part at least at five development team meetings. The overall response rate of 80.5 % is considered satisfactory and results in a factual sample size of $n = 62$.

Gender composition among the team members (male = 23.3 %, female = 76.6 %) corresponds fairly with those of teachers in Lower Saxony in 2016 (male = 27.9 % and female = 72.1 %) (MK Niedersachsen, 2018). The *age groups* represented in the development teams cover the full range from under 30 to above 59 years. Despite the group of persons with age above 49 (11.7 %), the age groups are approximately uniformly distributed which again corresponds roughly with the teacher composition in Lower Saxony (MK Niedersachsen, 2018). In addition, the *professional experience* is likewise approximately uniformly distributed and reflects various levels of expertise from novice to experienced practitioners.

The *stakeholder groups* are distinguished mainly between three major players in teacher education: practitioners (51.6 %), researchers (25.8 %), students (16.1 %), and others (6.5 %). Needless to say, the actual variety of educational backgrounds, organizational affiliations, and vocational status are in fact much more diverse. Especially, the subgroup *practitioners* comprises teachers and principals as well as teacher training educators. The latter works usually part-time at teacher training seminars and schools. *Researchers* refers to professors and research assistants at the university. *Students* are considered a major target group for the TDTs outcomes. In spite of that, student teachers are involved in only two out of eight teams and represent only a comparably small number within the sample size. There are two pragmatic reasons for this. First, participation at the TDTs base on voluntary commitment, while being quite time-consuming. In contrast to teachers, for instance, student teachers are not entitled to receive



expense allowances according to the regulations of the funding agency. Second, since most of the TDTs are closely linked to university-based teaching arrangements, student teachers participate in the outcomes of the TDTs' work without directly being part of the teams. Thus, most TDTs focused on the interaction among practitioners and researchers, instead. The category *others* refers to partners from extra-mural organizations like foundations and public authorities. Despite the fact, that they provide profound insights for the joint work in the development teams, their small number made it not feasible to consider them as an independent sub-group.

6.3 *Survey Instruments and Methods of Analysis*

The study utilizes data gathered through a written survey among all active TDT members. The questionnaire comprises standardized attitude scales with regards to DICs, open question formats about, and a survey instrument for ego-centric network analysis. The present study focuses exclusively on the analysis of the data generated through the open question formats. The corresponding questions read as follows: a) 'In your own opinion, please state the three most successful aspects with regard to the development team work?' and b) 'In your own opinion, what are the three most challenging aspects with regard to the development team work?' The survey has been conducted in German. Therefore, these questions and items within the coding manual (see Table 1) have been translated by the authors.

The responses were mostly expressed as keywords or short half-sentences, which is probably due to the considerable length of the overall survey with an average processing time of 45 minutes. A mixed-methods approach for data analysis was applied which was deemed most suitable against the backdrop of the following research conditions: a) the explorative aim of the study and thus b) the lack of a prior case or sub-sample selection criteria, c) the small scale setting with a sample size of $n = 62$ response sets, and d) given that the response sets comprised mostly key words and short sentences. In particular, a complementary transfer design was used that allows combining qualitative and quantitative approaches for data analysis (QUAL \rightarrow QUAN) (Kuckartz, 2014, pp. 87–90; Vogl, 2017). Initially, the data corpus was coded following the procedure for a structuring qualitative content analysis (Kuckartz, 2016). The analytic category system was derived deductively based on the conceptual framework as outlined in section 3. Table 1 displays an overview of the category system including working definitions, reference examples, and inter-coder reliability measures. The latter are displayed by Cohen's Kappa values. They range between .80 and .88 and indicate excellent inter-rater



agreement. Subsequently to the qualitative coding process, the data corpus has been quantified to allow for further statistical analysis.

Table 1

Coding manual including working definition, example quotes and inter-rater reliability measure Cohen's Kappa (K) for Dimensions of Integration (DI) Characteristics

DI	Characteristic	Definition	Examples	Cohen's Kappa
Epistemic	<i>Mutual Learning</i>	<i>Mutual Learning</i> refers to behaviors including exchange, co-construction and/or critical reflection of e.g. knowledge, experience, and concepts and materials among different actors.	'exchange among experts'; 'mutual confirmation / complementing of ideas'	.85
	<i>Knowledge Integration</i>	<i>Knowledge Integration</i> indicates team members' perception that the TDT is characterized by heterogeneous knowledge bases and perception, mutual perception taking and creation of a common-ground.	'differing state of knowledge'; 'creation of a shared project understanding'	.86
Social	<i>Perceived Trustworthiness</i>	<i>Perceived Trustworthiness</i> applies when team members state that they rely on agreements, individual interests are transparent and there are no hidden agendas.	'With regards to equitable cooperation, it would be conducive if there were transparency and assurance about how originators for (shared) developed ideas are documented'	.85
	<i>Appreciation within the Team</i>	<i>Appreciation within the Team</i> stands for the acceptance and acknowledgement among the TDT members, even if their perspectives may differ from another.	'respectful and appreciating interaction', 'to take each other seriously'	.88
Organizational	<i>Collective Ownership of Goals</i>	<i>Collective Ownership of Goals</i> indicates that TDT members participate and take on responsibility for defining and achieving joint goals.	'everybody works towards the same goals', 'shared decision making'	.80

Note. Definitions are positively formulated but also imply to statements which indicate a lack, violation or problematization of a given characteristic in order to cover challenging aspects of TDT work as well.

In order to answer research question 1, descriptive statistics, especially proportional values have been calculated to complement qualitative data inspection. This allows for the assessment of prevalence and distribution of statements with respect to successful and challenging aspects of DICs.



Research question 2 was approached by applying a hierarchical cluster analysis and a non-parametric ANOVA using van der Waerden's test statistics in order to distinguish different types of TDT members. In addition, χ^2 -tests have been performed to test for statistical independence between team members' cluster affiliation and control variables such as sex, professional experience in years, and stakeholder group affiliation. In addition, the cluster analysis represents a person-centered approach which is why the data set used to answer research question 1 was dichotomized previously. Subsequently, the value '1' indicates that a respondent made at least one statement about a certain DIC. In contrast '0' displays that no statement was made. Moreover, the differentiation between successful and challenging aspects has been maintained. For calculating the cluster analysis, the simple matching similarity measure and the complete linkage clustering algorithm was applied. This configuration is considered preferable in the case of qualitative data as a source of origin (Kuckartz, 2016, p. 238).

Moreover, a non-parametric ANOVA using van der Waerden's tests statistic was applied which is considered to be fairly reliable under test conditions such as dichotomous data, homogenous variances as well as unbalanced and comparable small sub-sample sizes (Luepsen, 2018). The tests have been performed in R using RStudio (ver. 1.2.1335) and the Package PMCMRplus (Pohlert, 2018). All other calculations have been performed with IBM SPSS Statistics (ver. 26.0).

7 Findings

7.1 *Assessment of Dimension of Integration Characteristics*

In order to investigate research question 1, how TDT members assess the team work with regards to DICs, descriptive statistics have been combined with a qualitative inspection. The total number of codings with respect to successful or challenging aspects regarding DICs is $n = 139$. This number contains also potential multiple mentions of a person regarding a particular DIC. Table 2 provides an overview of the prevalence of the statements regarding successful and challenging aspects of transdisciplinary DICs.



Table 2

Prevalence of Dimensions of Integration (DI) Characteristics with respect to successful and challenging aspects

DI	Characteristic	Successful aspects		Challenging aspects		total
		<i>n</i> (% _{col})	(% _{row})	<i>n</i> (% _{col})	(% _{row})	<i>n</i> (% _{col})
epistemic	<i>mutual learning</i>	29 (41.43)	(63.04)	17 (24.64)	(36.96)	46 (33.09)
	<i>knowledge integration</i>	12 (30.00)	(26.67)	33 (47.83)	(73.33)	45 (32.37)
social	<i>perceived trustworthiness</i>	2 (2.86)	(40.00)	3 (4.35)	(60.00)	5 (3.6)
	<i>appreciation within the team</i>	19 (27,14)	(76.00)	6 (8.70)	(24.00)	25 (17.99)
organizational	<i>collective ownership of goals</i>	8 (11.43)	(44.44)	10 (14.49)	(55.56)	18 (12.95)
Total		70	50.36	69	49.64	139

The overall amount of mentions is equally distributed among successful (50.36 %) and challenging aspects (49.64 %). Both epistemic dimensions of integration characteristics show the highest percentages with *mutual learning* (successful: 41.43 %; challenging 30.00 %) and *knowledge integration* (successful: 24.43 %; challenging 47.83 %), while perceived trustworthiness was the least mentioned characteristic (successful: 2.86 %; challenging: 4.35 %). When inspecting the proportions per each characteristic, it becomes apparent, that *mutual learning* and *appreciation within the team* feature particularly successful aspects of the development team work with 63.04 % and 76.00 %. In contrast, *knowledge integration* and *perceived trustworthiness* contain mainly challenging statements with 73.33 % and 60.00 %. In comparison, *collective ownership of goals* shows a relatively moderate proportion with regards to the overall amount of statements (12.95 %) and is also almost equally distributed according to successful and challenging mentions.

In addition to the analysis of the proportional distributions of the team members' statements, a qualitative inspection of the DICs shows that there are some differences with respect to the variety of facets and the depth of elaboration. Despite the fact that *mutual learning*



was coded quite frequently, the majority of answers referred literally to the aspect of exchange. Mostly, there were no further specifications, but if so then they indicate mostly intellectual exchange, for instance, exchange of opinions or experiences, in contrast to e.g. exchange of materials or products. In addition, only few statements were indicating co-constructive discussions and interactions. Challenging aspects referred, besides to the exchange, also to aspects of reflection.

As indicated above statements regarding *knowledge integration* were mostly stated as challenging. These can be differentiated into three groups. The first indicate in general, that there is considerable heterogeneity of understandings and perspectives, which have to be addressed during the development team work. Second, the need for mutual perspective taking has been addressed, while the development of common ground with respect to problem understanding and solution approaches comprises the third challenging facet. Mentions of *knowledge integration* as successful resemble similar sub-facets but occur less often.

The characteristic *perceived trustworthiness* was mentioned rather seldom. However, it becomes apparent that while positive mentions consist only of single key words like ‘trust’ and ‘reliability’, problematizing statements were considerably more elaborated. For instance, it was criticized that an initial arrangement regarding the compensation of teacher’s engagement could not be fulfilled as initially agreed as compensatory hours (German: “Anrechnungs- bzw. Entlastungsstunden”) but had to be replaced with monetary compensation. Another statement problematized the lack of transparency about the authorship of co-constructed ideas and concepts and the potential risk that single persons might earn the gratitude for collective efforts.

In contrast to *perceived trustworthiness*, the characteristics *appreciation within the team* was predominantly considered as a successful aspect regarding the development team work. Mostly, these statements referred plainly to key words such as ‘appreciation’, ‘respect’ or ‘equal footing’, but offer little explanation which aspects in particular were considered to be appreciative. This counts also for challenging aspects, which occurred less often. However, these referred, for instance, to the mitigation of hierarchies and involvement of students.

Finally, *collective ownership of goals* comprises rather equally successful and challenging aspects. With regards to successful aspects statement pointing mostly at ‘shared goals’, while challenging statements were a bit more diffuse ranging from the lack of shared commitment among different actor groups or joint engagement with research and development activities.



7.2 Types of Development Team Members

Subsequent to dichotomizing, the data set now comprises $n = 106$ occasions where a development team member made at least one statement with respect to one of the DICs. This allows for performing a cluster analysis in order to identify types of development team members which are distinguishable due to the characterizing pattern of DICs expressions.

A visual inspection of the dendrogram for the hierarchical cluster analysis indicates that the potential cluster solutions are quite similar to each other. Nonetheless, differentiating the data set into a set of four clusters represent the greatest differences among them. Accordingly, the resulting sub-sample sizes for each cluster are as follows: cluster A $n = 18$ (29.0 %), cluster B $n = 12$ (19.4 %), cluster C $n = 13$ (21 %), cluster D $n = 19$ (30.6 %). Table 3 displays frequencies, non-parametric test statistics based on van der Waerden's test, and respective effect sizes measured with *Cramer's V* for differences among Cluster A, B, C, and D regarding successful and challenging aspects of DICs.

Table 3

Frequencies and non-parametric ANOVA for Cluster A, B, C, and D

Characteristics	Cluster A ($n = 18$)		Cluster B ($n = 12$)		Cluster C ($n = 13$)		Cluster D ($n = 19$)		vdW	p	V	Post hoc
	$n_{(0)}$	$n_{(1)}$	$n_{(0)}$	$n_{(1)}$	$n_{(0)}$	$n_{(1)}$	$n_{(0)}$	$n_{(1)}$				
Mutual learning (s)	15	3	10	2	9	4	2	17	25.77	<.01	.64	D>A,B,C
Mutual learning (c)	18	0	12	0	4	9	15	4	26.04	<.01	.65	C>A,B,D
Knowledge integration (s)	14	4	12	0	12	1	13	6	6.54	.09	.32	A,B,C,D
Knowledge integration (c)	17	1	0	12	13	0	8	11	37.91	<.01	.78	B>D>A,C
Perceived trustworthiness (s)	18	0	10	2	13	0	19	0	8.74	.03	.38	A,B,C,D
Perceived trustworthiness (c)	17	1	10	2	13	0	19	0	5.56	.14	.30	A,B,C,D
Appreciation within the team (s)	15	3	6	6	6	7	18	1	13.37	<.01	.46	B,C>A,D
Appreciation within the team (c)	14	4	12	0	13	0	18	1	7.57	.06	.35	A,B,C,D
Collective ownership of goals (s)	18	0	9	3	9	4	19	0	12.11	<.01	.44	C>A,B,D
Collective ownership of goals (c)	17	1	11	1	13	0	11	8	14.15	<.01	.48	D>A,B,C

Notes. $n_{(0)}$ indicates that no statement was made to a given characteristic and $n_{(1)}$ indicates that at least one statement was made (s) refer to statements indicating successful aspects and (c) challenging aspects respectively vdW = van der Waerden test statistic; V = *Cramer's V*; the column labelled post hoc indicates significant differences for multiple pairwise comparisons at a $p < .05$ level.

The results indicate that there are group differences with regards to mutual learning (s), mutual learning (c), knowledge integration (c), perceived trustworthiness (s), appreciation within the



team (s), collective ownership of goals (s), and collective ownership of goals (c) with p -values ranging between $<.01$ and $.03$. The corresponding effect sizes range between $.38$ and $.78$ indicating medium to large differences among the clusters on a general level. In contrast, there are no statistical differences found for knowledge integration (s) ($p = .088$), perceived trustworthiness (c) ($p = .135$), and appreciation within the team (c) ($p = .056$).

In addition, post-hoc tests have been calculated to identify which clusters differ from each other in particular (see column to the far right). Based on this, it is also possible to further characterize the four clusters based on the genuine DIC's expressions.

Cluster A - Indifferent Members

According to the post hoc tests, team members comprised in cluster A only show occasional statements with regards to DIC's. Therefore, this group is referred to as 'Indifferent Members'. At this point, however, it has to be noted that the framework of analysis focused excluding on the deductively derived category system. Thus, members of this group may have made statements otherwise which were not included in the present study.

Cluster B - Integration Critics

Cluster B is referred to as 'Integration Critics' since the corresponding team members' statements problematize in particular that heterogeneous levels of expertise and knowledge within the development teams were an obstacle which they had to cope with. This does not necessarily imply that heterogeneity in terms of different professional backgrounds, organizational affiliations, and work experience itself was denied as important influencing factors. This interpretation is supported by the fact that respondents were significantly more likely to state that the collaboration was characterized by mutual appreciation than members of clusters A and D.

