Frontline Learning Research
An official journal of EARLI

Frontline **L**earning **R**esearch 6 (2014) 26-45
ISSN 2295-3159

A change in perspective – Teacher education as an open system

Christoph König[a], Regina H. Mulder[a]

[a]University of Regensburg, Germany

Article received 30 April 2014 / revised 5 June 2014 / accepted 11 September 2014 / available online 24 September 2014

Abstract

Teacher education is the environment for the learning and instruction of prospective teachers. Its structure, components, and contents shape the development of relevant competences which enable prospective teachers to be effective in the classroom. But its relevance is questioned because respective research, characterised by inconclusive results, does not offer explanations about the reasons why certain teacher education programmes are more effective than others in the development of relevant competences. One reason for the lack of explanations can be found in the way research assesses the effectiveness of teacher education. This might be due to problems regarding the conceptualisations of teacher education, as well as to the inherent selection and non-random allocation problems in research on the relation between teacher education and student achievement. In this paper we respond to claims for an organisational perspective on teacher education and develop such a new perspective. Accordingly, we provide these claims with an adequate theoretical foundation and develop an organisational model of teacher education based on Open Systems Theory. Besides being one of the first integrative organisational models of teacher education, it is among the first models which illustrate the relations and interdependencies of systems, its different parts, and its different levels, and enables researchers to investigate these interdependencies. The development of this model is further based on an alteration of the input variables of the concept of teacher quality. Moreover, the model has consequences for the notion of teacher education effectiveness. We illustrate these changes, and discuss them and the model with respect to possible areas of further research.

Keywords: Teacher Selection; Teacher Allocation; Teacher Education Effectiveness; Open System; Positive Matching

Corresponding author: Christoph König, Institute of Educational Science, University of Regensburg, Universitätsstrasse 31, D-93051 Regensburg, Germany. E-Mail: christoph.koenig@ur.de
Doi: http://dx.doi.org/10.14786/flr.v2i4.109

1. Introduction

Teacher education is the environment for the learning and instruction of prospective teachers. Its structure, components, and contents shape the development of relevant competences which enable prospective teachers to be effective in the classroom. These competences comprise cognitive, motivational, volitional, and social abilities and skills necessary for effective teaching (Weinert, 2001). But its relevance is questioned because respective research, characterised by inconclusive results, does not offer explanations about the reasons why certain teacher education programmes are more effective than others in the development of relevant competences (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Harris & Sass, 2011; Yeh, 2009). One reason for the lack of explanations can be found in the way research assesses the effectiveness of teacher education. Most studies compare graduates from different teacher education programmes with regard to differences in the achievement of students in schools; this approach has relatively high demands concerning methodology and conceptualisations of teacher education (Boyd, Grossman, Hammerness, Lankford, Loeb, Ronfeldt, & Wyckoff, 2012; Morge, Toczek, & Cakroun, 2010). However, this dominant approach and the conceptualisations of teacher education in these studies do not fully grasp the complexity of teacher education, especially the interplay between different components and the learning and instruction of prospective teachers. Four specific aspects illustrate the problems associated with the way research currently investigates teacher education effectiveness. The first two aspects are directly related to teacher education conceptualisations.

First, many studies conceptualise teacher education as an individual teacher attribute. They use narrow sets of variables, for example the degree and certification status, as proxies for competences which teachers bring into the classroom (Harris & Sass, 2011). Even structural features or policies of teacher education, for example the selection procedures or the structure of learning opportunities, are considered such individual teacher attributes (Little & Bartlett, 2010). These kinds of conceptualisations may not adequately reflect the relation between organisational aspects of teacher education and the behaviour of individuals, e.g. the use of learning opportunities by prospective teachers during initial teacher training. What happens at the level of the individual prospective teacher, that is, his learning processes, is embedded in the structure of teacher education. Harris and Sass (2011) labelled this aspect the "inherent selection problem". Second, most studies directly relate the aforementioned narrow sets of indicators for teacher education to the achievement of students in schools. However, as Konold, Jablonski, Nottingham, Kessler, Byrd, Imig, Berry, and McNergney (2008, p. 310) argue, "[…] there is little to be learned by examining the long jump between teacher characteristics and pupil learning. […]". Few studies take into account the full complexity of the relation between teacher education, teacher characteristics (such as their competences), teacher behaviour, and student achievement. Especially the relation between teacher behaviour and student achievement is neglected (Connor, Son, Hindman, & Morrison, 2005). An effect size of 0.91 for teacher behaviour measured by classroom observations on student achievement, found by Schacter and Tum (2004), illustrates the importance of teacher behaviour. The 'long jump' disregards this relation, and does not take into account the distinction between teacher quality (characteristics teachers possess) and teaching quality (their teaching practice). Thus, it hinders the identification of teacher characteristics which are important for effective teaching. The other two aspects are related to potential sources of bias in current estimates of the effectiveness of teacher education (Harris & Sass, 2011).

Third, one source of bias is the variation in the development of relevant competences across teacher education programmes (Boyd, et al., 2009). This variation may not be attributed only to a better provision of opportunities to learn, but also to a better selection of prospective teachers (Denzler & Wolter, 2009). Structural features of the selection procedures may shape unobserved characteristics of prospective teachers which influence their learning (Kennedy, 1998). Individual conceptualisations of teacher education lack explanatory power with regard to such organisational aspects. Fourth, another source of bias is the non-random allocation of teachers to schools. A prominent manifestation of this problem is positive matching. Students in schools with high socioeconomic status have better access to highly qualified teachers (in terms of paper qualifications), compared to students in schools with a lower socioeconomic status (Luschei & Carnoy, 2010; Loeb, Kalogrides, & Beteille, 2012). Only few studies investigate relevant structural features of the teacher labour market with regard to their influence on teacher distributions (Goldhaber, 2007;

Winters, Dixon, & Greene, 2012). Current individual conceptualisations of teacher education do not allow for explanations of the development of positive matching, because they address this problem when the allocation of teachers to schools has already happened. Hence, it remains unknown why teachers bring their competences into schools and classrooms in such a systematic way.

In this paper we address these issues and argue that, with a change in perspective on teacher education, some of them may be attenuated. This change in perspective is based on three premises: (1) a rearrangement of teacher education and teacher characteristics within the concept of teacher quality, accompanied by a clear distinction between teacher quality and teaching quality (Goe & Strickler, 2008). (2) An organisational approach to teacher education modelling teacher education as a system, which focuses on structural features relevant for the selection of teacher education candidates and prospective teachers, the development of relevant competences, and for the allocation of teachers to schools. (3) A change in the notion of teacher education effectiveness, which is due to the rearrangement of the teacher quality concept and the organisational approach to teacher education.

The aim is to develop an organisational model of teacher education which allows researchers to take into account (1) the relation between teacher education and its context, as well as (2) the interplay between teacher education and prospective teachers. The development is oriented along the ecological framework of teacher education proposed by Zeichner and Conklin (2008) and specifically focuses on the admission process and the institutional and labour market context of teacher education. Grossman and McDonald (2008) identify these contexts as being important influences on the policy and practice of teacher education, and argue that in order to gain new insights research should incorporate these contextual conditions. Moreover, the model provides a theoretical basis for explanations of learning and instruction of prospective teachers which is embedded in a teacher education system (Zeichner, 2005). Given the lack of research on organisational level we make use of system and organisational theories in order to characterise teacher education as a system. However, the reliance on these theories might be an advantage because, as Grossman and McDonald (2008) state, broadening the theoretical basis of research on teacher education might facilitate new insights and explanations of teacher education policy and practice. Eventually, the model will provide researchers with a new theoretical basis for research in order to reach a better understanding of learning and instruction of prospective teachers, because it illustrates the connections between different (organisational and individual) levels and systems, as well as the interdependencies of individual and organisational learning. These new insights might further be used for policies aimed at the facilitation of learning and instruction of prospective teachers.

