

## Introduction

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Since its emergence in medieval Europe, the idea of a university has developed and expanded continuously. Today, universities are drivers of progress and innovation as well as hotspots of dynamic international knowledge exchange. Motivated by the aim of providing both learners and educators for a globally interconnected world, universities are massively strengthening their internationalization strategy. They strive to foster global competences, global awareness, and international perspectives in their graduates. Educational governance increasingly supports internationalization in higher education through a growing number of calls for proposals and funding opportunities from national agencies such as DFG (German Research Foundation), NRF (South African National Research Foundation), DAAD (German Academic Exchange Service), or Erasmus Plus (European Exchange Program). Teacher education has made strong advances during the last decade: universities have developed a growing responsibility for providing research-based education for future teachers, combined with reflective practice and learning about social and global responsibilities. Teacher education aims to prepare future teachers for working in a globalized world, so that teachers can equip future generations responsibly for upcoming, often unforeseeable challenges. International cooperation in education has enhanced international comparative educational research at universities, and the need for the comparability of higher education has moved international university rankings into public focus. Large-scale assessments such as PISA and TIMSS have become increasingly prevalent. While for centuries, teacher education took place within strictly limited national domains, higher education institutions of teacher education today acknowledge the

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potential of international collaborative or comparative research (see for example Blömeke et al., 2014; Blömeke et al., 2019; Schratz & Vasileios, 2018). Comparative education works with quantitative or qualitative methods, and historical or conceptual research approaches. Comparative approaches enrich the educational landscape by providing researchers and educators with context-specific insight. They also prompt the discussion of systems as a whole, with regard to their historical, cultural, political and economic backgrounds.

The collaboration between the Wits School of Education at the University of the Witwatersrand and the Tübingen School of Education at the University of Tübingen began in 2019 with mutual visits to both universities. Both institutions pursue similar goals: research-based teacher education, support of junior academics, collaboration with faculties or other university-wide institutions, addressing and incorporating urgent societal and global challenges, and working with a broad spectrum of involved disciplines. Researchers from both Schools realized their shared interests and challenges, and began to work on questions of teacher education collaboratively and binationally. Teams were created between researchers from corresponding departments in both institutions.

The concept of this book requires either a comparative research approach between the two locations Wits and Tübingen or a binational approach addressing a joint question. The chapters on hand correspond to the characteristics of international comparative studies, as described by Montanaris (Morén-Alegret, 2012; Wladyka, 2020), with varying foci: international comparative studies cover two or more case studies, they aim to explain rather than analyze, the researchers combine different cultural perspectives in order to understand the processes in both countries, and the collaboration requires academic mobilities.

The results reveal similar challenges and approaches within very different contexts. Local solutions and realizations are put into focus and related to the institutional, content, and process dimension of educational governance (Parreira do Amaral, 2011). Further elements that shape work at institutions of teacher education worldwide are the concepts of pedagogical knowledge (PK), content knowledge (CK), and pedagogical content knowledge (PCK) according to Shulman (Shulman, 1986) and their interrelations. In the international context, Shulman's denominations are established but the national definitions and realizations still require differentiation. In order to provide a basis for understanding the work on hand, the definitions of Pedagogical Content Knowledge in Germany and South Africa are contrasted here.

The German term *Didaktik* refers to the general science of teaching, learning, and education. The German term for PCK, *Fachdidaktik*, describes the mediation of

knowledge structures with special regard for the teaching and learning processes of this knowledge at schools. German Fachdidaktik has developed a strong research base in the last 10 years, critically addressing research design challenges and analyzing methodologies and contents as well as the relationships between skills, competences, learning progress, learning outcomes, and evaluation. Fachdidaktik characteristically develops as a special composite discipline between the subject of education and its specification subject, e.g., mathematics education or history education (Vollmer, 2014; Rothgangel et al., 2021; Riegel & Rothgangel, 2021). Fachdidaktik also relates to meta-levels of learning and education: critical societal, philosophical, or ethical perspectives on contents and methodologies are discussed in an ongoing discourse. Thus, it serves as a continuing corrective for the challenging educational realities of schools and higher education.

In the South African context, the term PCK refers to the conceptualization by Shulman (1986, 1987), responding to the necessity of classroom teachers' understanding and transformation of the content to be taught. Here, Shulman (1986) considered PCK as specialized professional teacher knowledge for teaching content, which is germane to the profession of teaching, allowing difficult and abstract content to be taught in ways that are understandable to learners. The implementation of PCK in South Africa, particularly in the teacher education programs, happens largely through the re-conceptualized grainsize of PCK modelled at a topic-specific level (Carlsen et al., 2019). It is at a topic level that the transformation of content knowledge comes alive: through the interactive use of topic-specific representations, through considerations of what is most important and through an awareness of what is difficult to understand, including common learner misconceptions (Geddis, 1993; Mavhunga & Rollnick, 2013). PCK at the topic-specific level is referred to as Topic Specific Pedagogical Content Knowledge (TSPCK). Learning to teach through TSPCK has enabled teachers and pre-service teachers to develop expertise in one topic at a time and subsequently transfer that competence to develop TSPCK in another (Mavhunga, 2016). This observation makes TSPCK a powerful and promising tool for developing teacher capacity, especially in teaching school disciplines that have been found lacking, with consistent poor learner performance over the years, such as science (Mullis et al., 2020).