Cluster C - Learning Critics

Cluster C is likewise characterized by the perception of mutual appreciation, but more importantly, features significantly higher proportions with regards to critical aspects towards *mutual learning*. Therefore, this group is referred to as 'Learning Critics'. Accordingly, members of this cluster are more likely to articulate challenging or problematic aspects with respect to the exchange of experiences, reflection, or co-construction of new ideas, concepts, and/or materials. However, on a descriptive level, they also show slight tendencies to mention



positive aspects with regards to *mutual learning*. Therefore, *mutual learning*, in general, seems to be of importance to this cluster, even though it is regarded rather critically. Finally, there is also a significant tendency for *Learning Critics* to state successful aspects with regards to *collective ownership of goals* which indicate the perception of equivocal cooperation among the different team members.

Cluster D - Committed Learners

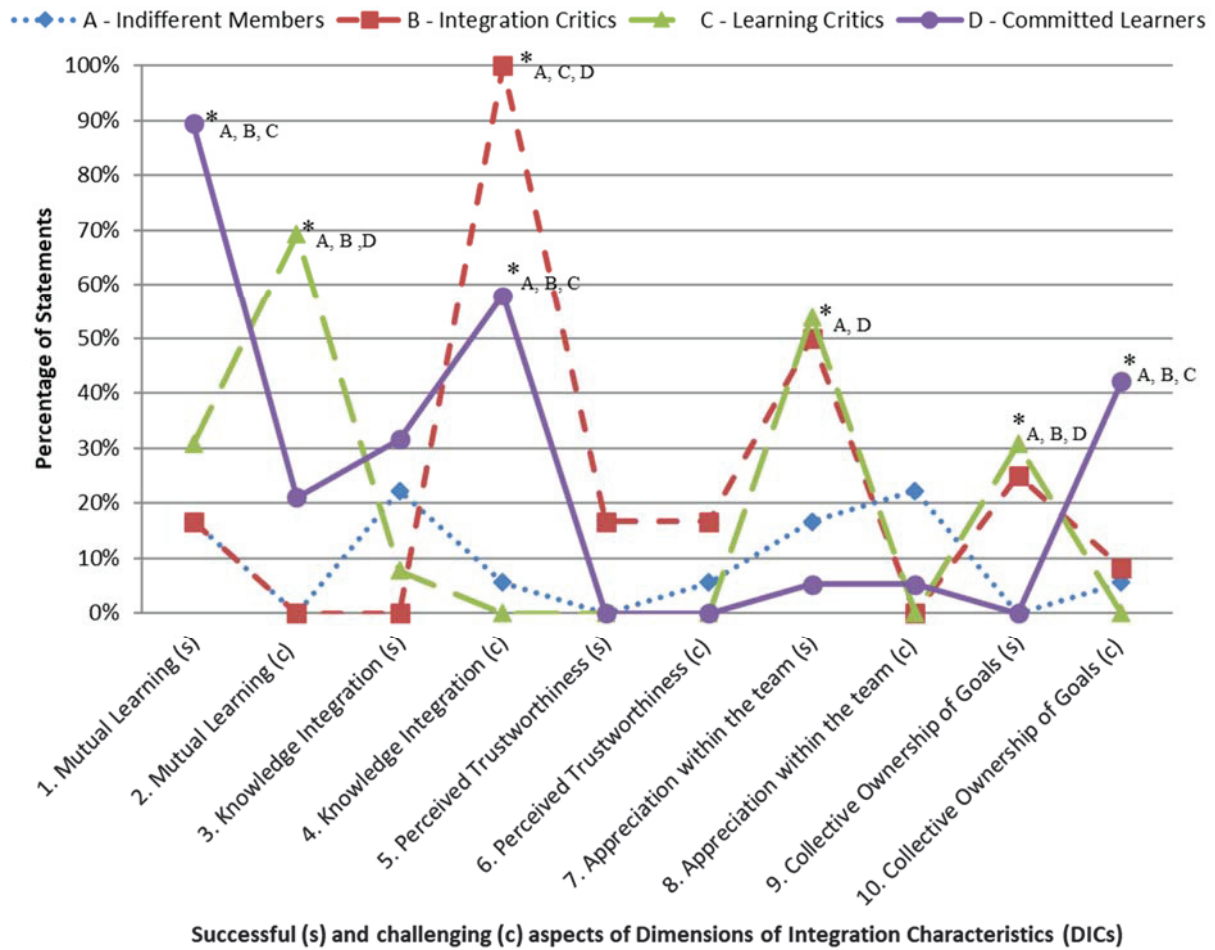
The final cluster D was labeled ‘Committed Learners’. On the one hand, respondents within this cluster are characterized by a significantly higher probability to assess *mutual learning* as a successful aspect regarding team work. On the other hand, they are more likely to articulate perceptions with regards to any of DICs in general. For instance, they also share rather critical views on aspects of *mutual learning* such as the Learning Critics do. However, in contrast, they also show approving statements towards successful exchange, joint reflection, and co-constructive processes. Nonetheless, members within this cluster are significantly more likely to express concerns about aspects of *collective ownership of goals*. Since they did not mention any aspects related to the appreciation within the team, this might indicate that they have experienced somewhat unbalanced situations with regards to an uneven division of responsibility rather than unequal participation.

Figure 1 illustrates the clusters profiles with regards to the proportion of statements made to successful or challenging aspects of the respective DICs.



Figure 1

Percentage of Statements according to Successful and Challenging Aspects of Dimensions of Integration Characteristics (DICs)



Finally, with regard to research question 2b, it has been analyzed whether the cluster compositions are related to relevant demographic or context specific variables such as sex (female; male), professional experience (in years; < 3 years = ‘inexperienced’, > 3 to 6 years = ‘experienced’ and > 6 = ‘established’) or affiliation to a focal stakeholder group (school practitioners, researchers, and students). With respect to sex, there are no significant differences to be found ($\chi^2_{(3)} = 6.01, p = .11, n = 60$). However, visual data inspection shows, that the proportion of male team members is slightly higher in cluster D – *Committed Learners* with 42.11 % than within the other clusters ranging between 8.3 % and 23.08 %. In addition, there seems to be no relation between the professional experience in years and the cluster composition ($\chi^2_{(6)} = 7.98, p = .24, n = 62$). Finally, no statistically significant relation was to be found regarding stakeholder group and cluster affiliation ($\chi^2_{(6)} = 11.46, p = .08, n = 58$). Nonetheless, distributions shown in Table 4 suggest the following tendencies: school practitioners tend to be



evenly spread across the four clusters. Researchers, implying professors and scientific staff, tend to be either within cluster D – Committed Learners (50.0 %) or are indifferent towards DICs (cluster A, 31.25 %). In contrast, students are more likely to be present among both critics clusters, B – Integration Critics (50.0 %) or cluster C – Learning Critics (30.0 %), respectively.

Table 4

Frequency and percentage distributions of Cluster Affiliation by Stakeholder Group

Measure	Practitioners (n = 30)		Researchers (n = 16)		Students (n = 10)		total
	n (%col)	(%row)	n (%col)	(%row)	n (%col)	(%row)	
A – Indifferent Members	9 (28.13)	60.00	5 (31.25)	33.33	1 (10.0)	6.67	15
B – Integration Critics	6 (18.75)	50.00	1 (6.25)	8.33	5 (50.0)	41.67	12
C – Learning Critics	8 (25.00)	61.54	2 (12.5)	15.38	3 (30.0)	23.08	13
D – Committed Learners	9 (28.13)	50.00	8 (50.0)	44.44	1 (10.0)	5,56	18

8 Conclusion, Limitations, and Outlook

Despite, the persistent critique towards the institutional fragmentation in teacher education, the three-staged system, was never seriously called into question (Hericks, 2004, pp. 301–302). Instead, an increasing amount of regional research and development projects has been established in order to mitigate the inherent theory-practice gap through boundary-crossing collaboration (Kleemann et al., 2019; Pilypaitytė & Siller, 2018). However, the institutionalized interrelation of university-based teacher education and school-based practice refers mainly to forms of school internships and pre-service teacher trainings aiming at students’ professional development (Weyland, 2012). Therefore, one has to realize that the initiation, establishment, and transfer of collaborative arrangements dedicated to co-construct didactical innovations at the intersection of university-based teacher education and school-based practice come at the cost of additional temporal and financial resources. Even more importantly, it requires not only significant commitment and willingness to participate but in addition to engage in controversial



debates and time-intensive negotiation and decision-making processes. By acknowledging this, it becomes apparent that such arrangements have to be considered as a genuine form of innovation. Accordingly, in the course of this article, it was suggested to conceptualize boundary-crossing collaboration in teacher education as a socio-organizational innovation. In alignment with pertinent definitions in social innovations theory (Moulaert, MacCallum, Mehmood et al., 2013, p. 1; Phillis et al., 2008), such collaborative formats allow for a more integrated interrelation of different bodies of knowledge and experiences as well as interests and needs. However, in contrast to ideal-typical definitions in social innovation theory, boundary-crossing collaborations in teacher education address primarily the reconfiguration of professional relationships and along with it organizational arrangements, such as debating and negotiation procedures and decision-making processes. Therefore, it is argued to use the term socio-organizational innovations. Furthermore, taking on this perspective allows one to analytically distinguish boundary-crossing collaborations as a genuine prerequisite for the co-construction of more integrative didactical arrangements.

Moreover, the present article outlined the importance of integration of focal stakeholder groups as a vital success factor for an effective and sustainable establishment of boundary-crossing collaborations in teacher education. In order to do so, an analytical framework inspired by the discourse on transdisciplinarity was applied (Straub et al., 2021). It highlights a multi-dimensional understanding of integration comprising (1) epistemic, (2) social, and (3) organizational factors such as (1a) *mutual learning* and (1b) *knowledge integration*, (2a) *perceived-trustworthiness* and (2b) *appreciation within the team* and (3) *collective ownership of goals*.

Against this theoretical backdrop, descriptive findings regarding research question 1 reveal that the TDT members assess epistemic characteristics ambivalently. On a general level *mutual learning* is considered mostly as being a successful aspect of cooperation, whereas *knowledge integration* was referred to as rather challenging. In addition, qualitative inspection revealed that *mutual learning* mostly referred to processes of exchange of expertise and experiences, while reflection and co-constructive were rarely mentioned. However, it would be overly simplifying to assume that these collaborative forms did not occur or would be otherwise considered to be problematic. On the contrary, it emphasizes the particular challenges inherently implied with boundary-crossing collaboration. In addition, these findings resonate to some extent with results in a representative study on teacher collaboration indicates that elaborated practices such as joint reflection and co-construction are less likely than less



demanding forms of cooperation like an exchange of experiences and materials (Richter & Pant, 2016, p. 20).

With regards to social DICs, it becomes apparent that *appreciation within the team* is an important factor for actors working together across their original professional backgrounds. In contrast, statements regarding *perceived trustworthiness* were comparable marginal in numbers. However, qualitative inspection showed that respective statements were noticeably elaborated, which again indicate their particular significance for the respondents. This implies also some conceptual considerations. So far, the literature on collaboration in teacher education has focused especially on the role of trust (Bartmann et al., 2012; Kappauf & Kolley, 2018). In consequence, it is argued that further research would benefit from an increasing attention towards appreciation and its interrelation with trust as significant social factors, see for example (Kulin, 2019).

In comparison to epistemic and organizational DICs, the assessment of *collective ownership of goals* representing organizational principles of cooperation was again rather ambiguous. This again is understood as an indicator that the negotiation of participation opportunities, distribution of responsibilities, and decision-making processes have to be understood as inherent challenges of boundary-crossing cooperation.

With regards to research question 2, four different types of TDT members have been identified characterized by a particular set of assessments towards successful and challenging aspects of DICs. In comparison, Cluster A, the *Indifferent Members*, show the lowest response rates towards integration characteristics. This does not mean that they are indifferent towards the boundary-crossing collaboration as such. However, due to the focus of the present study on DICs, statements not applicable to the deductive category system remain untouched. Future investigation of these statements might offer some additional insights about *Indifferent Members'* attitudes about TDT work and may eventually lead to an alternating characterization.

Clusters B and C, refer to actors which are characterized by problematizing challenges regarding epistemic aspects, *knowledge integration* and *mutual learning* respectively. Throughout the qualitative analysis, the impression became apparent that respective actors do not question the significance of *knowledge integration* or *mutual learning* as a crucial factor for successful boundary-crossing collaboration. Instead, at a conceptual level, their statements underpin that both epistemic processes are quite demanding with regards to temporal resources and personal commitment. In addition, these statements offer some practical implications for the potential support of the TDT work organization. The establishment of collective feedback



and reflection opportunities could, for example, provide TDT members to articulate potential demands that might help to identify effective support mechanisms.

Finally, cluster D refers to *Committed Learners*. They are characterized by their engagement with regards to epistemic dimensions of integration characteristics. In particular, the perceived *mutual learning* and hereby primarily exchange of knowledge and experience as a successful aspect of TDT work. In contrast, they assess *knowledge integration* in terms of the development of shared understandings and a joint common ground as rather challenging. Again, this finding is not understood as the denial of *knowledge integration* being an important success factor for the TDT work but as an indicator for its complexity and difficulty to achieve. As already suggested, deliberate reflection on this issue might help to develop productive insights for future team work to come. In addition, *Committed Learners* tend to problematize *collective ownership of goals*. Qualitative data inspection suggests that they embrace equal participation but in contrast also demand more equal distribution of responsibilities. However, further research is needed to substantiate this assumption.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

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References

- Arnold, E. (2010). Kooperationen zwischen der ersten und zweiten Phase der Lehrerausbildung [Cooperation between the First and Second Phase in Teacher Education]. *Zeitschrift Für Erziehungswissenschaft*, 21(40), 69–77.
- Ashta, A., Dayson, K., Gera, R., Hettihewa, S., Krishna, N. V., & Wright, C. (2013). Microcredit as a social innovation. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 80–92). Elgar.
- Bartmann, S., Pfaff, N., & Welter, N. (2012). Vertrauen in der erziehungswissenschaftlichen Forschung [Trust in Educational Research]. *Zeitschrift Für Pädagogik*, 58(6), 772–783.
- Beckmann, T., Ehmke, T., Dede, C., Kriel, A., Spöhrer, S., Straub, R., & Witt, S. (accepted). Unterrichtsbesprechungen als Orte der institutionenübergreifenden Zusammenarbeit im Langzeitpraktikum [Mentoring conversations as places of interinstitutional cooperation in long-term internships]. In S. Zankel, J. Schulz, & B. Brouer (Eds.), *Zusammenarbeit von Universität und Schule*. Beltz Verlag.
- Blömeke, S. (2014). Forschung zur Lehrerbildung im internationalen Vergleich [Research in Teacher Education in International Comparison]. In E. Terhart, H. Bennewitz, & M. Rothland (Eds.), *Handbuch der Forschung zum Lehrerberuf* (pp. 441–467). Waxmann.
- Boer, H. de, Fahrenwald, C., & Spies, A. (2018). Professionalization in Teacher Education as an Interorganizational Learning Challenge. *Frontiers in Education*, 3, Article 4, 1–8. <https://doi.org/10.3389/feduc.2018.00004>
- Broekkamp, H., & van Hout-Wolters, B. (2007). The gap between educational research and practice: A literature review, symposium, and questionnaire. *Educational Research and Evaluation*, 13(3), 203–220. <https://doi.org/10.1080/13803610701626127>
- Bronstein, L. R. (2002). Index of interdisciplinary collaboration. *Social Work Research*, 26(2), 113–126. <https://doi.org/10.1093/swr/26.2.113>
- Bürgener, L., & Barth, M. (2018). Sustainability competencies in teacher education: Making teacher education count in everyday school practice. *Journal of Cleaner Production*, 174, 821–826. <https://doi.org/10.1016/j.jclepro.2017.10.263>