2. The prerequisite - Rearranging components of the teacher quality concept

Goe and Strickler (2008) conceptualise teacher quality as a multidimensional concept consisting of three interrelated dimensions. They conceive of teacher qualifications (understood as degrees, majors, and other paper qualifications) and characteristics (such as their competences) as input variables, teacher behaviour as process variable, and teacher effectiveness as output variable which is commonly measured by standardised student test scores. In accordance with other authors they emphasise that teacher quality and teaching quality are two different aspects, and that they should be modelled accordingly (Goe & Strickler, 2008; Konold et al., 2008). However, as we already mentioned in the introduction, many studies on the relation between teacher education and student achievement disregard this distinction. The interrelations between the different concepts are as follows. Teacher qualifications and characteristics (such as their competences) have an influence on the behaviour of teachers, that is, what they do and can do in the classroom (teaching quality). Following Weinert's (2001) definition of competence, teacher characteristics constituting teacher quality comprise cognitive abilities and skills, for example knowledge about and mastery of subject-didactics and a repertoire and understanding of multiple models of teaching, as well as motivational, volitional, and social aspects such as commitment to a continued professional development after initial teacher training, love of children, collaboration with colleagues, and reflection over practice (Hopkins, 2008). Teacher quality translates into teaching quality. At the same time, with teaching being an experience good and social practice (Jovanovic, 1979), teaching quality influences teacher quality. For

example, reflection over practice, collaboration with colleagues, and a high commitment to continued professional development enables teachers to refine their practice and to further develop their competences after their initial teacher training. Eventually, the interplay between teacher and teaching quality is an important influencing factor for student achievement and, consequently, directly related to student achievement.

What becomes obvious is that teacher characteristics (such as their competence) have no direct relation to student achievement. Their effect on student achievement is mediated by the respective teacher behaviour, that is, they only have an indirect effect on student achievement. This indirect relation is also disregarded by many studies (for example Marshall & Sorto, 2012). Differences in teacher characteristics may lead to differences in what teachers are able to do in the school and in the classroom, and in turn to differences in student achievement. As of yet the specifics of these pedagogical mechanisms are unclear (Baumert, Kunter, Blum, Brunner, Voss, Jordan, Klusmann, Krauss, Neubrand, & Tsai, 2010). The unclear picture is due to a negligence of the indirect effect of teacher quality on student achievement. Hence, a first prerequisite for the change in perspective on teacher education involves acknowledging this indirect relation. This is accompanied by shifting the focus to the relation between teacher and teaching quality. This may be a way to identify specific teacher characteristics which are relevant for effective teaching.

Teacher qualifications and characteristics are frequently used interchangeably. However, they are two distinct concepts. Teacher qualifications are frequently used in studies as proxies for what the teacher did during initial teacher training (Harris & Sass, 2011). But teacher characteristics, such as their competence, are a consequence of teacher qualifications, that is, of what they did during initial teacher training. In other words, what teachers did during their initial teacher training, and why, has consequences for what they bring into the school and the classroom, and where. Jackson (2010) showed that the quality of teacher-student matches accounts for up to 40 percent of what is usually attributed to a teacher effect on student achievement. Hence, the second prerequisite involves a clear distinction between teacher qualifications and teacher characteristics. However, with individual level conceptualisations of teacher education, which mix up teacher qualifications and teacher characteristics, we cannot explain what a prospective teacher actually does during initial teacher training and why, where he ends up teaching, what he is able to do in the classroom, and eventually how his behaviour affects student achievement. Having teacher education disentangled from teacher characteristics, and having it identified as starting point for the complex chain between the resulting teacher characteristics (such as their competence), teacher behaviour, and student achievement, we are now in a position to model teacher education as a system of structured learning opportunities, including structural elements governing the selection of prospective teachers and the allocation of teachers, which is embedded in multiple institutional contexts (Zeichner, 2006).

3. A different perspective – Teacher education as an open system

The organisational model of teacher education described in this section is based on Open Systems Theory (Katz & Kahn, 1978). Despite being a rather old model, up to this date it still remains "the most systematic introduction of open system concepts into organisation theory" (Scott & Davis, 2007, p. 90), and is furthermore the theoretical basis for much of current organisational research (Schneider & Somers, 2006; Martz, 2013). Katz and Kahn (1978) were among the first recognising the dependency of organisations and their environment, as well as the linkage between psychological and structural/economic aspects of organisations. Compared to other currently used open system models, for example Contingency Theory (Lawrence & Lorsch, 1967), it is the aforementioned linkage between individual and organisation which makes Open Systems Theory an appropriate framework for teacher education systems. Compared to current further developments of open system models, for example Complex Adaptive Systems (Stacey, 1995), Open Systems Theory provides a more accessible framework due to the comprehensiveness of its core components.

However, the main reason for choosing Open Systems Theory was the fit of its theoretical propositions with the characteristics of teacher education systems (Bess & Dee, 2008) also show the

usefulness of this theory for educational organisations in their application of Open System Theory to Higher Education). First, it explicitly takes into account the relations and exchanges between different systems. This is important because the teacher education system is not an isolated entity, but is embedded in multiple contexts, for example Higher Education and the teacher labour market (Grossman & McDonald, 2008). In this part of the framework we are able to model which individuals choose teacher training, and where teachers bring their characteristics (such as their competence) to the school and the classroom. Second, it explicitly takes into account the dependencies and interplay of system and prospective teachers. This is important for modelling the use of available learning opportunities by prospective teachers. In this part of the framework we integrate what the prospective teacher does during initial teacher training.

3.1 Teacher education from the point of view of Open Systems Theory

An open teacher education system consists of a sequence of structured learning opportunities provided to prospective teachers within the system. The sequence and structure of the learning opportunities constitute an environment where the learning of prospective teachers is situated in a gradually growing participation in teaching practice (Korthagen, 2010). The active use of these opportunities leads to the development of competences required for effective teaching. The use of learning opportunities by prospective teachers is labelled as, in open system terms, patterned activities of individuals and describe the core of the interplay between system and prospective teachers (Katz & Kahn, 1978). Thus, what happens within the teacher education system is seen as an active developmental process, rather than just a transmission of declarative knowledge (Zeichner, 1983).

What prospective teacher do, and how successful their professional development is during initial teacher training depends on the characteristics they bring into the teacher education system. At the same time, the learning opportunities provided by the teacher education system require certain individual characteristics. If teacher education candidates or prospective teachers do not meet these requirements, the utilisation of learning opportunities, as a part of their professional development, becomes suboptimal and may even get cancelled prior to graduation (Blömeke, 2009). Thus, for an open teacher education system control over entry is essential (which is also called boundary maintenance; Scott & Davis, 2007). The selection function plays a key role in this regard, and is defined as the selection and sorting of teacher education candidates and prospective teachers (Musset, 2010; Van de Werfhorst & Mijs, 2010). It is based on the characteristics of the candidates and prospective teachers. An optimal selection function avoids adverse selection in terms of characteristics which hinder a successful utilisation of learning opportunities as a part of the professional development of prospective teachers.

Given the connection of an open teacher education system to its context (Scott & Davis, 2007), we have to consider what happens immediately after initial teacher training. The degree to which prospective teachers successfully use the learning opportunities during initial teacher training influences the competence they bring into schools and classrooms. This is a second component of the connection between teacher education and the education system. This allocation function is defined as the assignment of teachers to schools (Parsons, 1951), which has long been based on the assumption that schools and teaching position are equivalent across districts and regions (Johnson & Kardos, 2008). However, Jackson (2010) could show that there are teacher-school combinations which lead to better student achievement. Thus, it matters where teachers bring their competence into the classroom. An optimal allocation function provides teacher-school matches that minimise teacher turnover and attrition.

In sum, the general characteristics of an open teacher education system closely resemble the three common functions of education systems, which constitute an input-transformation-output-model (Kast & Rosenzweig, 1972): the selection and sorting of candidates and prospective teachers (input/selection), the provision of learning opportunities for students situated in a gradually growing participation in teaching practice to develop relevant competences (transformation/instruction), and the allocation of qualified teachers to schools (output/allocation).

3.2 The selection and allocation functions

In order to establish and maintain the selection and allocation processes, the open teacher education system develops respective structural elements (Katz & Kahn, 1978; Wang, Coleman, Coley, & Phelps, 2003). These structural elements are arranged in subsystems governing the selection and sorting of prospective teachers, and the allocation of teachers to schools. These structural elements comprise institutional structures and administrative regulations for control over and socialisation of prospective teachers and teachers (Maaz, Hausen, McElvany, & Baumert, 2006). They allow screening out individuals when they do not meet the requirements of teacher education or a given teaching position in a school.