TüSE and WSoE expect this volume to deepen scientific collaboration and provide insights into highly specialized research fields in both institutions. By approaching their research questions in binational teams, researchers from South Africa and Germany benefit from the challenge of making their specific educational context understandable and approachable for researchers from other backgrounds.

Education in today's globalizing world is carried out and developed in the context of national or local regulations and globalizing tendencies. While the Global Education Industry reveals tendencies towards equalization (Parreira do Amaral, 2019), emphasis on the value of local solutions has increased in educational work.

This book sheds light on these challenges by addressing how national educational institutions realize international standards and global topics. It is demonstrated how local specifications keep their significance on a globalized educational stage, and how institutions and individual approaches create a balance between the global and the local.

Chapters 1 to 4 introduce the reader to the societal and institutional background of education in South Africa and Germany. In chapter 1, the authors describe and critically discuss the historically evolved settings and constrictions of education in South Africa. Chapter 2 follows with a description of the German educational context. In chapter 3, the authors present the development and self-description of the Wits School of Education in Johannesburg, as well as their contribution to and vision for teacher education in 21<sup>st</sup> century South Africa. Chapter 4 follows with the example of the institutional structures of Tübingen School of Education in Tübingen.

Chapter 5 gives an extensive overview of the history and current challenges of inclusive education in both countries in a joined chapter. It is discussed how historically grown, segregated educational systems are faced with reform aspirations for inclusive education, creating challenges in both countries' educational realities. Changing perspectives on students with special needs are discussed, as well as the paradoxical consequences resulting from concepts of diversity.

Chapter 6 discusses how quality mentoring in Germany's teacher education can be ensured while taking into consideration the complexity and non-linearity of teacher education, as described in multiple professionalization theories. Mentoring is understood as a tool of indirect guidance within individual professionalization processes.

Chapter 7 approaches the development of professional identity and classroom efficacy with Legitimation Code Theory. A gap between school supervision and university mentorship is revealed, showing the need for improvements in the implementation of mentoring in South Africa. Chapters 6 and 7 both reveal the different national struggles surrounding the quality of guidance given to future teachers (see also Heinrich et al., 2019).

Chapters 8 to 10 focus on subject-specific questions in biology education, economic education, and physics education:

Chapter 8 is a collaborative qualitative study analyzing the lesson plans of biology students. The data are analyzed with reference to biology education models from Tübingen and frameworks from Witwatersrand. It is shown that combining educational

methods from Tübingen and Witwatersrand might support students in the field of biology lesson planning.

Chapter 9 identifies and discusses five urgent topics of today's economic reality, demanding changes in the curriculum and pedagogy of economic teacher education.

Chapter 10 approaches the teaching of voltage by referring to the characteristics of electrochemical cells, arguing that physics education in both South Africa and Germany can profit from overcoming narrow subject borders.

Chapters 11 and 12 focus on the topic of Education for Sustainable Development (ESD), showing its urgency and aiming to establish the topic as a pillar across all disciplines. Chapter 11 gives an overview of ESD at the University of Tübingen, describing its governmental regulations as well as its implementation in Tübingen. The authors vote for increased integration of ESD across all subjects, leading to increased competence in the normative-ethical reasoning of all students. Chapter 12 explores how ESD developed from Environmental Education and how it is integrated into the Natural and Life Sciences study program at the University of the Witwatersrand. The authors make a case for a more systematic and implicit integration of ESD.

The variety of subjects discussed in this book reflects the broad spectrum of topics addressed by teacher education in Witwatersrand and Tübingen. Teacher education in both countries works on developing new structures through their Schools of Education. Furthermore, both locations work with classical subjects such as biology, economics, or physics education, and aim to develop the fields of inclusion, mentoring, and Education for Sustainable Development.

This anthology shows the reader the potential of analyzing parallels and differences between teacher education at the University of the Witwatersrand and the University of Tübingen, which both serve as exemplary universities of their respective national contexts. The book further exemplifies functional ways in which North-South institutional collaborations may cultivate vibrant opportunities for knowledge exchange and research that embraces diversity while retaining institution and country identity, fostering inclusive participation by multiple researchers from each institution.

The editors thank all authors for their willingness to collaborate internationally. The authors have demonstrated their openness to the partner university, their ability to connect to a new context, and their ability to work both locally and globally. As a result, both universities are profiting from the academic exchange and resulting insights. Additionally, the work process experienced will continue to benefit teaching, future research, and university life at WSoE and TüSE in the long term.

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