- Bürgener, L., & Barth, M. (2020). Die Zusammenarbeit von Lehrkräften, Hochschulen und außerschulischen Bildungsakteuren - kollaborative Materialentwicklung unter der Perspektive BNE [The cooperation of teachers, universities and extracurricular educational actors - collaborative material development from the perspective of ESD], *43*(2), 4–10. <https://doi.org/10.31244/zep.2020.02.02>
- Carmeli, A., & Gittell, J. H. (2009). High-quality relationships, psychological safety, and learning from failures in work organizations. *Journal of Organizational Behavior*, *30*(6), 709–729. <https://doi.org/10.1002/job.565>
- Costa, A. C., & Anderson, N. (2011). Measuring trust in teams: Development and validation of a multifaceted measure of formative and reflective indicators of team trust. *European Journal of Work and Organizational Psychology*, *20*(1), 119–154. <https://doi.org/10.1080/13594320903272083>
- Ehmke, T., Leiss, D., & Schmidt, T. (Eds.). (2018). *Zwischenbilanz 2018 - ZZZ-Netzwerk [Iterim Report]*. ZZZ-Netzwerk. https://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/zzz/files/ZZZ/Zwischenbilanz_2018_ZZZ-Netzwerk_30.08.2018.pdf
- Einsiedler, W. (2010). Didaktische Entwicklungsforschung als Transferförderung [Didactical Development Research as Transfer Support]. *Zeitschrift Für Erziehungswissenschaft*, *13*(1), 59–81. <https://doi.org/10.1007/s11618-010-0106-y>
- Elzinga, A. (2008). Participation. In G. Hirsch-Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann, & E. Zemp (Eds.), *Handbook of Transdisciplinary Research* (pp. 345–359). Springer Science + Business Media B.V.
- European Commission/EACEA/Eurydice. (2015). *The Teaching Profession in Europe: Practices, Perceptions, and Policies: Eurydice Report*.
- Felt, U. (2009). Knowing and Living in Academic Research. In U. Felt (Ed.), *Knowing and living in academic research: Convergence and heterogeneity in research cultures in the European context* (pp. 17–39). Inst. of Sociology of the Acad. of Sciences of the Czech Republic.
- Felt, U., & Fochler, M. (2012). Re-ordering Epistemic Living Spaces: On the Tacit Governance Effects of the Public Communication of Science. In S. Rödder, M. Franzen, & P. Weingart (Eds.), *Sociology of the Sciences Yearbook: Vol. 28. The Sciences' media connection -*



public communication and its repercussions: Untersuchung zum reflektierten Handeln in Profession und Ehrenamt (Vol. 28, pp. 133–154). Springer Science+Business Media B.V.
https://doi.org/10.1007/978-94-007-2085-5_7

- Fernandes, A. C., Novy, A., & Singer, P. (2013). The linkage between popular education and solidarity economy in Brazil: An historical perspective. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 384–396). Elgar.
- Fontan, J.-M., Harrison, D., & Klein, J.-L. (2013). Partnership-based research: Coproduction of knowledge and contribution to social innovation. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 308–319). Elgar.
- Fullan, M. (2016). *The NEW meaning of educational change* (Fifth edition). Teachers College Press; Routledge; Ontario Principals' Council.
<https://ebookcentral.proquest.com/lib/leuphana/detail.action?docID=4513498>
- Gorodetsky, M., & Barak, J. (2008). The Educational-Cultural Edge: A Participative Learning Environment for Co-Emergence of Personal and Institutional Growth. *Teaching and Teacher Education*, 24(7), 1907–1918. <https://doi.org/10.1016/j.tate.2008.01.006>
- Gräsel, C. (2011). Die Kooperation von Forschung und Lehrer/innen bei der Realisierung didaktischer Innovationen [The Cooperation between Researchers and Teachers in the Realisation of Didactical Innovations]. In W. Einsiedler (Ed.), *Unterrichtsentwicklung und didaktische Entwicklungsforschung* (pp. 88–101). Klinkhardt.
- Hartmann, U., & Decristan, J. (2018). Brokering activities and learning mechanisms at the boundary of educational research and school practice. *Teaching and Teacher Education*, 74, 114–124. <https://doi.org/10.1016/j.tate.2018.04.016>
- Hericks, U. (2004). 3.4 Verzahnung der Phasen der Lehrerbildung [3.4 Interlinking of the Phases in Teacher Education]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 301–311). Klinkhardt.
- Hirsch-Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., Wiesmann, U., & Zemp, E. (Eds.). (2008). *Handbook of Transdisciplinary Research*. Springer Science + Business Media B.V.



- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between Mainstreaming and Marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Jessop, B., Moulaert, F., Hulgård, L., & Hamdouch, A. (2013). Social innovation research: A new stage in innovation analysis? In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 110–130). Elgar.
- Kappauf, Z., & Kolleck, N. (2018). Vertrauen im Bildungsverbund [Trust in the Educational Network]. *Zeitschrift Für Erziehungswissenschaft*, 21(5), 1045–1062. <https://doi.org/10.1007/s11618-018-0812-4>
- Kleemann, K., Jennek, J., & Vock, M. (Eds.). (2019). *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* [Supporting Cooperation of University and School: Strengthen Schools, Improve Teacher Education]. Verlag Barbara Budrich.
- Klein, J. T. (2014). Discourses of Transdisciplinarity: Looking Back to the Future. *Futures*, 63, 68–74. <https://doi.org/10.1016/j.futures.2014.08.008>
- Kolleck, N. (2014). Innovations through networks: Understanding the role of social relations for educational innovations. *Zeitschrift Für Erziehungswissenschaft*, 17(S5), 47–64. <https://doi.org/10.1007/s11618-014-0547-9>
- Korthagen, F. (2007). The gap between research and practice revisited. *Educational Research and Evaluation*, 13(3), 303–310. <https://doi.org/10.1080/13803610701640235>
- Korthagen, F. (2016). Inconvenient truths about teacher learning: Towards professional development 3.0. *Teachers and Teaching*, 1–19. <https://doi.org/10.1080/13540602.2016.1211523>
- Kotthoff, H.-G. (2011). Between Excellence and Equity: The Case of the German Education System. *Revista Española De Educación Comparada*, 18(0), 27–61.
- Kuckartz, U. (2014). *Mixed Methods: Methodologie, Forschungsdesigns und Analyseverfahren* [Mixed Methods: Methodology, Research Designs and Applications]. Springer VS. <http://dx.doi.org/10.1007/978-3-531-93267-5>



- Kuckartz, U. (2016). *Qualitative Inhaltsanalyse: Methoden, Praxis, Computerunterstützung* [Qualitative Content Analysis: Methods, Practice, Computational Support] (3., überarbeitete Auflage). *Grundlagentexte Methoden*. Beltz Juventa.
- Kulin, S. (2019). Beziehungen bilden als wesentliches Merkmal von Lehrer/innen-Bildung: Ein Fallbeispiel zu phasen- und institutionenübergreifenden Entwicklungsteams [Building Relationships as an Essential Characteristic of Teacher Education. A Case Study on Phase- and Institution-Crossed Development Teams]. In U. Graf & T. Iwers (Eds.), *Beziehungen bilden: Wertschätzende Interaktionsgestaltung in pädagogischen Handlungsfeldern. Schriftenreihe zur Humanistischen Pädagogik und Psychologie* (pp. 166–178). Klinkhardt.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Lenhard, H. (2004). 3.2 Zweite Phase an Studienseminaren und Schulen [Second Phase at Teacher Education Colleges and Schools]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 275–290). Klinkhardt.
- Loogma, K., Tafel-Viia, K., & Ümarik, M. (2013). Conceptualising educational changes: A social innovation approach. *Journal of Educational Change*, 14(3), 283–301. <https://doi.org/10.1007/s10833-012-9205-2>
- Luepsen, H. (2018). Comparison of nonparametric analysis of variance methods: A vote for van der Waerden. *Communications in Statistics - Simulation and Computation*, 47(9), 2547–2576. <https://doi.org/10.1080/03610918.2017.1353613>
- Messner, H. (2012). Leitlinien einer phasenübergreifenden Professionalisierung der Lehrerbildung [Guidelines of a Cross-Phased Professionalisation of Teacher Education]. In D. Bosse, L. Criblez, & T. Hascher (Eds.), *Reform der Lehrerbildung in Deutschland, Österreich und der Schweiz. Teil 1: Analysen, Perspektiven und Forschung* (pp. 63–92). Prolog.
- MK Niedersachsen. (2018). *Die niedersächsischen allgemein bildenden Schulen in Zahlen: Stand: Schuljahr 2016/2017* [The Schools of Lower-Saxony in Numbers]. https://www.mk.niedersachsen.de/download/135872/Broschuere_2016_2017_Die_niedersaechsischen_allgemein_bildenden_Schulen_in_Zahlen.pdf



- Moulaert, F., MacCallum, D., & Hillier, J. (2013). Social Innovation: Intuition, precept, concept, theory and practice. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 13–24). Elgar.
- Moulaert, F., MacCallum, D., Mehmood, A., & Hamdouch, A. (2013). General Introduction: The Return of Social Innovation as a Scientific Concept and a Social Practice. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 1–6). Elgar.
- Mulgan, G. (2012). Social Innovation Theores: Can Theory Catch Up with Practice? In H.-W. Franz, J. Hochgerner, & J. Howaldt (Eds.), *Challenge Social Innovation* (pp. 19–42). Springer Berlin Heidelberg.
- Novy, A., Habersack, S., & Schaller, B. (2013). Innovative forms of knowledge production: Transdisciplinarity and knowledge alliances. In F. Moulaert (Ed.), *The international handbook on social innovation: Collective action, social learning and transdisciplinary research* (pp. 430–441). Elgar.
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty* (1. Aufl.). Polity Press.
- Patry, J.-L. (2005). Zum Problem der Theoriefeindlichkeit der Praktiker [On the Problem of the Practitioners' Antipathy towards Theorizing]. In H. Heid (Ed.), *Verwertbarkeit: Ein Qualitätskriterium (erziehungs-)wissenschaftlichen Wissens?* (1st ed., pp. 143–161). VS Verl. für Sozialwiss.
- Peters, M. A. (2018). Toward a Political Theory of Social Innovation: Collective Intelligence and Co-Creation of Social Goods. In A. Schröer, N. Engel, C. Fahrenwald, M. Göhlich, C. Schröder, & S. Weber (Eds.), *Organisation und Pädagogik: Vol. 24. Organisation und Zivilgesellschaft: Beiträge der Kommission Organisationspädagogik* (1st ed., Vol. 24, pp. 239–251). Springer VS. https://doi.org/10.1007/978-3-658-18005-8_22
- Phillis, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering Social Innovation. *Stanford Social Innovation Review*, 6(4), 34–44.
- Pilypaitytė, L., & Siller, H.-S. (Eds.). (2018). *Schulpraktische Lehrerprofessionalisierung als Ort der Zusammenarbeit* [Practical teacher professionalization as a place of collaboration]. Springer VS. <https://doi.org/10.1007/978-3-658-17086-8>



- PMCMRplus* (Version 1.4.1) [Computer software]. (2018). <https://cran.r-project.org/web/packages/PMCMRplus/PMCMRplus.pdf>
- Richter, D., & Pant, H. A. (2016). *Lehrerkooperation in Deutschland: Eine Studie zu kooperativen Arbeitsbeziehungen bei Lehrkräften in der Sekundarstufe I* [Teacher Cooperation in Germany]. https://www.telekomstiftung.de/sites/default/files/files/media/publications/studie_lehrerkooperation_in_deutschland_1.pdf
- Rothland, M. (2020). Legenden der Lehrerbildung: Zur Diskussion einheitstiftender Vermittlung von „Theorie“ und „Praxis“ im Studium [Legends of Teacher Education: For the Discussion of Unifying Interrelation of „Theory“ and „Practice“]. *Zeitschrift Für Pädagogik*, 66(2), 270–287. <https://doi.org/10.3262/ZP2002270>
- Rothland, M., & Biederbeck, I. (Eds.). (2018). *Praxisphasen in der Lehrerbildung: Beiträge der Siegener Sommerakademie 2016* [Practice Phases in Teacher Education - Contributions of the Summer Academy in Siegen 2016]. Waxmann.
- Rürup, M. (2013). Graswurzelbewegungen der Innovation: Zur Innovativität von Schulen und Lehrkräften „At-the-Bottom“ der Schullandschaft [Grassroots Movements of Innovation: To Innovate Schools and Teachers „At-the-Bottom“ of the School Landscape]. In M. Rürup & I. Bormann (Eds.), *Educational governance: Vol. 21. Innovationen im Bildungswesen: Analytische Zugänge und empirische Befunde* (pp. 269–301). Springer VS.
- Scharnberg, S. (2019). Ko-konstruktive Lehrentwicklung im Entwicklungsteam Mathematik der Leuphana Universität Lüneburg [Development Teams of Mathematics at the Leuphana University Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 163–182). Verlag Barbara Budrich. https://shop.budrich-academic.de/wp-content/uploads/2020/08/Scharnberg_Ko-Konstruktive-Lehrentwicklung-im-Entwicklungsteam-Mathematik-der-Leuphana-Universit%C3%A4t-L%C3%BCneburg.pdf
- Scholz, R. W., & Steiner, G. (2015). The real type and ideal type of transdisciplinary processes: Part I - theoretical foundations. *Sustainability Science*, 10(4), 527–544. <https://doi.org/10.1007/s11625-015-0326-4>



- Schubert, C. (2016). Soziale Innovationen. Kontrollverluste und Steuerungsversprechen sozialen Wandels [Social innovations. Loss of control and control promises of social change]. In W. Rammert, A. Windeler, H. Knoblauch, & M. Hutter (Eds.), *Innovationsgesellschaft heute: Perspektiven, Felder und Fälle* (pp. 403–426). Springer VS.
- Sewell, A., Cody, T.-L., Weir, K., & Hansen, S. (2018). Innovations at the boundary: An exploratory case study of a New Zealand school-university partnership in initial teacher education. *Asia-Pacific Journal of Teacher Education*, 46(4), 321–339. <https://doi.org/10.1080/1359866X.2017.1402294>
- Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP) [Development and Validation of a Scale to Identify Problems of Knowledge Integration in Interdisciplinary Project Teams]. *Zeitschrift Für Arbeits- Und Organisationspsychologie A&O*, 53(3), 121–130. <https://doi.org/10.1026/0932-4089.53.3.121>
- Straub, R., & Dollereider, L. (2019). Transdisziplinäre Entwicklungsteams im ZZL-Netzwerk, Leuphana Universität Lüneburg [Transdisciplinary Development Teams in the ZZL-Network, Leuphana University Lüneburg]. In K. Kleemann, J. Jennek, & M. Vock (Eds.), *Kooperation von Universität und Schule fördern: Schulen stärken, Lehrerbildung verbessern* (pp. 57–82). Verlag Barbara Budrich. <https://doi.org/10.3224/84742209.04>
- Straub, R., Kulin, S., & Ehmke, T. (2021). A Transdisciplinary Evaluation Framework for the Assessment of Integration in Boundary-Crossing Collaborations in Teacher Education. *Studies in Educational Evaluation*, 68, 100952. <https://doi.org/10.1016/j.stueduc.2020.100952>
- Straub, R., & Vilsmaier, U. (2020). Pathways to educational change revisited— controversies and advances in the German teacher education system. *Teaching and Teacher Education*, 96, 1–13. <https://doi.org/10.1016/j.tate.2020.103140>
- Terhart, E. (2004). 1.2 Struktur und Organisation der Lehrerbildung in Deutschland [1.2 Structure and Organisation of Teacher Education in Germany]. In S. Blömeke, P. Reinhold, G. Tulodziecki, & J. Wildt (Eds.), *Handbuch Lehrerbildung* (pp. 37–59). Klinkhardt.