Both functions are closely connected to the context of the teacher education system, because they govern the transitions of individuals into and out of initial teacher training. Thus, the arrangements of structural elements can be understood as transition systems (Van der Velden & Wolbers, 2007). As such, they are means for the teacher education system to react to policy changes in the immediate context, namely the education system and the teacher labour market. An example for such reactions is a change in the selection mechanisms of a teacher education system given a shortage of teachers in the teacher labour market (Blömeke, 2006).

3.2.1 General characteristics of the selection function

The selection function governs the admission of teacher education candidates at entry into, and the sorting of prospective teachers within the teacher education system. By means of the aforementioned control and socialisation elements, the selection function provides information about (1) the aptitude of teacher education candidates for teaching, and (2) about the success of prospective teachers in their use of learning opportunities. Moreover, socialisation mechanisms initiate the transfer of professional role expectations and norms from teacher education to the prospective teacher and support the professional development of the prospective teacher (Saks, Uggerslev, & Fassina, 2007). This information can be used by prospective teachers in order to judge his attitude to and aptitude for teaching. Furthermore, it enables prospective teachers to reflect on their practice in order to determine how to improve his teaching. Moreover, the information provided by the selection function serves also as relevant feedback for the system for admission and progression decisions, in order to reduce the variability in the use of learning opportunities, which is due to variability in individual characteristics (Scott & Davis, 2007). With its control and socialization mechanisms, the selection function serves both the prospective teachers and the teacher education system in determining if a given prospective teacher can progress to the next developmental stage. While the information provided by the function is at first only a rough estimate of how well a given candidate might do, the information becomes more detailed when the actual development of the prospective teacher is assessed.

It is important to note that it is only possible to select individuals who (are able to) make themselves available (Grodsky & Jackson, 2009). Thus, variability in individual characteristics can be found either in the candidate pool or the prospective teachers. The structural elements constituting, and in turn influencing the success of the selection function, can be assigned to and described with three dimensions. First, the capacity of the teacher labour market influences the number and characteristics of the candidates. This comprises the accessibility of teacher education and the attractiveness of teaching. Second and third, the comprehensiveness of available information about candidates and students and the level of integration of students into teaching influence the number and the characteristics of the prospective teachers.

3.2.2 Structural elements of the selection function

We begin with the structural elements constituting the capacity of the teacher labour market. The theoretical rationale of the respective structural elements is based on rational choice and supply and demand models (Sicherman & Galor, 1990; Ehrenberg & Smith, 2011). Given that initial teacher training is an educational choice among others they postulate that individuals analyse educational alternatives by weighing costs against benefits. When the costs of a given educational alternative are higher than individual resources, individuals will opt for another alternative. Rational choice models emphasise two core aspects relevant for

characteristics of the candidate pool: structure and status. Based on these core aspects, the length and level of initial teacher training and the occupational status of teaching are structural elements of the capacity of the teacher labour market. While the influence of the length and level is ambiguous, a high occupational status of teaching attracts a greater number of teacher training candidates and increases the candidate pool. Countries with a highly attractive teaching profession do not have teacher supply problems (Schwille & Dembele, 2007). However, with an increased candidate pool it is more likely that the variability in individual characteristics is increased as well. Furthermore, characteristics of the student population affect the number of available teaching positions, that is, the demand of teachers. For example, an increased number of students in the education system affects the student-teacher ratio, which in turn influences teacher demand. While this aspect has no direct influence on the candidate pool, it affects the control mechanisms at entry into initial teacher training.

Educational decisions and the selection process are characterised by an asymmetric distribution of information (Van der Velden & Wolbers, 2007). Imperfect information about candidates and prospective teachers is problematic for systems, because they rely on signals (Stiglitz, 1975). Lack of information increases the risk of admitting and progressing teacher education candidates and prospective teachers who are not successfully using the learning opportunities, or else show an insufficient development. Hence, structural elements influencing the comprehensiveness of information available to the teacher education system are admission and assessment procedures, which are based on respective criteria. These criteria determine which individual characteristics are required for entry into initial teacher training and for teaching. Students with required characteristics utilise learning opportunities successfully and are more likely to graduate. While the admission procedures are implemented in order to collect information about teacher education candidates, the assessment procedures are implemented in order to monitor prospective teachers with respect to their use of learning opportunities as part of their professional development. Moreover, the assessment procedures serve as feedback and possibility for the prospective teachers to reflect on their development and teaching practice. The comprehensiveness of information increases if the admission and assessment procedures exhibit certain characteristics. According to Baartman, Bastiaens, Kirschner and van der Vleuten (2006) the characteristics of such assessment procedures within a competence-based approach to teacher education comprise fitness for purpose, comparability and reproducibility of results, acceptability and transparency. Moreover, the fairness, cognitive complexity, meaningfulness, and authenticity of the procedures are relevant, besides their costs and efficiency and their consequences (admission and progression decisions). Especially admission procedures are closely linked to the demand of teachers. The literature frequently discusses solutions to teacher shortages in form of reduced entry requirements for initial teacher training (Blömeke, 2006). The sequence, rigor, and the aforementioned quality-characteristics of procedures and their criteria increase the comprehensiveness of information about candidates and prospective teachers. This is especially important when the candidate pool is large.

Socialisation mechanisms serve as means to help prospective teachers to take on new roles and simultaneously stress the social aspects of the learning processes. These structural elements reduce the uncertainty of students about expectations and requirements about teaching when entering teacher education. Furthermore, the respective structural elements situate the learning of prospective teachers in a social environment, where they are guided and supported in their professional development (Korthagen, 2010). One structural element is internal support. It gives access to structured forms of support, either with guidance by experienced teachers or sequenced in clearly defined courses. The other is field experience. It describes opportunities for field experiences prior to entering the teaching profession, and directly influences the transfer of professional role expectations and norms. The level of integration of the selection function is high when a prospective teacher receives frequent internal support, as well as several possibilities to make relevant field experiences. The structural elements of the selection function and their assignment to their respective dimensions are summarised in Table 1.

3.2.3 General characteristics of the allocation function

The selection function governs the transition of trained teachers from initial teacher training into the teaching profession. Thus, it is related to the allocation of teachers to schools. By means of the

aforementioned control and socialisation elements, the allocation functions provides information (1) for schools about the characteristics of trained teachers, and (2) for trained teachers about characteristics of teaching positions in schools. The socialisation mechanisms initiate the transfer of school specific role expectations and norms. They serve as information for schools about how well a trained teacher is able to integrate into the specific school context. This is a relevant feedback for schools in order to make recruitment decisions. These decisions result in teacher-school matches (Lankford & Wyckoff, 2010). Similarly, the information is at first only a rough estimate of the characteristics of teachers, but becomes more detailed by an increasing amount of time between the first assignment and the definite recruitment decision (Liu & Johnson, 2006).

Due to varying success regarding the use of learning opportunities variability in teacher competences is likely. For example, despite having obtained the same degree, trained teachers still can vary in their acquired cognitive, motivational, volitional, and social skills (Van der Velden & Wolbers, 2007). Thus, it is difficult for schools to distinguish between teachers who are suited for a given teaching position, and those who are not. Hence, the structural elements constituting, and in turn influencing the success of the allocation function, can be assigned to and described with three dimensions. The first dimension is control over the recruitment process. This dimension includes the level of control, as well as the actual utilisation of the level of control with adequate recruitment procedures. A more direct control over recruitment, combined with various recruitment measures may facilitate staffing (Liu & Johnson, 2006). The control over the recruitment process is directly connected with the second dimension, namely the comprehensiveness of information which is available to schools and teachers about each other. With an increased comprehensiveness of information it is possible to make more informed recruitment decisions. Third, the level of integration of teachers into schools influences the smoothness of the transition into the specific teaching position.

