

Determining Long Term Effects of Teacher Education

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Introduction

The existence of programs for preservice teacher education (TE) is not self-evident. The life and sustainability of such programs ultimately depend on the effects they have on teachers' in-service behavior. Effects of TE are defined here as durable consequences of the preservice acquisition of knowledge and skills and development of motives, as manifested in graduates' professional behavior. A stricter definition pertains to long-term effects of TE programs. Here, such effects are defined as durable consequences of participation in preservice programs which manifest themselves in professional behavior more than 1 year after the completion of preservice TE. It is the responsibility of educational research to demonstrate, describe, explain, and help optimize the relationship between preservice TE and the professional behavior which teachers exhibit and develop during their careers. The description and explanation of long-term effects of preservice programs lend greater credence to the utility of TE.

Relevance of TE Effect Research

Studying TE effects and especially long-term effects empirically is a relevant endeavor in several respects. Quantitative arguments in favor of TE effect studies deal with issues of recruitment, selection, and retention. Any country that wishes to sustain its educational system must know what contribution TE programs make to the availability and employability of its teacher workforce. Like no other component of a country's education system, TE possesses a multiplier function for the quality of schooling and learning throughout the system as a whole. TE programs deliver generations of teachers, who in turn educate generations of pupils and students, who on their part carry with them and transform the knowledge and skills acquired in school, college, or university during the rest of their lives and work. Indeed, the contributions that TE can make to the productivity of a country's educational system eminently justify research into the influence of TE programs on the teaching competence of their graduates.

Aim of TE Effect Research

The aim of TE effect research should be to explain the influence that specific features of preservice programs exert on teaching competence, especially in the longer run. If predictors of success in teaching can be found before

and during TE as well as during beginning teaching and the further career, this evidence could underpin guidelines and strategies for improving TE learning environments. Empirical evidence about long-term TE effects could not only help increase retention in the profession, but also lay a basis for developing teachers' professional practice and well-being during all stages of their careers. The relevance of long-term effect studies for policymaking in the domain of TE is clearly illustrated by the debate about what is an adequate or even the best architecture of TE programs, be they regular 4-year programs or alternative certification programs (e.g., Darling-Hammond and Youngs, 2002). Teacher shortages worldwide lend urgency to such questions. As yet, the empirical knowledge base for designing learning environments for teachers is growing, but seriously incomplete. There is a clear need for research which explains specifically how TE learning effects come about.

TE as a research field characterizes itself by an enormous complexity. Program effects are not exclusively influenced by program features, but these interact with the personal backgrounds of candidates and the varied contexts in which their schooling takes place. To explain the complex interplay between conditions, processes, and outcomes involved in teacher learning, an adequate research base is not yet available, the American Educational Research Association (AERA) Panel on Research and Teacher Education has concluded. However, improvements in research design are underway (Cochran-Smith and Zeichner, 2005, p. 704). This conclusion is even more applicable when long-term effects of TE are taken as criteria.

This article focuses on what we know about TE effects as well as how we know it. Coming to grips with the complexity of teacher learning is crucial to scientific progress in the field of TE. The empirical evidence about effects of TE programs are therefore referenced with special attention to the strengths and weaknesses of TE effect studies. On this basis, validity requirements for TE effect research are explicated and productive research strategies are presented. For this purpose, a number of pioneering and exemplary studies serve as illustrations.

Contested Ground. What We Know about TE Effects and How We Know Them

Empirical evidence about effects of TE programs has begun to emerge during the last decades of the twentieth century, both in Europe and in the English-speaking

world. Toward the end of the century, growing teacher shortages in the United States spurred survey research on a larger scale into the outcomes of alternative certification programs. These programs, developed initially in the US since the 1980s, were intended to attract new candidates to the teaching profession (Dill, 1996; Zeichner and Schulte, 2001) and often consisted of abbreviated or condensed versions of regular TE programs. The need to evaluate the adequacy of these programs has put effect research into TE programs, both alternative and regular programs, high on the agenda. However, long before that time, in fact since the formalization and institutionalization of TE programs began in the 1920s, qualitative research has been carried out representing the experiences of teacher educators in developing programs and of candidates while learning to teach.