- van den Bossche, P., Gijsselaers, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>
- Vanderlinde, R., & van Braak, J. (2010). The gap between educational research and practice: Views of teachers, school leaders, intermediaries and researchers. *British Educational Research Journal*, 36(2), 299–316. <https://doi.org/10.1080/01411920902919257>
- Villiger, C. (2015). Lehrer(innen)bildung zwischen Theorie und Praxis: Erörterungen zu einer ungelösten Problematik.: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung [Teacher Education between Theory and Practice: Elaboration on an Unsolved Problem.]. In C. Villiger & U. Trautwein (Eds.), *Zwischen Theorie und Praxis: Ansprüche und Möglichkeiten in der Lehrer(innen)bildung* (pp. 9–17). Waxmann.
- Vilsmaier, U., Engbers, M., Luthardt, P., Maas-Deipenbrock, R. M., Wunderlich, S., & Scholz, R. W. (2015). Case-based Mutual Learning Sessions: Knowledge integration and transfer in transdisciplinary processes. *Sustainability Science*, 10(4), 563–580. <https://doi.org/10.1007/s11625-015-0335-3>
- Vogl, S. (2017). Quantifizierung [Quantifying]. *KZfSS Kölner Zeitschrift Für Soziologie Und Sozialpsychologie*, 69(S2), 287–312. <https://doi.org/10.1007/s11577-017-0461-2>
- Waschewski, T. (2018). Rechtschreibunterricht innovieren: Wie die Zusammenarbeit in einer „Community of Practice“ die Unterrichtspraxis von Lehrpersonen verändert [Innovating Spelling Lessons. How Collaboration in a “Community of Practice” Changes the Teaching Practice of Teachers]. In S. Riegler & S. Weinhold (Eds.), *Rechtschreibung unterrichten: Lehrerforschung in der Orthographiedidaktik* (173–191). Schmidt, Erich.
- Weyland, U. (2012). *Expertise zu den Praxisphasen in der Lehrerbildung in den Bundesländern* [Expertise in Practical Phases of the Teacher Education in the Länder]. <https://li.hamburg.de/contentblob/3305538/70560ef5e16d6de60d5d7d159b73322f/data/pdf-studie-praxisphasen-in-der-lehrerbildung.pdf?jsessionid=45499CC1240EB3EB38027EE816A1DBFA.liveWorker2>
- Wissenschaftsrat. (2001). *Empfehlungen zur künftigen Struktur der Lehrerbildung* [Recommendations on Future Structures of the Teacher Education.]. Wissenschaftsrat.
- ZZL-Netzwerk. (2018). *Ergebnisse* [Findings]. ZZL-Netzwerk, Leuphana Universität Lüneburg. <https://www.leuphana.de/zentren/zzl/zzl-netzwerk/erste-foerderphase-2016-2019/ergebnisse-aus-den-entwicklungsteams.html>



Appendix V: Scale Documentation

The following scale documentation provides comprehensive information about the questionnaire used for the empirical analysis in the studies C and D. Like the underlying questionnaire, the document is in German. Please note, that the scale documentation comprises also scales, which have not been utilized within this dissertation.



**Fragebogen zur Zusammenarbeit in phasen- und institutionenübergreifenden
Entwicklungsteams in der Lehrkräftebildung**

Skalendokumentation

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Stand: 15.11.2017



Vorwort

Sehr geehrte Leserin, sehr geehrter Leser,
die vorliegende Skalendokumentation bildet zentrale Merkmale und Konstrukte einer standardisierten Fragebogenerhebung ab, die im Rahmen der Begleitforschung des ZZL-Netzwerks durchgeführt wurde. Das ZZL-Netzwerk an der Leuphana Universität Lüneburg wird im Rahmen der gemeinsamen „Qualitätsoffensive Lehrerbildung“ von Bund und Ländern aus Mitteln des Bundesministeriums für Bildung und Forschung gefördert.

Die Befragung erfolgte im Sommersemester 2017 und erhebt Einstellungsmerkmale zu institutionen- und phasenübergreifenden Kooperationen in der Lehrkräftebildung. Konkret nahmen Mitglieder der im Rahmen des ZZL-Netzwerks etablierten Entwicklungsteams an der Befragung teil. Die Besonderheit dieser Entwicklungsteams besteht aus ihrer Zusammensetzung aus Vertreter*innen unterschiedlicher an der Lehrkräftebildung beteiligten Organisationen, wie der Leuphana Universität Lüneburg, (Campus-)Schulen, Studienseminaren und außerschulischen Bildungseinrichtungen. Vor diesem Hintergrund nimmt das verwendete Erhebungsinstrument eine transdisziplinäre und Perspektive ein, die sich gleichfalls in den nachstehenden Schwerpunkten des Fragebogens und somit auch in der Gliederung der Skalendokumentation widerspiegelt:

Tab. 1:

Inhaltlicher Aufbau der Skalendokumentation

Kapitel	Schwerpunkt	Item-Format
1.	Sozio-demografische Angaben	teilstandardisierte, offene & geschlossene Einzelitems
2.	Epistemische Integrationsdimensionen	Skalen
3.	Soziale Integrationsdimensionen	Skalen
4.	Organisationale Integrationsdimensionen	Skalen
5.	Zufriedenheit mit der Arbeit und den Ergebnissen der Entwicklungsteams	Skalen & teilstandardisierte Einzelitems
6.	Kooperationsbeziehungen (Netzwerkanalyse)	Ego-zentrierte Netzwerkdaten
7.	Offene Fragen	teilstandardisiertes, offenes Item-Format

Die in den Abschnitten zwei bis vier verwendeten Skalen gehen auf bereits erprobte Skalen zurück und wurden, sofern sie originär in englischer Sprache entwickelt wurden, durch die Autor*innen übersetzt. Ferner wurden Formulierungen zur Wahrung der Gegenstandsangemessenheit des Erhebungsinstruments angepasst, um den Bezug auf die



Zusammenarbeit in den Entwicklungsteams des ZZL-Netzwerks sicherzustellen. Um darüber hinaus die Angemessenheit, Verständlichkeit und Durchführbarkeit des Fragebogens zu gewährleisten, wurde der Haupterhebung ein kognitiver Pretest vorangestellt. An diesem Pretest haben insgesamt neun Personen teilgenommen, die aufgrund ihrer Beschäftigungsverhältnisse zentrale Status- und Berufsgruppen des antizipierten Samples abbildeten (Professor*innen, Wissenschaftliche Mitarbeiter*innen, Lehrkräfte und Studierende). In Folge des Pretests erfolgten Reformierungen unklarer Items, die Restrukturierung des Aufbaus des Fragebogens sowie eine Ergänzung des Erhebungsinstruments um eine Skala zur Erfassung der Zufriedenheit mit der Zusammenarbeit und den Ergebnissen in den Entwicklungsteams. Darüber hinaus wurden die quantitativen Erhebungsinstrumente um offene Frageformate ergänzt, um subjektive Beurteilungen der Befragten erfassen zu können.

Die Hauptbefragung wurde als Vollerhebung der acht im Rahmen des ZZL-Netzwerks etablierten Entwicklungsteams durchgeführt. Die Rücklaufquote der Haupterhebung ist mit knapp 80 % (62 von 78 Fragebögen) zufriedenstellend. Das Antwortformat der Items in den Abschnitten zwei bis fünf folgten einer sechsstufigen Likert-Skala, wobei nur die äußersten Antwortkategorien beschriftet wurden (1 = „Trifft überhaupt nicht zu“ – 6 = „Trifft völlig zu“). In Abschnitt 6 wurden ego-zentrierte Netzwerkdaten mittels Positionsgenerator unter Verwendung einer vierstufigen Intensitätsskala mit den Antwortformaten „gar nicht“, „kaum“, „etwas“, „sehr“ erhoben. Darüber hinaus sind wir an einem konstruktiven Austausch über die Verwendung und Weiterentwicklung des Fragebogens bzw. einzelner Elemente daraus interessiert und freuen uns sehr über Anregungen und Hinweise.



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Förderhinweis

Das ZZL-Netzwerk an der Leuphana Universität Lüneburg wird im Rahmen der gemeinsamen „Qualitätsoffensive Lehrerbildung“ von Bund und Ländern aus Mitteln des Bundesministeriums für Bildung und Forschung gefördert (Förderkennzeichen: 01JA1603)



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1 Sozio-demografische Daten

1.1 Geschlecht

Tab. 2:

Item-Statistik Geschlecht

Ausprägungen	Absolute Häufigkeiten	Prozentuale Häufigkeiten
1= männlich	14	22,6
2= weiblich	46	74,2
3= anderes	0	0
Gesamt	60	100
Fehlende Werte	2	2

Anmerkung. N = 60; Variablenname: Eges

1.2 Alter

Tab. 3:

Item-Statistik Alter

Ausprägungen	Absolute Häufigkeiten	Prozentuale Häufigkeiten
1 = bis 29 Jahre	16	25,8
2 = 30-39 Jahre	18	29,0
3 = 40-49 Jahre	19	30,6
4 = 50-49 Jahre	6	9,7
5 = über 59 Jahre	1	1,6
Gesamt	60	96,8
Fehlende Werte	2	3,2

Anmerkung. N = 60; Variablenname: Ealt

Dauer der Berufstätigkeit

Tab. 4:

Item-Statistik Dauer der Berufstätigkeit

N	AM	SD	Min.	Max.
60	9,78	8,59	0,5	37

Anmerkung. N = 60; Variablenname: EberJa

Identifikation mit Beruf

Tab. 5:

Item-Statistik Identifikation mit Beruf

Variablenname	Item (Variable)	AM	SD	rit	$\alpha_{itemdel}$
EberId	Ich identifiziere mich mit meiner hauptberuflichen Tätigkeit.	5,23	0,67	k.A.	k.A.

Anmerkung. N = 62



Beschäftigung in Institutionen

Tab. 6:

Item-Statistik Beschäftigung in Institutionen

Institutionen	Absolute Häufigkeiten			Prozentuale Häufigkeiten		
	0 = nicht beschäftigt an	1 = beschäftigt an	= Fehlende Werte	0 = nicht beschäftigt an	1 = beschäftigt an	= Fehlende Werte
Grundschule	38	23	1	61,3	37,1	1,6
Hauptschule	60	1	1	96,8	1,6	1,6
Realschule	61	0	1	98,4	0	1,6
Oberschule	50	11	1	80,6	17,7	1,6
Gymnasium	61	0	1	98,4	0	1,6
Integrierte Gesamtschule	59	2	1	95,2	3,2	1,6
Berufsschule, Berufsfachschule o.ä.	61	0	1	98,4	0	1,6
Universität (im Rahmen von Verwaltung, Professur, wiss. Mitarbeit, ...)	32	29	1	51,6	46,8	1,6
Universität (im Rahmen eines Studiums)	50	11	1	80,6	17,7	1,6
Studienseminar	54	7	1	87,1	11,3	1,6
Stiftung	61	0	1	98,4	0	1,6
Außerschulische Einrichtung	k.A.	k.A.	k.A.	k.A.	k.A.	k.A.
Andere	k.A.	k.A.	k.A.	k.A.	k.A.	k.A.

Anmerkung. N = 62; Variablenname: EinsA

Arbeitszeit in Institutionen

Tab. 7:

Item-Statistik Arbeitszeit in Institutionen

Ausprägungen	N	AM	SD	Min.	Max.
Grundschule	21	65,26	36,64	7,50	100,00
Hauptschule	1	31,0000	0	31,00	31,00
Realschule	0	k.A.	k.A.	k.A.	k.A.
Oberschule	11	77,27	28,58	5,00	100,00
Gymnasium	0	k.A.	k.A.	k.A.	k.A.
Integrierte Gesamtschule	2	95,00	7,07	90,00	100,00
Berufsschule, Berufsfachschule o.ä.	0	k.A.	k.A.	k.A.	k.A.
Universität (im Rahmen von Verwaltung, Professur, wiss. Mitarbeit, ...)	27	65,37	37,70	5,00	100,00
Universität (im Rahmen eines Studiums)	10	66,50	32,15	20,00	100,00
Studienseminar	6	57,91	12,08	40,00	75,00
Stiftung	0	k.A.	k.A.	k.A.	k.A.
Außerschulische Einrichtung	0	k.A.	k.A.	k.A.	k.A.
Andere	k.A.	k.A.	k.A.	k.A.	k.A.

Anmerkung. Variablenname: EinsB



Anzahl Treffen im Entwicklungsteam

Tab. 8:

Item-Statistik Anzahl Treffen im Entwicklungsteam

N	AM	SD	Min.	Max.
62	7,54	6,7	2	40

Anmerkung. Variablenname: Etreff

Tab. 9:

Item-Statistik Anzahl Treffen im Entwicklungsteam (gruppiert)

Ausprägungen	Absolute Häufigkeiten	Prozentuale Häufigkeiten
00-05	27	43,5
06-10	20	32,3
11-15	4	6,5
16-20	0	0
21-25	1	1,6
26-30	1	1,6
31-35	0	0
36-40	1	1,6
> 40	8	12,9
Gesamt	62	100
Fehlende	0	0

Anmerkung. Variablenname: Etreff_grp



2 Epistemische Integrationsdimensionen

2.1 Wissensintegration

2.1.1 Wissensintegration

Tab. 10:

Hintergrundinformationen zur Skala Wissensintegration

Merkmals	Ausprägung
Frage	Wie schätzen Sie folgende Aspekte zum Umgang mit unterschiedlichen Berufskontexten im Entwicklungsteam ein?
Quelle	Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP). Zeitschrift für Arbeits- und Organisationspsychologie A&O, 53(3), 121–130. doi:10.1026/0932-4089.53.3.121
Variablenname Skala	Ewi
Seitenzahl im Fragebogen	S. 6
Anzahl Items	8
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)

Tab. 11:

Statistiken Gesamtskala – Wissensintegration

N	AM	SD	Min.	Max.	Cronbachs α
62	5,03	0,44	4,13	6	0,59

Anmerkung. Skalename: Ewi

Tab. 12:

Item-Statistiken zur Gesamtskala Wissensintegration

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EwiAD1	Die Teammitglieder sind bereit, sich auf andere Sichtweisen einzulassen.	5,17	,67	,35	,54
EwiAD2	Die Teammitglieder können die eigene Sichtweise den anderen Teammitgliedern verständlich machen.	5,20	,66	,22	,57
EwiAD3	Es wird ausreichend Zeit aufgewendet, um ein gemeinsames Verständnis für die Arbeit im Team zu entwickeln.	5,17	,92	,26	,56
EwiAD4	Die Teammitglieder bemühen sich im ausreichenden Maße, die Denk- und Arbeitsweisen der anderen Teammitglieder zu verstehen.	5,28	,64	,57	,49
EwiCG1r*	Die Teammitglieder haben unterschiedliche Zielvorstellungen bzgl. der Arbeit im Team.	4,35	1,27	,08	,66
EwiCG2r*	Die Zusammensetzung des Teams aus Personen mit unterschiedlichen beruflichen Hintergründen erschwert die Entwicklung eines gemeinsamen Verständnisses für die Zusammenarbeit.	5,33	,75	,54	,49
EwiCG3	Im Team haben wir eine gemeinsame Basis für die Zusammenarbeit in Bezug auf die berufsspezifischen Denkweisen gefunden.	5,07	,84	,38	,53
EwiCG4	Die Arbeitsweisen der Personen aus anderen Berufskontexten sind mir klar und verständlich.	4,81	1,00	,21	,58



2.1.1.1 Wissensintegration – Audience Design

Tab. 13:

Statistiken Subskala Audience Design

N	AM	SD	Min.	Max.	Cronbachs α
62	5,02	0,5	4	6	0,60

Anmerkung. Skalename: EwiAD

Tab. 14:

Item-Statistiken zur Subskala Audience Design

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EwiAD1	Die Teammitglieder sind bereit, sich auf andere Sichtweisen einzulassen.	5,18	,67	,43	,49
EwiAD2	Die Teammitglieder können die eigene Sichtweise den anderen Teammitgliedern verständlich machen.	5,21	,66	,33	,56
EwiAD3	Es wird ausreichend Zeit aufgewendet, um ein gemeinsames Verständnis für die Arbeit im Team zu entwickeln.	5,18	,92	,31	,61
EwiAD4	Die Teammitglieder bemühen sich im ausreichenden Maße, die Denk- und Arbeitsweisen der anderen Teammitglieder zu verstehen.	5,30	,64	,49	,45