3.2.4 Structural elements of the allocation function

The starting point are structural elements constituting the comprehensiveness of available information about teachers and their characteristics. Similarly to the selection function, the allocation process is characterised by an asymmetric distribution of information (Van der Velden & Wolbers, 2007). Signals for teachers' characteristics and structural factors of the recruitment process attenuate the lack of information (Stiglitz, 1975). Lack of information about teacher characteristics increases the risk of recruiting the "wrong" teacher and increases the risk of teacher turnover. Signals are provided by certification requirements which trained teachers have to fulfil. However, certification requirements and respective teacher test scores are only weak signals of teachers' knowledge and skills (Goldhaber, 2007). Thus, another structural element for information about beginning teachers is probationary periods. With probationary periods, where teachers are monitored regarding their performance, the definite recruitment decision can be delayed, and more information about a teacher can be collected (Staiger & Rockoff, 2010). However, it is important to note that not only the length of the probationary period is relevant, but also its implementation. Probationary periods may be successful only if they provide trained teachers with a well-established and supportive environment (OECD, 2011). Examples of respective aspects are, for example, faculty collaborative periods, meeting with supervisors, classroom assistance, or a reduced workload (Ingersoll & Strong, 2011), within which teachers are enabled to reflect on their practice. Probationary periods may be combined with induction measures. In sum, the comprehensiveness of information is high if the allocation function includes certification requirements combined with elaborate probationary periods for teachers.

However, the influence of the level of information on the allocation process depends on the control over the recruitment process. As mentioned before, control over the recruitment process comprises the level of and utilisation of this control. The level of control is indicated by the degree of school autonomy regarding recruitment decisions. A direct control over recruitment decisions might facilitate the staffing of schools (Liu & Johnson, 2006). It may be hindered when there are central authorities or union regulations governing the recruitment process. Such regulations may not adequately consider school specific needs regarding personnel and can be understood as constraints interfering with school based recruitment. Thus, the level of control over recruitment decisions can be distinguished between school based or local recruitment, a recruitment controlled by regional or central authorities, or a recruitment which is coordinated

between local and central authorities. However, the level of control alone is not sufficient to characterise control over the recruitment process. Several studies have found that although schools have a high degree of autonomy in staffing decisions, they only utilise a small set of recruitment procedures during recruiting teachers (Balter & Duncombe, 2008; Staiger & Rockoff, 2010). Respective recruitment procedures might include for example interviews and supervised sample lessons. In sum, control over the recruitment process is adequate only if a school-based recruitment is complemented by a variety of recruitment procedures. At the same time, such control has a positive influence on the comprehensiveness of information about trained teachers (Liu & Johnsons, 2006).

Table 1

The functions, their dimensions, and their respective structural elements

Function	Dimension	Structural Elements
Context	Capacity of the Teacher Labour Market	Length of Teacher Education
		Level of Teacher Education
		Occupational Status of Teaching
		Student Population
Selection	Comprehensiveness of Information about Candidates & Prospective Teachers	Admission Procedures
		Assessment Procedures
		Admission Criteria
		Assessment Criteria
	Level of Integration of Prospective Teachers	Internal Support
		Field Experiences
Allocation	Control over the Recruitment Process	School Autonomy
		Union Regulations
		Recruitment Procedures
	Comprehensiveness of Information about Trained Teachers	Certification
		Probationary Periods
	Level of Integration of Teachers into Schools	Teacher Mentoring
		Teacher Induction

Socialisation mechanisms serve as means to help teachers to take on school-specific roles and norms. First, the beginning teacher learns the requirements of a role or teaching position (functional aspect); second, he integrates into the social structure of the school (inclusion aspect). Over time they get accustomed to the specific organisational characteristics and can adapt to them. Similarly to the selection function, these structural elements reduce the uncertainty of teachers about expectations and requirements when they start teaching in a given school. Moreover, they offer possibilities for teachers to reflect on their practice in order to improve their teaching. As such the socialisation mechanisms are means to foster teacher professional development after initial teacher training (Ingersoll & Strong, 2011). Structural elements related to the level of integration are teacher induction and teacher mentoring. They are means to make the teachers acquainted to the specific characteristics of a given school. It includes a formalised system to support teachers. Teacher mentoring is personal guidance provided by a senior teacher at a school. It varies from single meetings to formalised programmes involving frequent communications between teacher and mentor. Teacher induction and mentoring also influences teacher retention, thus decreasing teacher shortages and turnover (Wang, Odell, & Schwille, 2010). Schools are more frequently required to provide teachers with school-specific learning opportunities (Ingersoll & Strong, 2011). The level of integration varies according the comprehensiveness of induction and mentoring measures. The structural elements of the allocation function and their assignment to their respective dimensions are summarised in Table 1.

4. A change in notion – A different view of teacher education effectiveness

We already mentioned that the change in perspective on teacher quality and teacher education requires a different notion of teacher education effectiveness. Morge et al. (2010) distinguish three levels of validation of teacher education, depending on the specific outcome variable which is evaluated. The first level comprises teacher thinking and teacher knowledge as primary outcome. The effectiveness of teacher education is assessed by the level of cognitive and non-cognitive characteristics of teachers, that is, their knowledge and motivational, volitional, and social skills which they acquired during initial teacher training. However, at this first level the link between these characteristics and the instructional practice of teachers is not included (Morge et al., 2010). The second level includes this link, i.e. the effectiveness of teacher education is assessed with respect to the behaviour of the teachers. While the first level only allowed to ask what teachers know, the second level extends this question to what they are able to do in the school and in the classroom. The third level further extends the concept of teacher education effectiveness. Here, teacher education effectiveness is a question of what teacher is able to do in schools and in the classroom, and how this affects student achievement.

Current notions of teacher education effectiveness involve primarily the third level of validation. However, with the narrow teacher education conceptualisations which directly relate distal variables to student achievement, we cannot expect to gain reliable estimates of the effect of teacher education on student achievement (Konold et al., 2008). Furthermore, we cannot investigate if teachers who participated in initial teacher training behave in ways which positively affect student learning (Morge et al., 2010; Konold et al., 2008). The organisational model of teacher education as an open system, however, may be a way to investigate this question. In this regard, a change in notion of teacher education effectiveness, that is, a focus on the second level of validation, might be a necessary step. In the following we illustrate this change in notion and focus.

The starting point is teacher competence as outcome of teacher education. Thus, we focus on the first level of teacher education validation. Teacher competence depends on the utilisation of learning opportunities by prospective teachers. As already mentioned, the learning process situated in a gradually growing participation in teaching practice requires specific individual characteristics (Tillema, 1994). Teacher education is effective if it provides learning opportunities, based on specific curricula, which provide prospective teachers with the possibility to develop competences necessary for effective teaching. Given that the characteristics of prospective teachers depend on the effectiveness of the selection function in sorting them, the notion of teacher education effectiveness is extended: a teacher education system is only effective if (1) it provides prospective teachers with information about their development, with which they can reflect on their practice, and additionally if (2) the system screens out prospective teachers who are likely to fail. Besides this individual outcome of teacher education, we also have an organisational outcome. A successful utilisation of learning opportunities by students implies higher success rates (Gansemer-Topf & Schuh, 2006). Hence, a comprehensive notion of teacher education effectiveness includes selection effects on the use of learning opportunities and, thus, the professional development of prospective teachers, and an organisational aspect in terms of success rates. Moreover, the competences of prospective teachers are related to their teaching practice. In other words, teacher quality may only become visible through the associated teaching quality (Mulder, Messmann, & Gruber, 2009). This means that in order to assess teaching quality it is necessary to consider the competences of the (prospective) teachers, and vice versa. Classroom observations during initial teacher training, along with guided support by experienced teachers and room for reflection on their teaching practice, may facilitate an assessment of prospective teachers' readiness to teach and teaching quality, given the consensus on effective teaching practices (Akiba, LeTendre, & Scribner, 2007). However, classroom observations require the teachers' reflections on their teaching, that is, explications of the reasons why they did what they did. This may be a way to unravel the connection between teacher and teaching quality, and thus a possible clarification of the mechanisms with which teachers translate their competence into effective teaching.

Including what a teacher is able to do in a real classroom in a school, and how this affects student achievement in the concept of teacher education effectiveness is difficult. Each school, even each classroom, is a unique social system (Johnson & Kardos, 2008). Hence, specific contextual characteristics of schools,

for example their facilities and equipment, or the leadership style of the principal, may influence how well teachers are able to translate their knowledge into effective teaching. Moreover, where teachers bring their characteristics into schools and in the classroom depends on the specific characteristics of the allocation function. Each teacher effect on student achievement involves a complex interplay between recruitment decisions, school and classroom characteristics, and the behaviour of the teacher in the schools and in the classroom. Given that it is still unclear how teachers translate their knowledge into effective teaching (Baumert et al., 2010; Croninger, Rice, Rathbun, & Nishio, 2007), it is questionable if an effect of teacher education on student achievement can be identified. As a consequence, the assessment of teacher education effectiveness remains a question of the development of competences necessary for effective teaching, and thus remains on the second level of validation.