The State of the Art

The state of the art in TE effect research becomes apparent from seminal studies and research reviews in this domain.

Seminal studies

Seminal research exploring how teachers become and develop as teachers was reported by Lortie in his well-known book *School Teacher*. In two case studies using survey questionnaires and retrospective interviews, Lortie vividly showed and persuasively argued how a web of social and psychological forces conditions the ways in which teachers are socialized by the existing school system (Lortie, 1975). Lortie's sociological angle reminds the reader of the risks of unreflective reproduction of craft traditions of teaching. In his wake, Lacey explored attitude change in aspiring teachers as they enter the school system and traced the various strategies of occupational socialization open to them. On the basis of five case studies, in which observations and questionnaires were used to follow prospective teachers as they moved from preservice TE through their first year of beginning teaching, Lacey (1977, 1995, p. 619) distinguishes among internalized adjustment, strategic compliance, and strategic redefinition as possible ways for beginning teachers to deal with existing traditions in schools.

Until the 1970s, large-scale empirical evidence about long-term TE effects was virtually nonexistent; in fact, even now, shortly after the turn of the century, it is scantily available. The project *Teacher Attitudes*, carried out at Konstanz University in the south of Germany, was the first in Europe to demonstrate by means of path analysis on national longitudinal survey data the influence of specific features of preservice programs on outcomes in graduates (Dann *et al.*, 1978, 1981). This project showed that program features encouraging the integration of theory and practice can delay and/or mitigate the occurrence of practice shock and the associated attitudinal adjustment to

existing teaching practices. Building on Kelman's (1974) work on types of attitude change, Dann *et al.* (1978, pp. 96–104) and Müller-Fohrbrodt *et al.* (1978) have identified as crucial in beginning teachers' socialization what they call discrepancy experiences; they experience a rift between idealistic notions developed during TE programs, on the one hand, and pressure from schools as institutions to rely on traditional patterns of behavior, on the other. These discrepancy experiences are strongest in situations where practical action is required (Dann *et al.*, 1981).

This phenomenon of conservative attitude shift was demonstrated repeatedly in the US by the Pupil Control Studies initiated by Hoy (Packard, 1988). It was also documented in early qualitative research by Corcoran (1981), who described entry into teaching in terms of transition shock.

Perhaps the most important contribution of the Konstanz research group is that program characteristics were shown to differ in how fast and in what respects they influenced the U-curve in prospective and beginning teachers' attitude development (Dann *et al.*, 1978, 1981). This evidence supports the conclusion that integrative approaches in TE, in which student teachers' practical experiences are closely linked to theoretical input, can strengthen graduates' innovative teaching competence (Dann *et al.*, 1978, 1981). Similar research and findings were reported from Hamburg by Hinsch (1979) and from the Netherlands by Brouwer and Korthagen (2005).

Research reviews

Both the European research referenced above and the comprehensive review undertaken by the AERA Panel on Research and Teacher Education in the US confirm that TE programs do influence graduates' learning outcomes. The AERA review contains indications that coursework can promote graduates' subject-matter knowledge and that methods courses combined with field work can have an impact on their professional behavior (Cochran-Smith and Zeichner, 2005). The beneficial influence of integrating theory and practice during teacher preparation on teachers' in-service performance was confirmed in the US by reviews and secondary analyses of partly cross-sectional, partly longitudinal survey data carried out by Darling-Hammond (1999, 2000). This synthetic work has yielded two important conclusions: (1) the amount and quality of teacher preparation are positively related to teachers' retention in the profession as well as their success in promoting student achievement and (2) teacher quality is the single most influential factor determining student achievement.