2.1.1.2 Wissensintegration – Common Ground

Tab. 15:

Statistiken Subskala Wissensintegration – Common Ground

N	AM	SD	Min.	Max.	Cronbachs α
62	4,86	0,63	3,00	6,00	0,36

Anmerkung. Skalename: EwiCG

Tab. 16:

Item-Statistiken zur Subskala Common Ground

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EwiCG1r*	Die Teammitglieder haben unterschiedliche Zielvorstellungen bzgl. der Arbeit im Team.	4,38	1,28	-,014	,59
EwiCG2r*	Die Zusammensetzung des Teams aus Personen mit unterschiedlichen beruflichen Hintergründen erschwert die Entwicklung eines gemeinsamen Verständnisses für die Zusammenarbeit.	5,34	,75	,35	,17
EwiCG3	Im Team haben wir eine gemeinsame Basis für die Zusammenarbeit in Bezug auf die berufsspezifischen Denkweisen gefunden.	5,02	,92	,31	,17
EwiCG4	Die Arbeitsweisen der Personen aus anderen Berufskontexten sind mir klar und verständlich.	4,82	,99	,24	,24

Anmerkung. * = die Kodierung des Items wurde invertiert



2.1.2 Wissensintegration (gekürzt)

Tab. 17:

Hintergrundinformationen zur Skala Wissensintegration (gekürzt)

Merkmal	Ausprägung
Frage	Wie schätzen Sie folgende Aspekte zum Umgang mit unterschiedlichen Berufskontexten im Entwicklungsteam ein?
Quelle	Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP). Zeitschrift für Arbeits- und Organisationspsychologie A&O, 53(3), 121–130. doi:10.1026/0932-4089.53.3.121
Variablenname Skala	Ewi_R2
Seitenzahl im Fragebogen	S. 6
Anzahl Items	6 (Item EwiCG1r und EwiAD2 gestrichen; vgl. Reliabilitätsmaß Cronbachs Alpha)
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)

Tab. 18:

Statistiken Gesamtskala Wissensintegration (gekürzt)

N	AM	SD	Min.	Max.	Cronbachs α
62	5,12	0,5	4,17	6	0,66

Anmerkung. Skalename: Ewi_R2

Tab. 19:

Item-Statistiken zur Gesamtskala Wissensintegration (gekürzt)

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EwiAD1	Die Teammitglieder sind bereit, sich auf andere Sichtweisen einzulassen.	5,17	,67	,31	,65
EwiAD3	Es wird ausreichend Zeit aufgewendet, um ein gemeinsames Verständnis für die Arbeit im Team zu entwickeln.	5,17	,92	,28	,67
EwiAD4	Die Teammitglieder bemühen sich im ausreichenden Maße, die Denk- und Arbeitsweisen der anderen Teammitglieder zu verstehen.	5,28	,64	,54	,59
EwiCG2r*	Die Zusammensetzung des Teams aus Personen mit unterschiedlichen beruflichen Hintergründen erschwert die Entwicklung eines gemeinsamen Verständnisses für die Zusammenarbeit.	5,33	,75	,48	,60
EwiCG3	Im Team haben wir eine gemeinsame Basis für die Zusammenarbeit in Bezug auf die berufsspezifischen Denkweisen gefunden.	5,07	,84	,51	,58
EwiCG4	Die Arbeitsweisen der Personen aus anderen Berufskontexten sind mir klar und verständlich.	4,82	1,00	,33	,65

Anmerkung. * = die Kodierung des Items wurde invertiert



2.2 Team Learning

Tab. 20:

Hintergrundinformationen zur Skala Team Learning /Mutual Learning

Merkmal	Ausprägung
Frage Quelle	Wie schätzen Sie folgende Aussagen zur Kommunikation im Entwicklungsteam ein? van den Bossche, P., Gijssels, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. <i>Instructional Science</i> , 39(3), 283– 301. doi:10.1007/s11251-010-9128-3
Variablenname Skala	Etl
Seitenzahl im Fragebogen	S. 7
Anzahl Items	9
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 5 gültige Werte)

Tab. 21:

Statistiken Gesamtskala Team Learning

N	AM	SD	Min.	Max.	Cronbachs α
61	5,37	0,53	3,67	6,00	0,88

Anmerkung. Skalename: Etl

Tab. 22:

Item-Statistiken zur Gesamtskala Team Learning

Variablenname	Item (Variable)	AM	SD	r_{it}	α itemdel
EtlCFT1	Die Teammitglieder teilen Informationen und Ideen, die für die Zusammenarbeit relevant sind.	5,47	,63	,48	,88
EtlCFT2	Das Team begegnet Meinungsunterschieden durch offenes Ansprechen.	5,20	,87	,72	,87
EtlCFT3	Die Teammitglieder gehen auf Anmerkungen zu ihren eigenen Ideen ein.	5,24	,80	,74	,86
EtlCFT4	Das Team prüft die Ideen einzelner Teammitglieder durch kritisches Nachfragen.	5,07	,87	,72	,86
EtlCON1	Die Mitglieder des Teams hören einander aufmerksam zu.	5,66	,51	,40	,89
EtlCON2	Wenn etwas unklar ist, stellen sich die Teammitglieder gegenseitig Fragen.	5,61	,70	,50	,88
EtlCOC1	Die Teammitglieder greifen die Informationen und Ideen anderer Teammitglieder auf.	5,36	,71	,69	,87
EtlCOC2	Im Team werden Informationen wechselseitig ergänzt.	5,36	,69	,72	,87
EtlCOC3	Das Team arbeitet mit Ideen weiter, die durch einzelne Mitglieder eingebracht werden.	5,27	,81	,71	,86

2.2.1 Team Learning – Constructive Conflict

Tab. 23:

Statistiken Subskala Team Learning – Constructive Conflict

N	AM	SD	Min.	Max.	Cronbachs α
62	5,24	0,62	3,5	6	0,80

Anmerkung. Skalename: EtlCFT



Tab. 24:

Item-Statistiken zur Subskala Constructive Conflict

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EtlCFT1	Die Teammitglieder teilen Informationen und Ideen, die für die Zusammenarbeit relevant sind.	5,47	,63	,47	,81
EtlCFT2	Das Team begegnet Meinungsunterschieden durch offenes Ansprechen.	5,20	,87	,66	,74
EtlCFT3	Die Teammitglieder gehen auf Anmerkungen zu ihren eigenen Ideen ein.	5,24	,80	,72	,70
EtlCFT4	Das Team prüft die Ideen einzelner Teammitglieder durch kritisches Nachfragen.	5,07	,87	,65	,74

2.2.2 Team Learning – Construction

Tab. 25:

Statistiken Subskala Construction

N	AM	SD	Min.	Max.	Cronbachs α
61	5,64	0,48	4,00	6,00	0,43

Anmerkung. Skalename: EtlCON

Tab. 26:

Item-Statistiken zur Subskala Construction

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EtlCON1	Die Mitglieder des Teams hören einander aufmerksam zu.	5,66	,51	,29	k.a.
EtlCON2	Wenn etwas unklar ist, stellen sich die Teammitglieder gegenseitig Fragen.	5,62	,69	,29	k.a.

2.2.3 Team Learning – Co-Construction

Tab. 27:

Statistiken Subskala Co-Construction

N	AM	SD	Min.	Max.	Cronbachs α
61	5,34	0,64	3,33	6,00	0,84

Anmerkung. Skalename: EtlCOC

Tab. 28:

Item-Statistiken zur Subskala Co-Construction

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EtlCOC1	Die Teammitglieder greifen die Informationen und Ideen anderer Teammitglieder auf.	5,38	,71	,69	,81
EtlCOC2	Im Team werden Informationen wechselseitig ergänzt.	5,36	,68	,74	,76
EtlCOC3	Das Team arbeitet mit Ideen weiter, die durch einzelne Mitglieder eingebracht werden.	5,30	,80	,72	,78

2.3 Offene Fragen in Bezug auf epistemische Integration

Tab. 29:

Offene Fragen in Bezug auf epistemische Integration

Variablenname	Item (Variable)
EbeiBgrX (Beitrag der eigenen Berufsgruppe zur Zusammenarbeit)	Bitte nennen Sie aus Ihrer Sicht die drei wichtigsten Aspekte, die Sie im Unterschied zu anderen Berufsgruppen in die Zusammenarbeit einbringen konnten.
ElerBgrX (Lernen von anderen Berufsgruppen)	Bitte nennen Sie aus Ihrer Sicht die drei wichtigsten Aspekte, die Sie durch die Zusammenarbeit mit Vertreter*innen aus anderen Berufsgruppen gelernt haben.



3 Soziale Integrationsdimensionen

3.1 Perceived Trustworthiness

Tab. 30:

Hintergrundinformationen zur Skala Perceived Trustworthiness

Merkmal	Ausprägung
Frage	Wie schätzen Sie aus Ihrer Sicht das Miteinander innerhalb des Entwicklungsteams ein?
Quelle	Costa, A. C. & Anderson, N. (2011). Measuring trust in teams. Development and validation of a multifaceted measure of formative and reflective indicators of team trust. <i>European Journal of Work and Organizational Psychology</i> , 20 (1), 119-154.
Variablenname	EpeTru
Skala	
Seitenzahl im Fragebogen	S. 9
Anzahl Items	6
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 3 gültige Werte)

Tab. 31:

Statistiken Skala Perceived Trustworthiness

N	AM	SD	Min.	Max.	Cronbachs α
62	5,27	0,56	4,00	6,00	0,74

Anmerkung. Skalename: EpeTru

Tab. 32:

Item-Statistiken zur Skala Perceived Trustworthiness

Variablenname	Item (Variable)	AM	SD	r_{it}	α itemdel
EpeTru1	In diesem Team herrscht volle Zuversicht in die Fähigkeiten der anderen Mitglieder, anstehende Aufgaben zu bewältigen.	5,03	,80	,36	,74
EpeTru2	Die Teammitglieder halten sich an Absprachen.	4,98	,94	,50	,70
EpeTru3r*	In diesem Team verfolgen die Mitglieder eigene Interessen, ohne diese transparent zu machen.	5,31	,98	,52	,70
EpeTru4	In diesem Team können sich die Mitglieder aufeinander verlassen.	5,13	,76	,58	,68
EpeTru5r*	Die Teammitglieder stehen nicht zu ihren Zusagen.	5,58	,94	,49	,70
EpeTru6	In diesem Team werden die Interessen anderer Mitglieder respektiert.	5,56	,59	,49	,71

Anmerkung. * = die Kodierung des Items wurde invertiert

3.2 Psychological Safety

Tab. 33:

Hintergrundinformationen zur Skala Psychological Safety

Merkmal	Ausprägung
Frage	Wie schätzen Sie aus Ihrer Sicht das Miteinander innerhalb des Entwicklungsteams ein?
Quelle	Edmonson, A.C. (1999): Psychological safety and learning behavior in work teams. In: <i>Administrative Science Quarterly</i> 44, S. 350-383.
Variablenname Skala	EpsySa
Seitenzahl im Fragebogen	S. 9
Anzahl Items	7
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)



Tab. 34:

Statistiken Skala Psychological Safety

N	AM	SD	Min.	Max.	Cronbachs α
62	5,49	0,48	4,14	6,00	0,67

Anmerkung. Skalename: EpsySa

Tab. 35:

Item-Statistiken zur Skala Psychological Safety

Variablenname	Item (Variable)	AM	SD	r_{it}	α itemdel
EpsySa1r*	Wenn man Fehler in diesem Team macht, werden sie einem oft übelgenommen.	5,73	,52	,38	,64
EpsySa2	Mitglieder in unserem Team können Probleme und schwierige Themen zur Sprache bringen.	5,30	,85	,54	,58
EpsySa3r*	Mitglieder in unserem Team lehnen andere manchmal ab, weil sie anders sind.	5,72	,78	,24	,67
EpsySa4	In unserem Team können wir gefahrlos auch mal ein Risiko eingehen oder etwas Neues wagen.	5,37	,84	,55	,58
EpsySa5r*	Es fällt schwer, andere Mitglieder in unserem Team um Hilfe zu fragen.	5,67	,68	,37	,63
EpsySa6	Niemand in diesem Team würde absichtlich oder vorsätzlich meine Bemühungen untergraben.	5,47	1,17	,21	,71
EpsySa7	In der Zusammenarbeit mit den Mitgliedern dieses Teams werden meine besonderen Fähigkeiten und Talente geschätzt und genutzt.	5,23	,79	,47	,60

Anmerkung. * = die Kodierung des Items wurde invertiert

3.3 Partizipative Sicherheit

Tab. 36:

Hintergrundinformationen zur Skala Partizipative Sicherheit

Merkmal	Ausprägung
Frage	Wie schätzen Sie folgende Aussagen zur Kommunikation im Entwicklungsteam ein?; Wie beurteilen Sie die gegenseitige Wertschätzung im Entwicklungsteam?
Quelle	Brodbeck, F., Anderson, N. & West, M (2000). Das Teamklimainventar. Handanweisung. Verfügbar unter: ttp://www.psy.lmu.de/wirtschaftspsychologie/forschung/working_papers/wop_working_paper_2000_2.pdf
Variablenname	Eps
Skala	
Seitenzahl im Fragebogen	S. 7; S. 11
Anzahl Items	7
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)

Tab. 37:

Statistiken Skala Partizipative Sicherheit

N	AM	SD	Min.	Max.	Cronbachs α
62	5,49	0,48	4,14	6,00	0,67

Anmerkung. Skalename: EpsySa



Tab. 38:

Item-Statistiken zur Skala Partizipative Sicherheit

Variablenname	Item (Variable)	AM	SD	r _{it}	α _{itemdel}
EpsInf1	In der Regel geben wir Information an alle Mitglieder des Teams weiter, anstatt sie für uns zu behalten.	5,57	,62	,46	,71
EpsInf2	Wir halten uns über arbeitsrelevante Themen gegenseitig auf dem Laufenden.	5,08	1,02	,52	,69
EpsInf3	Es gibt im Team echtes Bemühen, Informationen innerhalb des Teams zu teilen.	5,43	,81	,64	,67
EpsSi1	Die Teammitglieder fühlen sich gegenseitig akzeptiert und verstanden.	5,51	,57	,50	,71
EpsSi2	Wir haben eine „wir sitzen in einem Boot“-Einstellung.	5,11	1,02	,53	,69
EpsEi1	Wir alle beeinflussen einander.	5,07	1,08	,50	,70
EpsEi2	Jede Ansicht wird angehört, auch wenn es die Meinung einer Minderheit ist.	5,51	,67	,12	,77

3.3.1 Partizipative Sicherheit – Informationsverteilung

Tab. 39:

Statistiken Subskala Partizipative Sicherheit - Informationsverteilung

N	AM	SD	Min.	Max.	Cronbachs α
62	5,34	0,67	3,00	6,00	0,72

Anmerkung. Skalename: EpsInf

Tab. 40:

Item-Statistiken zur Subskala Partizipative Sicherheit - Informationsverteilung

Variablenname	Item (Variable)	AM	SD	r _{it}	α _{itemdel}
EpsInf1	In der Regel geben wir Information an alle Mitglieder des Teams weiter, anstatt sie für uns zu behalten.	5,55	,65	,41	,77
EpsInf2	Wir halten uns über arbeitsrelevante Themen gegenseitig auf dem Laufenden.	5,06	1,02	,60	,57
EpsInf3	Es gibt im Team echtes Bemühen, Informationen innerhalb des Teams zu teilen.	5,40	,82	,66	,47

3.3.2 Partizipative Sicherheit – Sicherheit

Tab. 41:

Statistiken Subskala Partizipative Sicherheit - Sicherheit

N	AM	SD	Min.	Max.	Cronbachs α
62	5,29	0,69	2,50	6,00	4,96

Anmerkung. Skalename: EpsSi

Tab. 42:

Item-Statistiken zur Subskala Partizipative Sicherheit - Sicherheit

Variablenname	Item (Variable)	AM	SD	r _{it}	α _{itemdel}
EpsSi1	Die Teammitglieder fühlen sich gegenseitig akzeptiert und verstanden.	5,51	,57	,39	k.A.
EpsSi2	Wir haben eine „wir sitzen in einem Boot“-Einstellung.	5,11	1,02	,39	k.A.