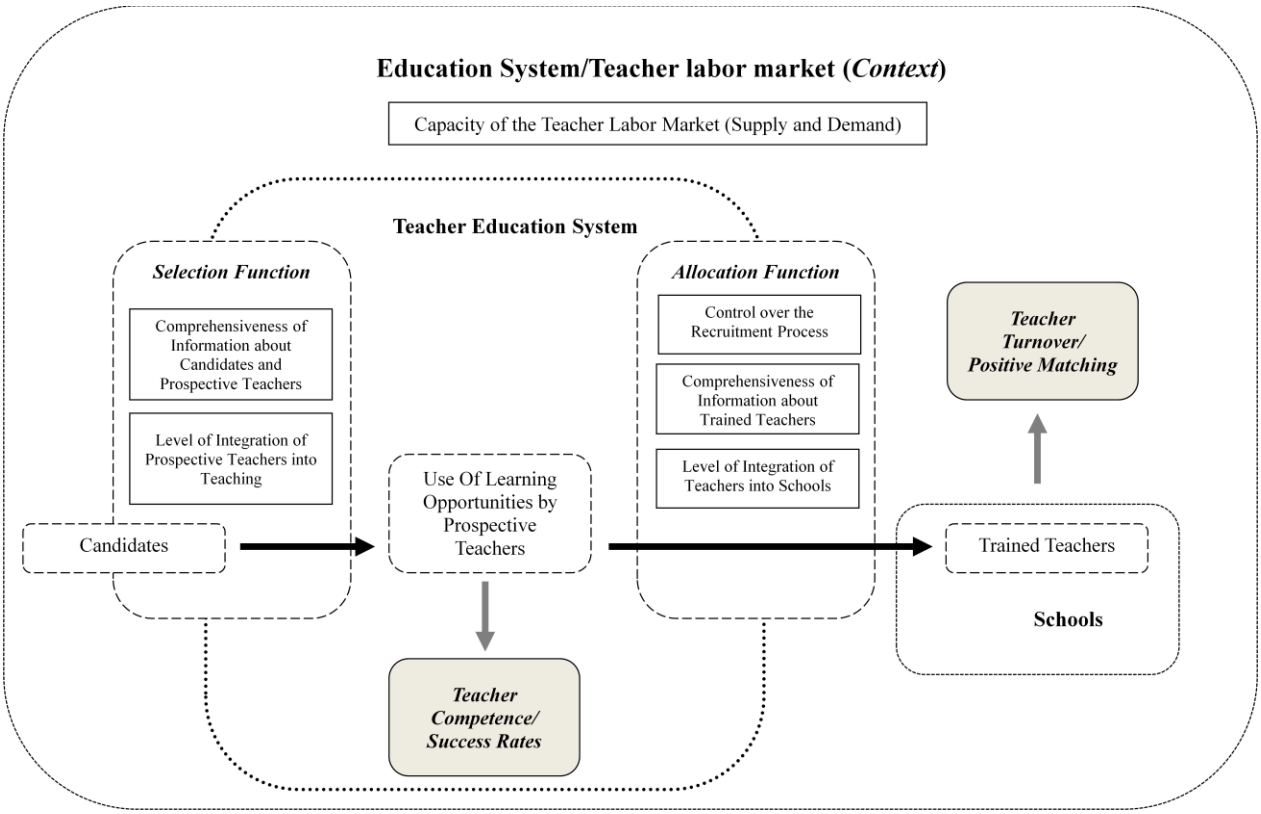

Figure 1. The organisational model of teacher education as an open system. Rectangles depict the dimensions of the selection and allocation function, as well as contextual conditions in the education system/teacher labour market. Black arrows illustrate the transition of an individual through teacher education into schools, from teacher education candidate over prospective teacher to a trained teacher in a school. Gray arrows and boxes show the consequence of the use of learning opportunities by prospective teachers on their competence and success rates, and the consequences of specific teacher distributions (teacher turnover and positive matching).

From an organisational point of view it is nevertheless possible to relate the allocation function to specific manifestations of teacher distributions, such as the positive matching between teachers and schools. It is a peculiarity of the allocation in the context of education systems that a successful allocation is not only a question of balancing supply and demand, but to a greater degree a question of students' equal access to highly qualified teachers. Hence we have an organisational indicator for the effectiveness of the allocation function: the degree to which its structural arrangement of elements attenuates positive matching of teachers to schools.

In sum, based on the changes in the teacher quality concept and the organisational perspective on teacher education as an open system, the notion of teacher education effectiveness receives a narrower, but more meaningful and distinct focus. The inclusion of organisational indicators for the effectiveness of the selection and allocation functions allow for an investigation of teacher education effectiveness on a different level. An interesting aspect in this regard is the relation between higher success rates of the teacher education system and the impact of the allocation function on positive matching, because higher success rates imply a higher number of teachers available for allocation. Hence, the organisational model allows investigating the relation between the functions as well. The complete organisational model is visualised in Figure 1.

5. Discussion – The model's value in research on teacher education

In this paper we addressed four shortcomings of current research on the relation between teacher education and student achievement, namely the conceptual, the complexity, the inherent selection, and the non-random allocation problem (Konold et al., 2008; Harris & Sass, 2011). The aim was to develop an organisational model of teacher education which provides researchers with a new, alternative perspective on teacher education practice. This perspective enables researchers to investigate the relation between teacher education and its context (for example the teacher labour market and the education system), the interaction of different systemic levels, as well as the interdependencies of individual and organisational development.

The development was based on three specific premises. First, an alteration of the input variables of the teacher quality concept. This involved a clear distinction between teacher education as an antecedent of teacher characteristics, that is, teacher education directly influences teacher competences relevant for teaching. Second, a change in perspective away from teacher education as an individual teacher characteristic to a model of teacher education as an open system. Within this model, we outlined the role of the selection function for prospective teachers' professional development, and the role of the allocation function for different manifestations of the non-random allocation of teachers to schools, for example positive matching. Third, as a consequence of the change in perspective, we illustrated an associated change in the notion of teacher education effectiveness. This concept was refocused on the development of competences of prospective teachers, and extended with two organizational indicators of effectiveness. This narrower focus is necessary because of the complex interplay between school and classroom characteristics and what teachers are able to do in the school and in the classroom, which may hinder the identification of a definite teacher education effect on student achievement.

The relative underspecification of the learning opportunities in the model is intentional. In contrast to the elements of the selection and allocation functions, it is difficult to identify generic elements of learning opportunities which are comparable across institutional or national settings. Although there is some convergence in the design of learning opportunities, there is still a great variety in elements of learning opportunities (Paine & Zeichner, 2012). Moreover, research shows that some of the more generic characteristics such as the length and structure of teacher education are unrelated to teacher education effectiveness (Zeichner, 2006). However, in order to make the model useful for, for example, cross-country comparisons it is necessary to keep the model as generic as possible. The underspecification of the learning opportunities provided by a teacher education system might be interpreted as an opportunity for researchers to take into account country-specific characteristics of the learning opportunities in their own studies. Hence, researchers are able to fill this gap in the model with characteristics of learning opportunities in their respective samples.

The model as a whole imposes high requirements on the collection, amount, and quality of data. This limitation applies to all aspects mentioned in this section. Although recent international comparative studies such as TEDS-M and TALIS provide new databases, available data might not be sufficient to test the model as a whole. Thus, it might be more reasonable to concentrate on specific aspects of the model, such as the relation between selection and student characteristics, the relation between allocation and positive matching, or the relation between student teachers and their use of learning opportunities. Nevertheless, the model

outlined in this paper might serve as a foundation for more elaborate and comprehensive data collection in future studies on teacher education systems.

We hope that the organisational model of teacher education will provide a theoretical basis which initiates new research leading to new insights and a better understanding of teacher education policy and practice, especially with regard to the identification of teacher characteristics relevant for teaching, the selection of teacher education candidates and prospective teachers, and the positive matching between teachers and schools. In the following sections we will discuss the usefulness of our model in the context of three possible areas of research.