Taken together, these conclusions mean that preservice TE programs have a discernible and relevant influence on teaching and learning in schools, especially if they integrate practical and theoretical components. However, precisely how these effects come about and which specific

program features are responsible for which kinds of effects are questions which require further study of a sophisticated kind.

How to Research Long-Term Effects of Educating Teachers?

So far, much TE research lacks the qualities needed to refine and elaborate upon the available evidence. Wilson *et al.* (2002) reviewed 57 studies about the impact of TE programs published in peer-reviewed journals mostly during the 1990s. They concluded that this research was often small scale, allowed researcher bias, employed few direct measures, and often lacked in detail in reporting about methodology. Similar criticisms were voiced by Wideen *et al.* (1998) in their review of the research about learning to teach. In their judgment, the theoretical basis of such studies should be made more explicit. They also note a lack of longitudinal research and advocate a systemic and ecological approach in TE effect research. Considering this state of affairs, the AERA Panel on Research and Teacher Education calls for research taking into account the contexts of TE programs, participants' backgrounds and characteristics, and how these relate to the processes and outcomes of TE programs. Such research requires employing longitudinal designs more frequently and a theory-driven conceptualization of outcome measures, whose operationalization should go beyond indirect verbal data.

These reviews, with quite a some consensus, point in the same direction. The outcomes of TE programs probably never result from a limited number of social conditions and personal characteristics. They had better be conceived of as resulting from a complex interplay of factors which simultaneously create and constrain opportunities for learning. To understand how this complex interplay affects teacher learning, a type of relational knowledge is needed, as described by Apple (1979); in other words, a systems perspective which pays attention to the manifold relationships between the components of TE as a social system. If TE effect research is to answer its questions, it would benefit not only from stronger conceptualization generally, but also, especially from using ecological and developmental concepts to theorize about its research object.

Modeling the object of research

In order to explain how all the factors operating in TE programs work together to generate teacher learning, TE effect research should rest on more systematic theorizing. A suitable vehicle for achieving this is the decision-oriented evaluation model introduced by Stufflebeam and Webster (1988). This model distinguishes between different types of variables, designated as context, input, process, and

product (CIPP). When applied to preservice TE, context factors include the institutional and cultural constraints in schools, colleges, and universities within which TE programs are offered. Input factors include personal background characteristics of teacher candidates and the resources for training and guiding them on their way to beginning teaching. Process factors are the ways in which programs are implemented, including the degree to which and the ways in which practical exercise and theoretical study are adjusted to each other. These process factors are decisive mediators determining the nature of learning effects in graduates. These effects fall under the CIPP model component product. Models for TE effect research should take into account candidate, program, and context features and preferably include factors from each model component relevant for the study at hand. This kind of modeling encourages the researcher to examine the relationships and the balance of forces between influences emanating from TE programs and from school contexts in particular.

Ecological conceptions of the objects of social research go rather against the grain of mainstream educational psychology, but if the TE research community wants to develop a methodology that is congruent with theorizing about the complexity of teacher learning, it could consider a paradigm shift from a mechanistic toward an organicist worldview (cf. Baltes *et al.*, 1977). In developmental psychology, ecological conceptions have long been available, notably in the work of Bronfenbrenner (1979), who situates the individual as one of the driving forces in a nested structure of systems, that is, the micro-system, in which he or she directly participates, the mesosystem, which constitutes the institutional constraints within which human activity unfolds, and the macrosystem on national and world levels determining the material and cultural conditions of human development. Researching the individual as an entity developing in its social context, warns Bronfenbrenner, is seeking to understand his or her exosystem, that is, how the relationships between the three subsystems distinguished mediate personal development.

Methodology of exemplary studies

What we know about TE effects is determined to an important extent by how we know them. Empirical studies are inevitably shaped by the way in which researchers relate their theoretical perspectives to their choice and use of methods. It is from this angle that we now examine an illustrative selection of exemplary TE effect studies in order to try and cull from the researchers' experience suggestions for conducting ecological inquiry into the influence of TE programs on the teacher workforce and its professional competence. The studies presented below are all examples of longitudinal research.