3.3.3 Partizipative Sicherheit – Einfluss

Tab. 43:

Statistiken Subskala Partizipative Sicherheit - Einfluss

N	AM	SD	Min.	Max.	Cronbachs α
62	5,27	0,64	3,50	6,00	k.A.

Anmerkung. Skalename: EpsEi

Tab. 44:

Item-Statistiken zur Subskala Partizipative Sicherheit - Einfluss

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EpsEi1	Wir alle beeinflussen einander.	5,03	1,10	,00	k.A.
EpsEi2	Jede Ansicht wird angehört, auch wenn es die Meinung einer Minderheit ist.	5,50	,67	,00	k.A.

3.4 Soziale Erwünschtheit

Tab. 45:

Hintergrundinformationen zur Skala Soziale Erwünschtheit

Merkmal	Ausprägung
Frage Quelle	Items an unterschiedlichen Stellen im Fragenbogen platziert. modifiziert nach: Brodbeck, F., Anderson, N. & West, M (2000). Das Teamklimainventar. Handanweisung. Verfügbar unter: http://www.psy.lmu.de/wirtschaftspsychologie/forschung/working_papers/wop_working_paper_2000_2.pdf
Variablenname Skala Seitenzahl im Fragebogen Anzahl Items Ausprägungen Berechnung Stufen	EsozEr S. 9; S. 11; S. 13 4 Trifft überhaupt nicht zu – Trifft völlig zu (1-6) Summe (mind. 4 gültige Werte) Analog zur Quelle der Skala wird unterteilt in folgende Wertebereiche: die obersten 12%, die mittleren 16 % und die unteren 72%. Dies entspricht bei der vorliegenden Anzahl von Items und der vorliegenden Likert-Skalierung folgenden Stufen: 24-21: Soziale Erwünschtheit liegt in nicht akzeptablem Ausmaß vor. Es besteht eine hohe Wahrscheinlichkeit verzerrter Antworten. 21-17: Soziale Erwünschtheit ist in gewissem Maße erkennbar. Weniger als 17: Hinreichend geringe soziale Erwünschtheit.

Tab. 46:

Statistiken Skala Soziale Erwünschtheit

N	AM	SD	Min.	Max.	Cronbachs α
62	4,54	0,77	2,75	6,00	0,61

Anmerkung. Skalename: EsozEr

Tab. 47:

Item-Statistiken zur Subskala Soziale Erwünschtheit

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EsozEr1	Die Beziehungen zwischen den Personen im Team sind gleichbleibend harmonisch.	5,00	,82	,48	,51
EsozEr2	Ein Teil dieses Teams zu sein ist für die Teammitglieder das Wichtigste bei der Arbeit.	4,15	1,45	,31	,65
EsozEr3	Es gibt niemals Spannungen zwischen Personen im Team.	4,35	1,22	,39	,55
EsozEr4	Dem Team gelingt es immer, seine Fähigkeiten auch in Leistung umzusetzen.	4,78	,88	,50	,49



3.5 Persönliche Wertschätzungskompetenz

Tab. 48:

Hintergrundinformationen zur Skala Persönliche Wertschätzungskompetenz

Merkmal	Ausprägung
Frage	Wie schätzen Sie sich selbst in Bezug auf den persönlichen Umgang mit Mitgliedern aus Ihrem Entwicklungsteam ein?
Quelle	Rösch, C. (2013). Erfassung der persönlichen Wertschätzungskompetenz.
Variablenname Skala	EpeWe
Seitenzahl im Fragebogen	S. 10
Anzahl Items	11
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 6 gültige Werte)

Tab. 49:

Statistiken Subskala Persönliche Wertschätzungskompetenz

N	AM	SD	Min.	Max.	Cronbachs α
62	5,48	0,41	4,27	6,00	0,71

Anmerkung. Skalename: EpeWe

Tab. 50:

Item-Statistiken zur Skala Persönliche Wertschätzungskompetenz

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EpeWe1	Wenn mir die Erfahrung einer Person im Team wichtig ist, fällt es mir leicht, diese Person um Rat zu fragen.	5,53	,68	,52	,67
EpeWe2	Ich gebe gerne positives Feedback für jemanden im Team, der/die gute Arbeit macht.	5,59	,73	,50	,67
EpeWe3r*	In einer Diskussion im Team interessiert mich wenig, was die anderen über das Thema denken.	5,79	,41	,20	,71
EpeWe4	Wenn ich nicht sicher bin, ob ich bei der Arbeit für das Team den richtigen Weg eingeschlagen habe, frage ich ohne zu zögern nach.	5,16	1,01	,49	,67
EpeWe5r*	Ich gebe durchaus zu erkennen, wenn ich ein Mitglied im Team für weniger wichtig als mich selbst halte.	5,71	,68	,42	,69
EpeWe6r*	Wenn andere eine Arbeit für das Team erledigen, die für uns alle relevant ist, interessiere ich mich nicht wirklich dafür, wie sie es tun.	5,43	1,03	,26	,72
EpeWe7r*	Für die Zusammenarbeit im Team habe ich das Motto: „Vertrauen ist gut, Kontrolle ist besser“.	5,24	,82	,37	,69
EpeWe8r*	Wenn mir die Leistung einer anderen Person im Team nicht zusagt, lasse ich sie das öfter mal spüren.	5,67	,60	,28	,70
EpeWe9r*	Ich habe Probleme damit, Personen im Team für ihren Aufwand zu danken.	5,72	,81	,27	,70
EpeWe10	Unabhängig davon, ob es mir gut geht, fällt es mir leicht, Personen im Team für eine Leistung positives Feedback zu geben.	5,21	,81	,41	,69
EpeWe11r*	Wenn ich jemandem aus dem Team helfe, dann lasse ich ihn oder sie gerne spüren, wie viel Arbeit mir das macht.	5,36	,91	,31	,70

Anmerkung. * = die Kodierung des Items wurde invertiert



3.6 Wertschätzung im Team

Tab. 51:
Hintergrundinformationen zur Skala Wertschätzung im Team

Merkmal	Ausprägung
Frage	Wie beurteilen Sie die gegenseitige Wertschätzung im Entwicklungsteam?
Quelle	Carmeli, A. & Hoffer Gittel, J. (2008). High-quality relationships, psychological safety, and learning from failures in work organizations. <i>Journal of organizational behavior</i> . Volume 30, Issue 6. Pages 709–729.
Variablenname Skala	EweTe
Seitenzahl im Fragebogen	S. 11
Anzahl Items	4
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 2 gültige Werte)

Tab. 52:
Statistiken Skala Wertschätzung im Team

N	AM	SD	Min.	Max.	Cronbachs α
62	5,28	0,57	3,75	6,00	0,72

Anmerkung. Skalename: EweTe

Tab. 53:
Item-Statistiken zur Skala Wertschätzung im Team

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EweTe1	In unserem Team ist die Arbeit von hoher Wertschätzung geprägt.	5,45	,62	,56	,64
EweTe2	Wenn jemand im Team eine grundsätzlich andere Meinung ausdrückt, dann schätzen wir auch diese Meinung.	5,10	,82	,45	,69
EweTe3	Gegenseitige Wertschätzung ist die Basis für die zwischenmenschlichen Beziehungen in unserem Team.	5,40	,64	,61	,61
EweTe4	In unserem Team erkennen wir die unterschiedlichen beruflichen Hintergründe als besonders relevant für die zu leistende Entwicklungsarbeit an.	5,18	,98	,48	,69

3.7 Sozialer Zusammenhalt

Tab. 54:
Hintergrundinformationen zur Skala Sozialer Zusammenhalt

Merkmal	Ausprägung
Frage	Wie beurteilen Sie die gegenseitige Wertschätzung im Entwicklungsteam?
Quelle	Kauffeld, S., & Frieling, E. (2001). Der Fragebogen zur Arbeit im Team (F-A-T). <i>Zeitschrift für Arbeits- und Organisationspsychologie A&O</i> , 45(1), 26–33.
Variablenname Skala	EsoZu
Seitenzahl im Fragebogen	S. 11
Anzahl Items	4
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 2 gültige Werte)



Tab. 55.

Statistiken Skala Sozialer Zusammenhalt

N	AM	SD	Min.	Max.	Cronbachs α
62	5,13	0,71	2,75	6,00	0,65

Anmerkung. Skalename: EsoZu

Tab. 56:

Item-Statistiken zur Skala Sozialer Zusammenhalt

Variablenname	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EsoZu1	Das Team steht im Mittelpunkt und nicht der Einzelne.	5,16	,95	,40	,60
EsoZu2	Es versucht niemand, sich auf Kosten anderer in den Vordergrund zu drängen.	5,11	1,14	,57	,48
EsoZu3	Konkurrenz zwischen den Teammitgliedern ist kein Thema.	5,36	,84	,49	,56
EsoZu4	Wir fühlen uns als ein Team.	4,93	1,06	,31	,67



4 Organisationale Integrationsdimensionen

4.1 Collective Ownership of Goals

4.1.1 Collective Ownership of Goals (original)

Tab. 57:

Hintergrundinformationen zur Skala Collective Ownership of Goals

Merkmal	Ausprägung
Frage	Wie schätzen Sie die gemeinsame Aufgaben- und Zielorientierung im Entwicklungsteam ein?
Quelle	Bronstein, L. R. (2002). Index of interdisciplinary collaboration. Social Work Research, 26 (2), 113-126.
Variablenname Skala	EcolOs
Seitenzahl im Fragebogen	S. 12
Anzahl Items	7
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)

Tab. 58:

Statistiken Subskala Collective Ownership of Goals

N	AM	SD	Min.	Max.	Cronbachs α
62	4,89	0,62	3,14	6,00	0,58

Anmerkung. Skalename: EcolOs

Tab. 59:

Item-Statistiken zur Skala Collective Ownership of Goals

Variablen -name	Item (Variable)	AM	SD	r_{it}	α itemdel
EcolOs1	In meinem Team ermutigen mich die anderen Teammitglieder, mich einzubringen.	4,45	1,25	,31	,54
EcolOs2r*	Die Teammitglieder engagieren sich nicht für die Zusammenarbeit.	5,18	1,29	-,13	,71
EcolOs3	Die Mitglieder in meinem Team besprechen mit mir Konflikte, um diese zu lösen.	4,00	1,55	,34	,53
EcolOs4	Wenn Teammitglieder Entscheidungen treffen, wägen sie gemeinsam Alternativen ab.	4,91	,98	,63	,43
EcolOs5	Die Interaktion mit den Teammitgliedern erfolgt in einem Klima, in dem es Freiraum gibt, unterschiedlich zu sein und zu widersprechen.	5,39	,71	,52	,50
EcolOs6	Die Mitglieder bestimmen selbst über das Vorgehen im Team.	4,96	,99	,35	,53
EcolOs7	Die Mitglieder übernehmen Verantwortung für das Erreichen der gemeinsamen Ziele.	5,41	,78	,46	,51

Anmerkung. * = die Kodierung des Items wurde invertiert



4.1.2 Collective Ownership of Goals (gekürzt)

Tab. 60:

Hintergrundinformationen zu Skala Collective Ownership of Goals

Merkmal	Ausprägung
Frage	Wie schätzen Sie die gemeinsame Aufgaben- und Zielorientierung im Entwicklungsteam ein?
Quelle	Bronstein, L. R. (2002). Index of interdisciplinary collaboration. <i>Social Work Research</i> , 26 (2), 113-126.
Variablenname Skala	EcolOs_R
Seitenzahl im Fragebogen	S. 12
Anzahl Items	6 (unter Ausschluss von EcolOs2r, vgl. Reliabilitätsmaß Cronbachs Alpha)
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 4 gültige Werte)

Tab. 61:

Statistiken Skala Collective Ownership of Goals (gekürzt)

N	AM	SD	Min.	Max.	Cronbachs α
61	4,86	0,70	2,83	6,00	0,71

Anmerkung. Skalename: EcolOs_R

Tab. 62:

Item-Statistiken zur Skala Collective Ownership of Goals (gekürzt)

Variablenname	Item (Variable)	AM	SD	r _{it}	$\alpha_{itemdel}$
EcolOs1	In meinem Team ermutigen mich die anderen Teammitglieder, mich einzubringen.	4,45	1,25	,34	,69
EcolOs3	Die Mitglieder in meinem Team besprechen mit mir Konflikte, um diese zu lösen.	4,00	1,55	,45	,69
EcolOs4	Wenn Teammitglieder Entscheidungen treffen, wägen sie gemeinsam Alternativen ab.	4,91	,98	,65	,60
EcolOs5	Die Interaktion mit den Teammitgliedern erfolgt in einem Klima, in dem es Freiraum gibt, unterschiedlich zu sein und zu widersprechen.	5,39	,71	,46	,67
EcolOs6	Die Mitglieder bestimmen selbst über das Vorgehen im Team.	4,96	,99	,38	,68
EcolOs7	Die Mitglieder übernehmen Verantwortung für das Erreichen der gemeinsamen Ziele.	5,41	,78	,49	,66

4.2 Cooperative Behavior

Tab. 63:

Hintergrundinformationen zur Skala Cooperative Behavior

Merkmal	Ausprägung
Frage	Wie schätzen Sie die gemeinsame Aufgaben- und Zielorientierung im Entwicklungsteam ein?
Quelle	Costa, A. C. & Anderson, N. (2011). Measuring trust in teams. Development and validation of a multifaceted measure of formative and reflective indicators of team trust. <i>European Journal of Work and Organizational Psychology</i> , 20 (1), 119-154.
Variablenname Skala	EcoBe
Seitenzahl im Fragebogen	S. 12
Anzahl Items	6
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 3 gültige Werte)



Tab. 64:
Statistiken Subskala Cooperative Behavior

N	AM	SD	Min.	Max.	Cronbachs α
61	5,33	0,55	3,50	6,00	0,71

Anmerkung. Skalename: EcoBe

Tab. 65:
Item-Statistiken zur Skala Cooperative Behavior

Variablen- name	Item (Variable)	AM	SD	r_{it}	$\alpha_{itemdel}$
EcoBe1	Im Team arbeiten wir in einem kooperativen Arbeitsklima.	5,52	,62	,59	,64
EcoBe2	Anliegen und Probleme diskutieren und behandeln wir im Team offen.	5,46	,81	,43	,67
EcoBe3	Bei Entscheidungen berücksichtigen wir die Meinungen aller Teammitglieder.	5,23	,76	,47	,66
EcoBe4r*	Die Personen im Team halten wichtige Informationen zurück.	5,52	,89	,51	,64
EcoBe5r*	In meinem Team vermeiden die Personen, über sich zu erzählen.	5,02	1,10	,20	,77
EcoBe6	Die Personen im Team sind offen für Anregungen und Hilfe von anderen.	5,36	,73	,61	,62

Anmerkung. * = die Kodierung des Items wurde invertiert



5 Zufriedenheit mit der Arbeit und den Ergebnissen der Entwicklungsteams

5.1 Zufriedenheit mit Arbeit im Entwicklungsteam

Tab. 66:

Hintergrundinformationen zur Zufriedenheit mit Arbeit im Entwicklungsteam

Merkmal	Ausprägung
Frage	Wie zufrieden sind Sie mit der Arbeit im Entwicklungsteam insgesamt?
Quelle	Eigenentwicklung
Variablenname Skala	Ezufri
Seitenzahl im Fragebogen	S. 13
Anzahl Items	7
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert (mindestens 3 gültige Werte)

Tab. 67:

Statistiken Skala Zufriedenheit mit Arbeit im Entwicklungsteam

N	AM	SD	Min.	Max.	Cronbachs α
62	5,17	0,63	3,67	6,00	0,83

Anmerkung. Skalename: EcoBe

Tab. 68:

Item-Statistiken zur Skala Zufriedenheit mit Arbeit im Entwicklungsteam

Variablenname	Item (Variable)	AM	SD	r_{it}	α itemdel
Ezufri1	Die Verständigung auf gemeinsame Ziele ist in unserem Team gelungen.	5,36	,62	,68	,80
Ezufri2	Mit den Rahmenbedingungen für die Zusammenarbeit bin ich zufrieden.	5,11	,91	,63	,80
Ezufri3	Die Arbeitsorganisation in unserem Team ist zufriedenstellend.	5,13	,92	,60	,80
Ezufri4	Ich bin zufrieden mit den Arbeitsergebnissen in unserem Team.	5,00	,83	,72	,78
Ezufri5	Insgesamt bin ich mit der Leistung in unserem Team zufrieden.	5,13	,79	,71	,78
Ezufri6	Ich würde gerne auch in Zukunft in dem Team mitarbeiten.	5,43	,89	,34	,84
Ezufri7	Die Arbeit im Team trägt dazu bei, die Ausbildung von Lehrkräften an der Leuphana Universität Lüneburg zu verbessern.	5,36	,86	,43	,83

5.2 Zufriedenheit mit Arbeitsergebnissen des Teams in Bezug auf meine Tätigkeit außerhalb des ZZL-Netzwerks

Tab. 69:

Hintergrundinformationen zu Arbeitsergebnissen des Teams in Bezug auf meine Tätigkeit außerhalb des ZZL-Netzwerks

Merkmal	Ausprägung
Frage	Die Arbeitsergebnisse des Teams helfen mir in Bezug auf meine Tätigkeit außerhalb des ZZL-Netzwerks.
Quelle	Eigenentwicklung
Variablenname Skala	Ezufri8
Seitenzahl im Fragebogen	S. 13
Anzahl Items	1
Ausprägungen	Trifft überhaupt nicht zu – Trifft völlig zu (1-6)
Berechnung	Mittelwert k.A.