5.1 Identification of teacher characteristics relevant for effective teaching

We already mentioned in the introduction that research on the relation between teacher education and student achievement is unsuccessful at identifying teacher characteristics relevant for effective teaching. Besides the inherent selection problem, that is, the unobserved characteristics which influence what a teacher did during his initial teacher training, this is further due to the distal conceptualisations of teacher education used in current studies. These conceptualisations, for example the certification status of teachers, are selected because of their relevance for policies concerning the teacher labour market (Goldhaber, 2007; Harris & Sass, 2011). However, these conceptualisations might gain meaning if the aforementioned unobserved characteristics are made observed, and their relations to effective teaching are established (this is in line with the focus on the second teacher education validation level described in section four). We argue that our model can provide a means in order to accomplish these tasks.

Our model explicitly states relations between characteristics of prospective teachers and their use of learning opportunities provided by the system. With teaching being an experience good, the identification of relevant characteristics requires accurate information about what prospective teachers are able to do in the classroom, that is, classroom observations of prospective teachers which are supported by guided reflection on teaching practice (Morge et al., 2010). These classroom observations and possibilities for reflection may be integrated in a more refined concept of the assessment procedures. The authenticity of the assessment procedures may be the core aspect with regard to the identification of relevant characteristics, because it is a more direct way of assessing how well prospective teachers are able to translate the contents of their initial teacher training into effective teaching behaviour (Darling-Hammond & Snyder, 2000). The performance scores derived from these observations, as well as information about the reflections of the teachers, may then be related to a set of characteristics prospective teachers possess.

The identification of relevant teacher characteristics further has positive consequences for the selection and sorting of prospective teachers during initial teacher training. The selection and sorting of teacher education candidates and prospective teachers are still based on rather gross measures, such as the grade point average or subject-specific grades in secondary education (Blömeke, 2009). With an increased authenticity of assessment in the context of the selection function, and with the associated more accurate information about prospective teachers, the identified characteristics can in turn be used as more refined and accurate admission and assessment criteria. Hence, our model not only allows addressing the inherent selection problem on individual, but also on organisational level. It has to be noted that the identification and use of the identified characteristics is an iterative process and requires a significant amount of time, that is, longitudinal models. However, our model is flexible enough to allow for such extensions. The identified characteristics of prospective teachers may be of limited use for the identification of what a teacher is able to do in a school and in a real classroom, given school-specific contexts influencing their practice.

5.2 Research on teacher distributions and the teacher body

Given the explicit modelling of the allocation function, which is integrated into our model of teacher education as an open system, researchers are enabled to investigate consequences of different approaches to allocating teachers to schools. For example, it may be investigated how certification requirements affect the pool of teachers who choose to teach. There are already studies concerning this problem (for example

Angrist & Guryan, 2008). However, they investigate this feature of the allocation function isolated from other relevant features, and isolated from the teacher labour market context. An isolated investigation of these features may not suffice for explanations of different teacher distributions. For example, Boyd et al. (2012) conclude that, while some teacher education programmes produce teachers with higher student achievement gains than others, these effects are eliminated when their attrition rate is taken into account. Another example are the results a simulation study conducted by Rothstein (2012). It showed that changing the quality of the teaching force through selection is only successful if at the same time teacher evaluation systems and increased teacher salaries are introduced. This illustrates the need for possibilities for an integrated rather than isolated investigation of selection and allocation effects, which our model provides.

Moreover, schools depend on the amount of available information about teachers in order to make informed recruitment decisions. These decisions seem to rely on only weak and noisy signals (Goldhaber, 2007). Thus, it is frequently argued that for an acquisition of reliable specific information, an assessment of teachers based on actual classroom performance is necessary (Goldhaber & Liddle, 2011). Staiger and Rockoff (2010) suggest that tenure should be delayed until a sufficient amount of information is collected. As long as indicators of teacher education do not adequately capture what teachers do during their initial teacher training (cf. the respective description in section 5.1), mismatches between teachers and schools are to be expected which lead to teacher turnover. In light of the change in the notion of teacher education effectiveness, a stronger reliance on actual classroom performance of teachers in the context of recruitment seems reasonable. Our model allows for an investigation of the influence of different approaches to recruiting teachers and their relation to teacher turnover, taking into account contextual conditions of the teacher labour market. It has to be noted that the model in his current state captures only the structural prerequisites of recruitment decisions. However, our model can be easily extended to include the individual recruitment (or transfer) decisions of teachers and principals within the context of a given configuration of an allocation function. The relations and research questions outlined in the previous sections may also be investigated by cross-country comparisons of teacher education systems, for example a comparison of credential-based and information-based allocation functions (Van de Werfhorst, 2011).

Comparisons of different approaches to allocating teachers to schools need to consider not only quantitative, but also qualitative aspects of, for example, recruitment procedures or probationary periods. These qualitative aspects not only include the variety of the different procedures, but also the actual utilisation of these procedures by principals, school boards, or other entities responsible for staffing decisions. Thus, when collecting data, researchers may not only rely on institutional data provided by administrative datasets or official documents, because this might only cover the ‘espoused allocation’. In order to gain a complete picture of the qualitative aspects, it might be necessary to actually ask principals or school boards about the actual utilisation of the procedures in order to capture the ‘allocation in use’ (a similar distinction can be found in Cannata, 2010). Covering only one of these two procedures may lead to biased estimates of the relation between allocation approaches and teacher distributions.

5.3 Cross-country and cross-institutional comparisons of teacher education systems

It is important to consider that teacher education practice, as well as learning of prospective teachers during initial teacher training, depend on country-specific characteristics of teacher education systems and contextual conditions present in education systems and teacher labour markets (Paine & Zeichner, 2012). Depending on the point of view, our model enables researchers to investigate not only cross-country, but also cross-institutional differences in teacher education practice. Cross-country, as well as cross-institutional analyses involve three overarching steps: (1) the choice and inclusion of contextual information in the model; (2) modeling the interrelation between functions, dimensions, or structural elements; (3) and modeling the interrelation between prospective teachers and the system.

In its current form, the focus is on the general education system, or teacher labour market, as the immediate context of teacher education. It has to be kept in mind that this is not the only context teacher education is embedded in. Depending on the researcher’s point of view, the institutional, political, or societal context might be considered the immediate context of teacher education (Grossman & McDonald, 2008).

The choice of contextual information relates to the decision of the researcher to compare different teacher education programmes (for example, university-based versus school-based teacher education; concurrent versus consecutive), or to compare teacher education systems in different countries. When comparing teacher education programmes, the primary context is the institutional context. Thus, respective information relates to Higher Education, for example the degree of integration of the teacher education programme into universities. When comparing teacher education systems, the primary context is the education system or teacher labour market. Respective information relates, according to our model, to the supply and demand of teachers in the education system.

It is possible to include contextual characteristics as background information, or else, information about group membership in a multigroup model. For example, comparing teacher education programmes in this multigroup framework allows investigating the differential effect of teacher education variables across different educational levels (Huang & Moon, 2009). For example, the importance of obtaining a degree for student achievement seems to differ across elementary, middle, and high school levels (Phillips, 2010). The differential relevance is explained by the generalist/specialist distinction between elementary, middle, and high school teacher education; the importance of subject-specific degrees increases with education level, where teachers are more often trained to be specialists. Hence, there seem to be differential effects of different teacher education programmes on teacher characteristics. Other possibilities to include contextual information are cross-classification approaches or multilevel models, depending on the quality and detail of available data.

The interrelation of the functions, the dimensions of the functions, and even the structural elements constituting the functions might complicate cross-country or institutional comparisons of teacher education systems. With these interrelations it becomes difficult to pinpoint the influencing factors of competence (development) of the prospective teachers, as well as of positive matching, or more general teacher-school matches. However, it can be argued that it is especially this interrelation which renders the possibility of a single influencing factor of teacher education effectiveness improbable. Consequently, our model allows the investigation of the influence of configurations of functions, dimensions, and structural elements on the different aspects of teacher education effectiveness. This might be a more appropriate approach to research on teacher education, especially in light of the complex nature of teacher education systems.