Phenomenographic studies

Since the 1970s, especially, there has been a host of exploratory, phenomenographic case studies into prospective and beginning teachers' experiences in becoming a teacher (see the review by [Wideen et al., 1998](#)). Most of this research is purely qualitative and involves small numbers of respondents, if only because the researchers lacked the resources to process large amounts of qualitative data. The result has been to describe in interpretive ways prospective teachers' experiences as they learned to teach. An advantage of this approach is that it can illuminate the processes and mechanisms involved in teacher learning, especially if the "inner workings" of the TE programs concerned are carefully described ([Cochran-Smith and Zeichner, 2005](#): p. 700). However, studies which restrict themselves to using only qualitative methods in small samples may fail to identify and explain which program features significantly encourage later performance in teaching practice. Without larger numbers of respondents and strategic sampling, TE effect research cannot produce generalizable knowledge about productive learning environments for teachers.

Large-scale quantitative studies

At the other extreme is purely quantitative survey research capitalizing on the law of great numbers, which uncovers patterns and relationships, notably concerning issues of recruitment (cf. the pertinent entry), selection, and retention.

A persuasive example is [Ingersoll's \(2001\)](#) demonstration of a revolving-door effect in teacher turnover. By analyzing with regression techniques the national longitudinal data sets in the US spanning 7 years, Ingersoll showed that contrary to public and political opinion, there are sufficient numbers of teachers available who are willing to fulfill schools' staffing needs. However, too many of them grow dissatisfied too soon with the work conditions in education and therefore move to different schools or leave teaching profession altogether. [Chin and Young \(2007\)](#) reported how personal backgrounds of alternative-route candidates such as ethnic status, age, gender, family obligations, and career history interact with local and regional employment opportunities as well as attractive characteristics of teaching as a profession in determining recruitment patterns.

In the area of teacher selection and self-selection, various longitudinal studies were carried out tracing the backgrounds, employment, and work experience of graduates of alternative certification programs. A review of these studies makes it clear that rather than general measures, such as grade point averages based on standardized achievement tests, candidates' cognitive skills, and levels of cognitive complexity, their self-efficacy and previous experience in instructing and coaching people in group settings have some merit as predictors of retention or at

least success in teaching as rated by teacher educators and employers ([Brouwer, et al. 2007](#)).

Time-dependent patterns in retention have been uncovered by [Shen \(2003\)](#), using large-scale longitudinal data. Dropout of beginning teachers was shown to increase with time, often in leaps at the beginning of a new school year or semester. In the same research, a positive relation was found between the length of training and the length of time teachers remained in the profession. In addition, support for teachers after graduation can influence their commitment to schools. Various induction packages consisting of different types of support for teachers who were new to a school were shown to differ significantly in their influence on percentages of turnover after the first year of employment. Much of the turnover occurred among teachers without any type of support during induction. Turnover was reduced among teachers who had supportive communication with school leaders, and even more so when they were given opportunities to collaborate with colleagues and had access to teacher networks and extra resources ([Smith and Ingersoll, 2004](#)).

In the area of attitude development, [Watzke \(2007\)](#) analyzed the development of work-related concerns in 79 beginning teachers using six repeated measures with a concerns inventory. [Fuller \(1969\)](#) and others have posited a stage chronology, which has tended to portray beginning teachers' development as a series of subsequent steps proceeding from concerns about maintaining a desirable presentation of self through concerns about performing teaching tasks proficiently to concerns about the adequacy of one's own teaching in promoting student learning. In contrast to this self-task-impact-stage chronology, concerns about impact on learners were shown in Watzke's sample to rank consistently highest across time. Concerns about impact, whether academic or personal in orientation, were shown to recur over time instead of characterizing one specific phase of beginning teacher development.