Tab. 70:

Statistiken Skala Zufriedenheit mit Arbeit im Entwicklungsteam

N	AM	SD	Min.	Max.	Cronbachs α
41	5,00	1,14	1,00	6,00	k.A.

Anmerkung. Skalename: EcoBe

5.3 Offene Fragen zu gelungenen und herausfordernden Aspekten sowie Wünschen und Wirkungen bzgl. der Zusammenarbeit im Entwicklungsteam

Tab. 71:

Offene Fragen zu gelungenen und herausfordernden Aspekten sowie Wünschen und Wirkungen bzgl. der Zusammenarbeit im Entwicklungsteam

Variablenname	Item (Variable)
EzuGeX (Gelingensbedingungen)	Bitte nennen Sie aus Ihrer Sicht die drei wichtigsten Aspekte der Zusammenarbeit, die in Ihrem Entwicklungsteam besonders gelungen sind.
EzuHfX (Herausforderungen)	Bitte nennen Sie aus ihrer Sicht die drei wichtigsten Aspekte, die für die Zusammenarbeit in Ihrem Entwicklungsteam besonders herausfordernd sind.
EzuWuX (Wünsche für die Zukunft)	Wenn Sie nun einen Blick in die Zukunft werfen: Welche drei wichtigsten Wünsche haben Sie für die Zusammenarbeit im Entwicklungsteam?
EwiOrgX (Auswirkungen)	Wenn Sie nun an Ihre Organisation denken, an der Sie hauptberuflich tätig sind: Welche (Aus-) Wirkungen ergeben sich aus Ihrer Sicht durch Ihre Mitarbeit im Entwicklungsteam für diese Organisation?



6 Kooperationsbeziehungen (Netzwerkanalyse)

6.1 Kooperativer Austausch (egonetzwerk)

Tab. 72:

Hintergrundinformationen zu Kooperativer Austausch (egonetzwerk)

Merkmal	Ausprägung
Frage	Wie sehr ist aus Ihrer Sicht die Zusammenarbeit mit den folgenden Berufsgruppen geprägt durch die <u>wechselseitige Bereitstellung</u> von Erfahrungen, Fachwissen und Materialien, die für die Arbeit im Entwicklungsteam relevant sind?
Quelle	Fussangel, K. (2008). <i>Subjektive Theorien von Lehrkräften zur Kooperation</i> . Dissertation, Bergische Universität Wuppertal. Wuppertal. (Insbesondere S. 20-21) Gräsel, C., Fussangel, K. & Pröbstel, C. (2006). Lehrkräfte zur Kooperation anregen – eine Aufgabe für Sisyphos? <i>Zeitschrift für Pädagogik</i> , 52 (2), 205-219.
Variablenname Skala	EnetAu
Seitenzahl im Fragebogen	S. 15
Anzahl Items Ausprägungen	Gar nicht – Sehr (1-4), Nicht im Team vertreten (5) Mittelwert (mindestens # gültige Werte)

Tab. 73:

Item-Statistiken zu Kooperativer Austausch (egonetzwerk)

Variablenname	Item (Variable)	AM	SD	Min	Max	N
EnetAu1	Lehrkräfte	3,93	0,25	3	4	61
EnetAu2	Schulleiter*innen	2,92	0,76	1	4	25
EnetAu3	Sonderpädagog*innen	3,50	0,92	1	4	28
EnetAu4	Sozialpädagog*innen	3,00	0,89	1	4	11
EnetAu5	Heilpädagog*innen	2,33	1,15	1	3	3
EnetAu6	Erzieher*innen	1,75	0,50	1	2	4
EnetAu7	Studienseminarangehörige	3,50	0,77	1	4	36
EnetAu8	Mitarbeiter*innen aus außer-schulischen Partnerorganisationen	3,46	0,78	1	4	24
EnetAu9	Mitarbeiter*innen von Behörden und Ämtern	3,15	0,90	1	4	13
EnetAu10	Professor*innen	3,82	0,54	1	4	60
EnetAu11	Wissenschaftliche Mitarbeiter*innen an Universitäten und Hochschulen	3,57	0,73	1	4	58
EnetAu12	Referendar*innen	2,43	1,13	1	4	7
EnetAu13	Studierende	3,41	0,76	1	4	44



6.2 Arbeitsteilung (egonetzwerk)

Tab. 74:

Hintergrundinformationen zu Arbeitsteilung (egonetzwerk)

Merkmal	Ausprägung
Frage	Wie sehr ist aus Ihrer Sicht die Zusammenarbeit mit den folgenden Berufsgruppen geprägt durch <u>arbeitsteiliges Vorgehen</u> ?
Quelle	Eigenentwicklung
Variablenname	EnetAt
Skala	
Seitenzahl im Fragebogen	S. 16
Anzahl Items	Gar nicht – Sehr (1-4), Nicht im Team vertreten (5)
Ausprägungen	Mittelwert (mindestens # gültige Werte)
Berechnung	Wie sehr ist aus Ihrer Sicht die Zusammenarbeit mit den folgenden Berufsgruppen geprägt durch <u>arbeitsteiliges Vorgehen</u> ?

Tab. 75:

Item-Statistiken zu Arbeitsteilung (egonetzwerk)

Variablenname	Item (Variable)	AM	SD	Min	Max	N
EnetAt1	Lehrkräfte	3,60	0,66	1	4	55
EnetAt2	Schulleiter*innen	2,85	0,93	1	4	20
EnetAt3	Sonderpädagog*innen	3,25	0,90	1	4	24
EnetAt4	Sozialpädagog*innen	3,33	0,52	3	4	6
EnetAt5	Heilpädagog*innen	2,50	0,71	2	3	2
EnetAt6	Erzieher*innen	2,33	0,58	2	3	3
EnetAt7	Studienseminarangehörige	3,48	0,57	2	4	29
EnetAt8	Mitarbeiter*innen aus außerschulischen Partnerorganisationen (bspw. Bildungseinrichtungen)	3,33	0,84	1	4	18
EnetAt9	Mitarbeiter*innen von Behörden und Ämtern	2,78	1,09	1	4	9
EnetAt10	Professor*innen	3,47	0,82	1	4	53
EnetAt11	Wissenschaftliche Mitarbeiter*innen an Universitäten und Hochschulen	3,53	0,70	1	4	53
EnetAt12	Referendar*innen	2,67	1,15	2	4	3
EnetAt13	Studierende	3,28	0,72	1	4	39



6.3 Ko-Konstruktion (egonetzwerk)

Tab. 76:

Hintergrundinformationen zu Ko-Konstruktion (egonetzwerk)

Merkmale	Ausprägung
Frage	Wie sehr ist aus Ihrer Sicht die Zusammenarbeit mit den folgenden Berufsgruppen geprägt durch <u>gemeinsame Aufgaben- und Problemlösung im direkten Dialog?</u>
Quelle	Eigenentwicklung
Variablenname Skala	EnetKk
Seitenzahl im Fragebogen	S. 17
Anzahl Items	Gar nicht – Sehr (1-4), Nicht im Team vertreten (5)
Ausprägungen	Mittelwert (mindestens # gültige Werte)

Tab. 77:

Item-Statistiken zu Ko-Konstruktion (egonetzwerk)

Variablenname	Item (Variable)	AM	SD	Min	Max	N
EnetKk1	Lehrkräfte	3,82	0,43	2	4	60
EnetKk2	Schulleiter*innen	2,83	0,89	1	4	23
EnetKk3	Sonderpädagog*innen	3,50	0,79	1	4	28
EnetKk4	Sozialpädagog*innen	3,25	1,04	1	4	8
EnetKk5	Heilpädagog*innen	2,00	1,00	1	3	3
EnetKk6	Erzieher*innen	2,00	1,00	1	3	3
EnetKk7	Studienseminarangehörige	3,50	0,88	1	4	32
EnetKk8	Mitarbeiter*innen aus außerschulischen Partnerorganisationen (bspw. Bildungseinrichtungen)	3,29	1,01	1	4	21
EnetKk9	Mitarbeiter*innen von Behörden und Ämtern	2,27	0,79	1	3	11
EnetKk10	Professor*innen	3,68	0,71	1	4	57
EnetKk11	Wissenschaftliche Mitarbeiter*innen an Universitäten und Hochschulen	3,53	0,78	1	4	57
EnetKk12	Referendar*innen	2,75	1,50	1	4	4
EnetKk13	Studierende	3,30	0,74	1	4	43



6.4 Reflexion (egonetzwerk)

Tab. 78:

Hintergrundinformationen zu Reflexion (egonetzwerk)

Merkmale	Ausprägung
Frage:	Wie sehr ist aus Ihrer Sicht die Zusammenarbeit mit den folgenden Berufsgruppen geprägt durch <u>gemeinsame Reflexion im direkten Dialog</u> über Erfahrungen, Fachwissen und Materialien?
Quelle:	Eigenentwicklung
Variablenname	EnetRe
Skala:	
Seitenzahl im Fragebogen	S. 18
Ausprägungen:	Gar nicht – Sehr (1-4), Nicht im Team vertreten (5)
Berechnung:	Mittelwert (mindestens # gültige Werte)

Tab. 79:

Item-Statistiken zu Reflexion (egonetzwerk)

Variablenname	Item (Variable)	AM	SD	Min	Max	N
EnetRe1	Lehrkräfte	3,85	0,41	2	4	59
EnetRe2	Schulleiter*innen	3,13	0,90	1	4	24
EnetRe3	Sonderpädagog*innen	3,48	0,75	1	4	27
EnetRe4	Sozialpädagog*innen	2,88	0,99	1	4	8
EnetRe5	Heilpädagog*innen	2,00	1,00	1	3	3
EnetRe6	Erzieher*innen	2,00	1,00	1	3	5
EnetRe7	Studienseminarangehörige	3,52	0,80	1	4	33
EnetRe8	Mitarbeiter*innen aus außerschulischen Partnerorganisationen (bspw. Bildungseinrichtungen)	3,38	0,86	1	4	21
EnetRe9	Mitarbeiter*innen von Behörden und Ämtern	2,75	1,06	1	4	12
EnetRe10	Professor*innen	3,67	0,79	1	4	57
EnetRe11	Wissenschaftliche Mitarbeiter*innen an Universitäten und Hochschulen	3,48	0,87	1	4	56
EnetRe12	Referendar*innen	2,25	1,50	1	4	4
EnetRe13	Studierende	3,33	0,84	1	4	43



6.5 Kontakt außerhalb des ZZZ-Netzwerks (egonetzwerk)

Tab. 80:

Hintergrundinformationen zu Kontakt außerhalb des ZZZ-Netzwerks (egonetzwerk)

Merkmal	Ausprägung
Frage:	Mit wie vielen Personen der nachfolgenden Berufsgruppen außerhalb des Entwicklungsteams haben Sie in den letzten vier Wochen über Dinge gesprochen, die für Ihre hauptberufliche Tätigkeit wichtig waren?
Quelle:	Eigenentwicklung
Variablenname	EnetKa
Skala:	
Seitenzahl im Fragebogen	S. 19
Ausprägungen:	Gar nicht – Sehr (1-4), Nicht im Team vertreten (5)
Berechnung:	Mittelwert (mindestens # gültige Werte)

Tab. 81:

Item-Statistiken zu Kontakt außerhalb des ZZZ-Netzwerks (egonetzwerk)

Variablenname	Item (Variable)	AM	SD	Min	Max	N
EnetKa1	Lehrkräfte	15,00	15,23	0	60	57
EnetKa2	Schulleiter*innen	1,76	2,10	0	10	50
EnetKa3	Sonderpädagog*innen	3,11	7,80	0	50	46
EnetKa4	Sozialpädagog*innen	1,06	1,62	0	10	47
EnetKa5	Heilpädagog*innen	0,04	0,21	0	1	45
EnetKa6	Erzieher*innen	0,83	1,65	0	10	47
EnetKa7	Studienseminar-angehörige	2,61	6,07	0	30	49
EnetKa8	Mitarbeiter*innen aus außerschulischen Partnerorganisationen (bspw. Bildungseinrichtungen)	1,09	2,34	0	10	47
EnetKa9	Mitarbeiter*innen von Behörden und Ämtern	1,84	4,69	0	30	49
EnetKa10	Professor*innen	2,65	4,89	0	30	49
EnetKa11	Wissenschaftliche Mitarbeiter*innen an Universitäten und Hochschulen	2,40	3,95	0	20	50
EnetKa12	Referendar*innen	2,98	5,06	0	24	48
EnetKa13	Studierende	9,46	28,92	0	200	48



7 Freitextfeld

Tab. 82:

Freitextfeld

Variablenname	Item (Variable)
EfrTxZuX (Freitextfeld)	Hier haben Sie die Möglichkeit, über weitere Aspekte der Zusammenarbeit in Ihrem Entwicklungsteam zu berichten, die für Sie für wichtig erachten, jedoch nicht im Fragebogen erfasst wurden.

8 Abkürzungen und Glossar

AM = Arithmetisches Mittel

Cronbachs α = Reliabilitätsmaß für die interne Konsistenz einer Skala zur Erfassung eines Konstrukts

Cronbachs α_{itemdel} = Reliabilitätsmaß einer Skala, nachdem das jeweilige Item gestrichen würde

k. A. = keine Angabe

Max. = Maximum, höchste Merkmalsausprägung

Min. = Minimum, niedrigste Merkmalsausprägung

N = Anzahl gültiger Fälle

r_{it} = Trennschärfe eines Einzelitems in Bezug auf Gesamtskala (korrigierte Item-Skalen-Korrelation)

SD = Standardabweichung



Appendix VI: Coding Scheme

The following coding scheme has been applied for the qualitative analysis in study D. Like the corresponding questionnaire (see Appendix V), the document is in German.