These interrelations can be accounted for depending on the availability of data and on the focus on either outcomes or processes. With our characterisation of the selection and allocation functions, it is possible to construct empirical typologies of their structural arrangements. In this case, the structural elements are then treated as indicators of their respective dimensions. For example, the assessment procedures and their criteria are indicators of the comprehensiveness of information available about prospective teachers. In a similar manner, school autonomy, recruitment procedures, and union regulations are indicators of control over the recruitment process. Based on the structural elements composite measures can be constructed for each dimension. In a further step these composite measures can be used in latent class or cluster analyses in order to identify different approaches to selecting teacher education candidates and prospective teachers, as well as different approaches to allocating teachers. These different profiles can be investigated with regard to their associated organisational outcomes, that is, to success rates of the teacher education system or to different distributions of teachers in the education system. Similar approaches have been taken in the context of institutional dimensions of education systems and the relation between education and labour market outcomes (Hofman, Hofman, & Gray, 2008; Bol & Van de Werfhorst, 2011).

Another possibility for cross-country comparisons in a multigroup framework is focusing on processes rather than outcomes, that is, focusing on the interplay between use of learning opportunities and development of competence rather than on comparisons of mean competence levels. Such questions are suited best for a multiple group structural equation modelling approach. The different configurations of both functions can be used as background variables to select countries with similar or different levels of information, integration, or labour market capacities. Next, these countries can be compared in differences in the relation between characteristics of prospective teachers, their use of learning opportunities, and the development competences. Depending on the comprehensiveness of this learning model, differences in the relations are attributed to differences in the configuration of the functions.

Interrelations may further be specified as interaction effects or cross-classifications of the structural elements in multilevel models. This might be suited if the researcher wants not only to compare different teacher education systems or programmes, but also to identify the influencing factors on for example competence development of prospective teachers. The aforementioned multigroup model can be extended to a multigroup multilevel model. On the organisational level we have the specific structure and characteristics of the learning environment, cross-classified with characteristics of the selection function and contextual conditions in the education system. The individual level comprises, for example, characteristics of prospective teachers and information about their use of the learning opportunities. The different programmes or systems can easily be integrated into the multigroup approach by specifying the multilevel model for each educational level (for example elementary, middle, or high school level). The aforementioned relationships can then be compared across programmes or systems. Any difference in coefficients across the groups informs us about the differential effect of teacher education on competence development across teacher education programmes or systems. With this approach, is it not necessary to keep contextual information constant, because it is directly included in the model. Moreover, modern structural equation modeling programmes allow the specification of cross-level interactions. With these interaction it is not only possible to investigate top-down (from the system to the prospective teacher), but also bottom-up processes (from the prospective teacher to the system), or else, to investigate the relation between individual and organisational development more closely.

6. Conclusion

To sum up, it can be stated that the organisational perspective on teacher education as an open system can contribute to existing research by raising awareness with regard to the interrelations of the different parts of a teacher education system, and the interplay between system and individual prospective teachers. With its focus on the selection and sorting of teacher education candidates and prospective teachers, and on the allocation of teachers to schools in the education system, it offers a framework which facilitates a better understanding of these processes and their relation with teacher education effectiveness. Additionally it is flexible enough to allow for further developments and extensions, for example the continuing professional development of teachers once they are in the teaching profession, and offers a framework in which researchers are able to integrate own studies and projects. In the end, the model may lead to substantive new insights which facilitate informed and effective policies in order to make teacher education practice more effective, both for prospective teachers and for the system itself.

Keypoints

- An organisational model of teacher education is developed.
- The model illustrates the dependencies of teacher education and its context.
- The model illustrates the interplay of individual and organisational development.
- The model includes characterisations of the selection and allocation functions.
- The model offers various opportunities for further research on teacher education.

References

Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher, 36(7)*, 369-387. doi:10.3102/0013189X07308739

Angrist, J., & Guryan, J. (2008). Does teacher testing raise teacher quality? Evidence from state certification requirements. *Economics of Education Review, 27,* 483-503. doi:10.1016/j.econedurev.2007.03.002

Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., ... Tsai, Y.-M. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal, 47,* 133–180. doi:10.3102/0002831209345157

Bess, J. L. & Dee, J. R. (2008). *Understanding college and university organization: Theories for effective policy and practice; Volume I: The state of the system*. Sterling, VA: Stylus Publishing.

Blömeke, S. (2006). Struktur der Lehrerausbildung im internationalen Vergleich. Ergebnisse einer Untersuchung zu acht Ländern. *Zeitschrift für Pädagogik, 52,* 393-416. http://nbn-resolving.de/urn:nbn:de:0111-opus-44668

Blömeke, S. (2009). Predicting educational and occupational success in teacher training and subject-specific degrees – on the predictive validity of cognitive and psycho-motivational selection criteria. *Zeitschrift für Erziehungswissenschaft, 12,* 82-110. doi:10.1007/s11618-008-0044-0

Bol, T., & Van de Werfhorst, H. (2011). Signals and closure by degrees: the education effect across 15 European countries. *Research in Social Stratification and Mobility, 29,* 119-132. doi:10.1016/j.rssm.2010.12.002

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis, 31,* 416-440. doi:10.3102/0162373709353129

Boyd, D., Grossman, P., Hammerness, K., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2012). Recruiting effective math teachers: evidence from New York City. *American Educational Research Journal,* doi:10.3102/0002831211434579

Cannata, M. (2010). Understanding the teacher job search process: espoused preferences and preferences in use. *Teachers College Record, 112,* 2889-2934. http://www.tcrecord.org ID Number: 16011, Date Accessed: 1/23/2014 4:13:37 PM

Connor, C. M., Son, S. H., Hindman, A. H., & Morrison, F. J. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: complex effects on first graders' vocabulary and early reading outcomes. *Journal of School Psychology, 43,* 343-375. doi:10.1016/j.jsp.2005.06.001

Croninger, R. G., Rice, J. K., Rahbun, A., & Nishio, M. (2007). Teacher qualifications and early learning: effects of certification, degree, and experience on first-grade student achievement. *Economics of Education Review, 26,* 312-324. doi:10.1016/j.econedurev.2005.05.008

Darling-Hammond, L., & Snyder, J. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education, 16,* 523-545. doi:10.1016/S0742-051X(00)00015-9

Denzler, S., & Wolter, S. (2009). Sorting into teacher education: how the institutional setting matters. *Cambridge Journal of Education, 39,* 423-441. doi:10.1080/03057640903352440

Ehrenberg, R. G., & Smith, R. S. (2011). *Modern labor economics* (11th Edition). Amsterdam: Prentice Hall.

Gansemer-Topf, A., & Schuh, J. (2006). Institutional selectivity and institutional expenditures. *Research in Higher Education, 47,* 613-142. doi:10.1007/s11162-006-9009-4

Goe, L., & Strickler, L. (2008). *Teacher quality and student achievement: Making the most of recent research*. Washington, DC: National Comprehensive Center for Teacher Quality. (ERIC Document Reproduction Service No. ED520769)

Goldhaber, D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human Resources, 42,* 765-794. doi:10.3368/jhr.XLII.4.765

Goldhaber, D., & Liddle, S. (2011*). The gateway to the profession: Assessing teacher preparation programs based on student achievement*. Seattle: CEDR.

Grodsky, E., & Jackson, E. (2009). Social stratification in higher education. *Teachers College Record, 111*, 2347-2384. http://www.tcrecord.org ID Number: 15713, Date Accessed: 9/16/2013 3:53:50 PM

Grossman, P., & McDonald, M (2008). Back to the future: directions for research in teaching and teacher education. *American Educational Research Journal, 45*, 184-205. doi:10.3102/0002831207312906

Harris, D. N. & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics, 95*, 798-812. doi:10.1016/j.jpubeco.2010.11.009

Hofman, R. H., Hofman, W. H. A., & Gray, J. M. (2008). Comparing key dimensions of schooling: towards a typology of European school systems. *Comparative Education, 44*, 93-110. doi:10.1080/03050060701809508

Hopkins, D. (2008). *A teacher's guide to classroom research*. Maidenhead: McGraw-Hill.

Huang, F. L., & Moon, T. R. (2009). Is experience the best teacher? A multilevel analysis of teacher characteristics and student achievement in low performing schools. *Educational Assessment Evaluation and Accountability, 21*, 209-234. doi:10.1007/s11092-009-9074-2

Ingersoll, R.M., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: a critical review of the research. *Review of Educational Research, 81*, 201-233. doi:10.3102/0034654311403323

Jackson, C. K. (2010). *Match quality, worker productivity, and worker mobility: Direct evidence from teachers*. NBER Working Paper 15990.