Tab. 1

Deduktiv-Induktives Kategoriensystem zur inhaltlich-strukturierenden Qualitativen Inhaltsanalyse nach Kuckartz (2016)

Kategorie	Definition, ggf. Abgrenzungskriterien	Ankerbeispiel	Literatur
1. Epistemische Integration (d)	Die Kategorie „Epistemische Integration“ bezeichnet, wie und inwiefern unterschiedliche Wissensstände und Expertisen der Status- und Berufsgruppen in die Zusammenarbeit eingehen.		Bergman et al. (2012), Jahn et al. (2012)
1.1 Wissens-integration (d)	Die Unterkategorie „Wissensintegration“ spiegelt die Wahrnehmung der Entwicklungsteammitglieder wider, inwiefern im Team unterschiedliche Sichtweisen (Wissen, Expertisen, Erfahrungen, Perspektiven, Überzeugungen) a) vorliegen, b) verständlich gemacht werden („Audience Design“) bzw. c) inwiefern eine gemeinsame Wissensbasis für die Zusammenarbeit („common ground“) entwickelt wurde.	- "Kopplung von unterschiedlichen Interessen der unterschiedlichen Vertreter zu einem großen Ganzen"	Steinheider et al. (2009)
1.1.1 Wissens-heterogenität (i)	Die Unterkategorie "Wissensheterogenität" spiegelt die Wahrnehmung der Befragten wider, inwiefern sich die vertretenden Akteur_innen sowie Akteursgruppen insbesondere in Bezug auf ihr Wissen, ihre Expertisen, Erfahrungen, Perspektiven, Überzeugungen u.a. unterscheiden.	- "unterschiedliche Professionen = verschiedene Schwerpunkte" - "unterschiedlicher Kenntnisstand"	
1.1.2 Audience Design (d)	Die Unterkategorie „Audience Design" spiegelt wider, ob in der Zusammenarbeit a) die jeweiligen Sichtweisen in Bezug auf u.a. Wissen, Expertisen, Erfahrungen, Perspektiven und Überzeugungen verständlich gemacht werden, d.h. ob sich darum bemüht wird, ein vertieftes Verständnis für die Sichtweisen anderer zu generieren und b) geschildert wird, dass sich die Entwicklungsteammitglieder auf unterschiedliche Perspektiven einlassen.	a) - "Transparenz der Vorstellungen der Mitglieder" - "Zudem wären zu Beginn genaue Formulierungen der Vorstellungen & Erwartungen hilfreich gewesen, um Missverständnisse innerhalb der Tandems zu vermeiden." b) - "trotz viel Erfahrungen sich für Visionen öffnen, um neue Erfahrungen machen zu können"	Steinheider et al. (2009)
1.1.3 Common Ground (d)	Die Unterkategorie "Common Ground" bezieht sich auf Aussagen, die auf die Gestaltung einer gemeinsamen Wissensbasis für die Zusammenarbeit abzielen. Hierzu zählen u.a. ein gemeinsames Problem-, Aufgaben- und Zielverständnis, die Verwendung einer gemeinsamen Sprache/Terminologie sowie der Bezug zu gemeinsamen Konzepten, Modellen und Ansätzen.	-"alle auf einen Wissensstand zu bringen". -"Schaffung eines gemeinsamen Problemverständnisses"	Steinheider et al. (2009)



Tab. 1

Deduktiv-Induktives Kategoriensystem zur inhaltlich-strukturierenden Qualitativen Inhaltsanalyse nach Kuckartz (2016)

Kategorie	Definition, ggf. Abgrenzungskriterien	Ankerbeispiel	Literatur
1.2 Gemeinsames Lernen (Team Learning) (d)	Die Kategorie „Gemeinsames Lernen“ bezeichnet Verhaltensweisen, die sich auf <i>Konstruktion</i> (inkl. <i>Austausch und aufmerksames Zuhören</i>), die <i>Ko-Konstruktion</i> (Weiterentwickeln von Ideen anderer) sowie den <i>kritischen-konstruktiven</i> Umgang (kritische Nachfragen) mit Informationen, Wissen und Expertisen sowie <i>Reflexion</i> zwischen den unterschiedlichen Akteuren beziehen.	- "Austausch verschiedener Experten" - "gegenseitige Rückkopplung über Geschehnisse im Seminar"	van den Bossche et al. (2011)
1.2.1 Austausch (d)	Die Unterkategorie "Austausch" bezeichnet Aussagen, in denen die Befragten angeben, sich über Informationen, Erfahrungen, Materialien oder Konzepte ausgetauscht bzw. diskutiert zu haben.	- "Austausch fachlicher Expertise auf Augenhöhe" - "Intensiver offener Informationsaustausch" - "Erfahrungsaustausch"	Gräsel et al. (2006)
1.2.2 Ko- Konstruktion (d)	Die Unterkategorie "Ko-Konstruktion" bezeichnet Aussagen, in denen die Befragten angeben, Ideen anderer aufgegriffen und gemeinsam weiterentwickelt zu haben oder gemeinsam mit anderen Akteuren an Konzepten und/oder Materialien gearbeitet oder diese angewendet zu haben.	- "gemeinsames Planen einer U-Einheit + deren Durchführung" - "ggs. Bestärkung/ Ergänzung in Ideen" - "Lehrer und Studenten haben zu individuellem schöpferischen Miteinander gefunden"	Gräsel et al. (2006)
1.2.3 Diskussion & Reflexion (d)	Die Unterkategorie „Diskussion“ bezieht sich auf die vertiefte sachliche Auseinandersetzung mit für das Entwicklungsteam relevanten Themen. Die Unterkategorie "Reflexion" bezeichnet Aussagen, in denen die Befragten angeben, Ideen anderer oder die Erarbeitung oder Umsetzung von Konzepten, Modellen, Materialien gemeinsam reflektiert zu haben. Die Unterkategorie "Reflexion" grenzt sich von "Diskussion" insofern ab, dass sie sich vorrangig retrospektiv auf bereits erfolgte Aktivitäten und Arbeitsschritte bezieht.	- "gemeinsames Reflektieren der Arbeitsergebnisse" - "Wir haben nicht die Zeit genommen, unsere Arbeitsweise gemeinsam zu besprechen und zu reflektieren" - "gegenseitige Rückkopplung über Geschehnisse im Seminar"	Gräsel et al. (2006)
2. Soziale Integration	Die Kategorie „Soziale Integration“ bezieht sich darauf, inwiefern die beteiligten Akteure auf interpersonaler Ebene notwendige Voraussetzungen für die Zusammenarbeit schaffen.		Bergman et al. (2012), Jahn et al. (2012)



Tab. 1

Deduktiv-Induktives Kategoriensystem zur inhaltlich-strukturierenden Qualitativen Inhaltsanalyse nach Kuckartz (2016)

Kategorie	Definition, ggf. Abgrenzungskriterien	Ankerbeispiel	Literatur
2.1 Vertrauen (d)	Die Kategorie "Vertrauen" bezieht sich darauf, dass sich die Teammitglieder an Absprachen halten, sich aufeinander verlassen können und, dass Eigeninteressen transparent gemacht werden, wenn diese die Interessen anderer beschneiden (Hidden Agendas). Die Kategorie "Vertrauen" ist dann zu wählen, wenn aus der Kodiereinheit ein nachvollziehbarer Vertrauensbezug ersichtlich wird. Dies ist der Fall, wenn Schlagwörter wie "Vertrauen", "Zuverlässigkeit", "Zusagen einhalten", "Versprechen einhalten" oder deren Gegenbeispiel genannt werden und darüber hinaus ersichtlich wird, dass dies eine Rolle für die kooperative Haltung der Entwicklungsteampartner_innen spielt. Sofern keine weiteren Ausführungen dazu vorliegen, ist in diesen Fällen von einer Beurteilung der Arbeitsorganisation auszugehen, die nicht zwingend vertrauensrelevante Implikationen mit sich bringt. Daher werden nicht weiter spezifizierte Verweise auf "Absprachen" unter der Kategorie "Aspekte der Zusammenarbeit und der Ergebnisse" => "Arbeitsorganisation" kodiert. Bei konkreteren Aussagen, bspw. "nicht eingehaltene Absprachen", werden diese der Kategorie "Vertrauen" zugeordnet.	<ul style="list-style-type: none"> - "Für die gleichberechtigte Arbeit im Team wäre es teilw. zuträglich, wenn es eine Transparenz & Zusicherung darüber gäbe, wie die Urheber von (gemeinsam) entwickelten Ideen benannt/ verschriftlicht werden würde. So kann teilw. das Gefühl entstehen, man arbeite nur "zu" & andere "schmücken" sich mit "fremden Federn"." - "Es ist wirklich schade, dass die Abrechnung der Lehrkräfte nicht wie gewünscht über Anrechnungsstunden vorgenommen wird. Das war vorher in Aussicht gestellt und findet nun nicht statt. So etwas trübt immer die gute Zusammenarbeit." 	Costa & Anderson (2011)
2.2 Wertschätzung (d)	Die Kategorie "Wertschätzung" steht für eine Akzeptanz und Anerkennung gegenüber den Entwicklungsteammittgliedern (intern) sowie Außenstehenden (extern) als auch das Respektieren der einzelnen Positionen, wenn diese von der eigenen abweichen. Diese Kategorie wird auch angewendet, wenn Schlagwörter wie "Akzeptanz", "Anerkennung", "Respekt", "Toleranz" bzw. "Würdigung" oder vergleichbare Beschreibungen gewählt werden.	<ul style="list-style-type: none"> - "Akzeptanz vers. Sichtweisen" - "respektvoller u. wertschätzender Umgang" - "gegenseitiges Ernstnehmen" 	Carmeli & Gittel (2009)
2.3 Sozialer Zusammenhalt (d)	Die Kategorie „Sozialer Zusammenhalt“ spiegelt wider, inwiefern sich die Entwicklungsteammittglieder als ein Team bzw. eine Gruppe verstehen.	<ul style="list-style-type: none"> - "Wir agieren gemeinsam als Team" - "Es hat sich ein echtes Teamgefühl entwickelt" 	
3. Organisationale Integration	Organisationale Integration bezieht sich darauf, inwiefern die Zusammenarbeit durch organisationale Prinzipien gekennzeichnet ist, die eine hohe Partizipation aller beteiligten Akteure ermöglichen.		Bergman et al. (2012), Jahn et al. (2012)



Tab. 1

Deduktiv-Induktives Kategoriensystem zur inhaltlich-strukturierenden Qualitativen Inhaltsanalyse nach Kuckartz (2016)

Kategorie	Definition, ggf. Abgrenzungskriterien	Ankerbeispiel	Literatur
3.1 Gemeinsame Zielverantwortung (Collective Ownership of Goals)	<p>Die Kategorie "Collective Ownership of Goals" steht dafür, dass die Ziele sowie die Wahl der Mittel zur Erreichung der Ziele gemeinsam durch die beteiligten Entwicklungsteammitglieder erarbeitet, umgesetzt und verantwortet werden. Hierbei liegt die besondere Betonung auf der gemeinschaftlichen Identifikation und Erreichung der Ziele.</p> <p>Hierunter werden folgende Aspekte gefasst: "sich gemeinsam in die Arbeit einzubringen"; "gemeinsam Alternativen abwägen". Weitere Indikatoren sind Schlagworte wie "gemeinsam"; "Gruppe"; "zusammen" in der Verbindung mit dem Prozess zur Erreichung der Ziele.</p> <p>„Gemeinsame Zielverantwortung“ grenzt sich bspw. von „Kooperative Haltung“ ab, indem es weniger auf die direkte Beziehungsebene, d.h. den Umgang mit anderen Entwicklungsteampartner_innen gerichtet ist, sondern die gemeinsame Verantwortung von Zielen und die hierzu notwendigen Mittel und Prozesse in den Blick nimmt (Verantwortung auf der Sachebene).</p> <p>Von der Kategorie „Aspekte der Zusammenarbeit und der Ergebnisse“ -> „Zielorientierung“ ist die Kategorie „Gemeinsame Zielverantwortung“ insofern abzugrenzen, da diese immer dann zum Tragen kommt, wenn explizit die Gemeinsamkeit als Besonderheit in Bezug auf die Zielfindung, -orientierung bzw. -erreichung betont wird. Wenn aber in Abgrenzung zur Gemeinsamkeit ein weiterer Bezug stark gemacht wird, bspw. ein konkreter Bezug zur Anwendung oder Theorie-Praxis-Verzahnung, wird das Segment entsprechend dort kodiert (bspw. „gemeinsames Planen einer U-Einheit + deren Durchführung“).</p>	<ul style="list-style-type: none"> - "alle arbeiten an einem Ziel" - "gemeinsame Entscheidungen" - "gemeinsames Fazit des Projekts aufstellen mit Ausblick auf zukünftige Projekte" 	Bronstein (2002)
3.2 Kooperative Haltung (d)	<p>Die Kategorie „Kooperative Haltung“ grenzt sich insofern von "Collective Ownership of Goals" oder der allgemeinen Kategorie "Aspekte der Zusammenarbeit und der Ergebnisse" ab, als dass sie direkt auf die Beziehungsebene, sprich den Umgang mit anderen</p>	<ul style="list-style-type: none"> - "gutes Miteinander & Gleichberechtigung beibehalten" - "Offenheit den anderen gegenüber" - "Kooperation" 	Costa & Anderson (2011)



Tab. 1

Deduktiv-Induktives Kategoriensystem zur inhaltlich-strukturierenden Qualitativen Inhaltsanalyse nach Kuckartz (2016)

Kategorie	Definition, ggf. Abgrenzungskriterien	Ankerbeispiel	Literatur
	Entwicklungsteammitgliedern gerichtet ist. "Atmosphäre" wird der gleichnamigen Kategorie zugeordnet.		

Anmerkung: In der Spalte „Kategorie“ stehen die Buchstaben (d) = deduktive Kategorie und (i) = induktive Kategorie.



Literatur

- Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C., & Schramm, E. (2012). *Methods for Transdisciplinary Research: A Primer for Practice (1. Aufl.)*. Sozialwissenschaften 2012. Campus Verlag. https://content-select.com/media/moz_viewer/519cc457-3eb8-4599-9999-290f5dbbeaba
- Bronstein, L. R. (2002). Index of interdisciplinary collaboration. *Social Work Research*, 26(2), 113–126. <https://doi.org/10.1093/swr/26.2.113>
- Carmeli, A., & Gittell, J. H. (2009). High-quality relationships, psychological safety, and learning from failures in work organizations. *Journal of Organizational Behavior*, 30(6), 709–729. <https://doi.org/10.1002/job.565>
- Costa, A. C., & Anderson, N. (2011). Measuring trust in teams: Development and validation of a multifaceted measure of formative and reflective indicators of team trust. *European Journal of Work and Organizational Psychology*, 20(1), 119–154. <https://doi.org/10.1080/13594320903272083>
- Gräsel, C., Fussangel, K., & Pröbstel, C. (2006). Lehrkräfte zur Kooperation anregen - eine Aufgabe für Sisyphos? [Prompting Teachers to Co-Operate – A Sisyphean Task?]. *Zeitschrift Für Pädagogik*, 52(2), 205–219. <http://www.pedocs.de/volltexte/2011/4453/>
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between Mainstreaming and Marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Kauffeld, S., & Frieling, E. (2001). Der Fragebogen zur Arbeit im Team (F-A-T). *Zeitschrift Für Arbeits- Und Organisationspsychologie A&O*, 45(1), 26–33. <https://doi.org/10.1026//0932-4089.45.1.26>
- Steinheider, B., Bayerl, P. S., Menold, N., & Bromme, R. (2009). Entwicklung und Validierung einer Skala zur Erfassung von Wissensintegrationsproblemen in interdisziplinären Projektteams (WIP) [Development and Validation of a Scale to Identify Problems of Knowledge Integration in Interdisciplinary Project Teams]. *Zeitschrift Für Arbeits- Und Organisationspsychologie A&O*, 53(3), 121–130. <https://doi.org/10.1026/0932-4089.53.3.121>
- van den Bossche, P., Gijsselaers, W., Segers, M., Woltjer, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>