Johnson, S. M., & Kardos, S. M. (2008). The next generation of teachers: Who enters, who stays, and why. In M. Cochran-Smith, S. Feiman-Nemser & D.J. McIntyre (eds.), *Handbook of research on teacher education* (pp. 445-467). New York: Routledge.

Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of Political Economy, 87*, 972-990. http://www.jstor.org/stable/1833078

Kast, F. E., & Rosenzweig, J. E. (1972). General systems theory: Applications for organization and management. *The Academy of Management Journal, 15*, 447-465. http://www.jstor.org/stable/255141

Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations*. New York: Wiley.

Kennedy, M. (1998). *Learning to teach writing: Does teacher education make a difference?* New York: Teachers College Press.

Konold, T., Jablonski, B., Nottingham, A., Kessler, L., Byrd, S., Imig, S., … McNergney, R. (2008). Adding value to public schools – Investigating teacher education, teaching, and pupil learning. *Journal of Teacher Education, 59*, 300-312. doi:10.1177/0022487108321378

Korthagen, F.J.A. (2010). Situated learning theory and the pedagogy of teacher education: towards an integrative view of teacher behavior and teacher learning. *Teaching and Teacher Education, 26*, 98-106. doi:10.1016/j.tate.2009.05.001

Lankford, H., & Wyckoff, J. (2010). Teacher labor markets: An overview. In D.J. Brewer & P.J. McEwan (eds.), *Economics of Education* (pp. 235-242). London: Elsevier.

Liu, E., & Johnson, S. (2006). New teachers' experiences of hiring: late, rushed, and information-poor. *Educational Administration Quarterly*, 42, 324-360. doi:10.1177/0013161X05282610

Loeb, S., Kalogrides, T., & Beteille, T. (2012). Effective schools: teacher hiring, assignment, development, and retention. *Education Finance and Policy, 7*, 269-304. doi:10.1162/EDFP_a_00068

Luschei, T., & Carnoy, M. (2010). Educational production and the distribution of teachers in Uruguay. *International Journal of Educational Development, 30*, 169-181. doi:10.1016/j.ijedudev.2009.08.004

Little, J., & Bartlett, L. (2010). The teacher workforce and problems of educational equity. *Review of Research in Education, 34*, 285-328. doi:10.3102/0091732X09356099

Maaz, K., Hausen, C., McElvany, N., & Baumert, J. (2006). Keyword: transitions in the educational system. *Zeitschrift für Erziehungswissenschaft, 9*, 299-327. doi:10.1007/s11618-006-0053-9

Marshall, J. H., & Sorto, A. M. (2012). The effects of teacher mathematics knowledge and pedagogy on student achievement in rural Guatemala. *International Review of Education, 58*, 173-197. doi:10.1007/s11159-012-9276-6

Martz, W. (2013). Evaluating organizational performance: rational, natural, and open system models. *American Journal of Evaluation, 34*, 385-401. doi:10.1177/1098214013479151

Morge, L., Toczek, M-C., & Chakroun, N. (2010). A training programme on managing science class interactions: its impact on teachers‘ practises and on their pupils achievement. *Teaching and Teacher Education, 26*, 415-426. doi:10.1016/j.tate.2009.05.008

Musset, P. (2010). *Initial teacher education and continuing training policies in a comparative perspective: Current practices in OECD countries and a literature review on potential effects*. OECD Working Papers No. 48. Paris: OECD Publishing.

OECD (2011). *Teachers matter: attracting, developing and retaining effective teachers. Pointers for policy development*. Paris: Directorate for Education, Education and Training Policy Division. http://www.oecd.org/edu/school/48627229.pdf

Paine, L., & Zeichner, K. (2012). The local and the global in reforming teaching and teacher education. *Comparative Education Review, 56*, 569-583. doi:10.1086/667769

Parsons, T. (1951). *The social system*. London: Routledge.

Phillips, K. J. R. (2010). What does ‘highly qualified’ mean for student achievement? Evaluating the relationships between teacher quality indicators and at-risk students’ mathematics and reading achievement gains in first grade. *Elementary School Journal, 110*, 464-493. http://www.jstor.org/stable/10.1086/651192

Rothstein, J. (2012). *Teacher quality policy when supply matters*. NBER Working Paper 18419.

Saks, A., Uggerslev, K., & Fassina, N. (2007). Socialization tactics and newcomer adjustment: a meta-analytic review and test of a model. *Journal of Vocational Behavior, 70*, 413-446. doi:10.1016/j.jvb.2006.12.004

Schacter, J., & Thum, Y. M. (2004). Paying for high and low-quality teaching. *Economics of Education Review, 23*, 411–430. doi:10.1016/j.econedurev.2003.08.002

Schneider, M., & Somers, M. (2006). Organizations as complex adaptive systems: implications of complexity theory for leadership research. *The Leadership Quarterly, 17*, 351-365. doi:10.1016/j.leaqua.2006.04.006

Schwille, J., & Dembele, M. (2007). *Global perspective on teacher learning: improving policy and practice*. Paris: UNESCO International Institute for Educational Planning.

Scott, W. R., & Davis, G. F. (2007). *Organizations and organizing. Rational, natural, and open system perspectives*. Upper Sadle River: Pearson.

Sicherman N., & Galor O., (1990). A theory of career mobility. *Journal of Political Economy, 98*, 169-192. http://www.jstor.org/stable/2937647

Staiger, D. O., & Rockoff, J. E. (2010). Searching for effective teachers with imperfect information. *Journal of Economic Perspectives*, 24, 97-118. doi:10.1257/jep.24.3.97

Stiglitz, J. E. (1975). The theory of screening, education and the distribution of income. *American Economic Review, 65*, 283-300. http://www.jstor.org/stable/1804834

Tillema, H. H. (1994). Training and professional expertise: bridging the gap between new information and pre-existing beliefs of teachers. *Teaching and Teacher Education, 10*, 601-615. doi:10.1016/0742-051X(94)90029-9

Van de Werfhorst, H. G. (2011). Skills, positional good or social closure? The role of education across structural-institutional labour market settings. *Journal of Education and Work, 24*, 521-548. doi:10.1080/13639080.2011.586994

Van de Werfhorst, H. G., & Mijs, J. J. B. (2010). Achievement inequality and the institutional structure of educational systems: a comparative perspective. *Annual Review of Sociology, 36*, 407-428. doi:10.1146/annurev.soc.012809.102538

Van der Velden, R., & Wolbers, M. H. J. (2007). How much does education matter and why? *European Sociological Review, 23*, 65-80. doi:10.1093/esr/jcl020

Wang, A., Coleman, A., Coley, R., & Phelps, R. (2003). *Preparing teachers around the world*. Princeton: Educational Testing Service.

Wang, J., Odell, S. J., & Schwille, S. A. (2008). Effects of teacher induction on beginning teachers‘ teaching. A critical review of the literature. *Journal of Teacher Education, 59*, 132-152. doi:10.1177/0022487107314002

Weinert, F. E. (2001). Concept of competence: a conceptual clarification. In D. S. Rychen, & L. H. Salganik (eds.), *Defining and selecting key competencies* (pp. 45-65). Seattle, WA: Hogrefe & Huber.

Winters, M. A., Dixon, B. L., & Greene, J. P. (2012). Observed characteristics and teacher quality: impacts of sample selection on a value added model. *Economics of Education Review, 31*, 19-32. doi:10.1016/j.econedurev.2011.07.014

Yeh, S.S. (2009). The cost-effectiveness of raising teacher quality. *Educational Research Review, 4,* 220-232. doi:10.1016/j.edurev.2008.06.002

Zeichner, K. (1983). Alternative paradigms of teacher education. *Journal of Teacher Education, 34*, 3-9. doi:10.1177/002248718303400302

Zeichner, K. (2005). A research agenda for teacher education. In M. Cochran Smith, & K. Zeichner (eds.), *Studying teacher education* (pp. 737-761). Mahwah: Lawrence Erlbaum.

Zeichner, K. (2006). Studying teacher education programs: enriching and enlarging the inquiry. In C.F. Conrad, & R.C. Serlin (eds.), *The Sage handbook for research in education* (pp. 79-95). Thousand Oaks: Sage.

Zeichner, K., & Conklin, H.G. (2008). Teacher education programs as sites for teacher preparation. In M. Cochran-Smith, S. Feiman-Nemser, D. McIntyre, & K. Demers (eds.), *Handbook of research on teacher education* (pp. 269-289). New York: Routledge.