Mixed-methods studies

A study based on ecological assumptions and relating processes and outcomes is the reconstruction of competence development in 357 teachers from the beginning of preservice training until the third year of in-service practice reported by [Brouwer and Korthagen \(2005\)](#). Building on the work of [Dann et al. \(1978\)](#) and using a conceptual model derived from the literature on teacher socialization, this study assessed the relative influences on competence development of preservice TE programs on the one hand, and school contexts before and after graduation on the other. The methods used in this study were questionnaires, document analysis, observations, and retrospective interviews with student teachers as they developed into beginning teachers, cooperating teachers, and teacher educators. Among the main findings were that a carefully planned alternation of student-teaching and college-based

periods, a gradual increase in the complexity of student-teaching activities, and the use of a clinical supervision model in cooperative small-group settings encouraged graduates' professional competence, notably their ability to activate learners.

Longitudinal mixed-methods approaches capable of addressing the complexity of teacher learning are also used on a larger scale in the Pathways into Teaching Project in New York City schools. In this project, comprehensive quantitative surveys are combined with detailed qualitative descriptions of an array of different TE programs and the learning experiences of the participants in them (Boyd *et al.*, 2006).

Validity requirements

Against this backdrop of examples and with due caution, the methodological strengths and weaknesses of studies of long-term TE effects can be assessed as follows. Explaining relationships between TE program features and outcomes in graduates is facilitated by combining quantitative and qualitative methods. Using quantitative data from sizeable samples enables the researcher to establish significant relationships and patterns and begin to generalize findings. Using qualitative data, preferably from direct observation, enables the researcher to reconstruct and infer from thick description (Geertz, 1973) in which settings and in which ways teachers acquire and transform professional teaching behaviors. TE effect research with explanatory power is further characterized by longitudinal rather than cross-sectional designs, repeated rather than one-shot measures, and multivariate correlational rather than experimental or quasi-experimental methods of analysis.

Given these experiences and trends in the conduct of TE effect research, it is appropriate to explicate what should count as valid causal explanations in an ecological conception of TE effect research. Therefore, two validity requirements are now presented for the benefit of explaining the complex whole of factors determining effects of TE programs. Conclusions about cause-effect relationships in TE effect research should be considered valid only, when:

- relationships are demonstrated on the basis of a research model incorporating context, input, process, and product factors and
- the processes responsible for these relationships are reconstructed.

The latter demand implies that explanations of human learning are incomplete, if only an experimentalist, black-box approach is taken. Such an approach would underestimate the role that subjective representations, such as perceptions, experiences, opinions, and attributions, play in human learning (cf. Maxwell, 2004). These two validity requirements embody a causal-genetic conception of

scientific explanation in educational research and share important assumptions about the object of research as put forward in Bronfenbrenner's ecological conception of human development.

Suggestions for Conducting TE Effect Studies

The validity requirements proposed above lay a basis for arriving at decisions about research design, instrumentation, data collection, and data analysis (cf. the criteria for research programs advocated by Bronfenbrenner and Lüscher, 1976).

Design

An ecological conception of TE programs and effects as an object of causal-genetic explanation would entail including in the design of an empirical study the main settings of the college-based curriculum, student teaching, and beginning teaching in schools. Prospective teachers should be followed longitudinally from the beginning of training until the second year of in-service teaching, preferably longer. The instruments and measures used should allow recording and understanding the backgrounds, actions, experiences, and motives of the persons studied.

Combining qualitative and quantitative methods helps solve the breadth-depth problem in investigating TE programs and effects. If one type of method is used exclusively, either many situations and persons are studied superficially, or a few are studied thoroughly (Berger, 1974). A solution to this problem is to select, from all the programs and respondents in a study, a smaller number to form a representative subset. These may be termed the whole sample and the subsample, respectively. The whole sample can then be studied using quantitative methods, so that generalizable relationships and patterns can be discovered. The subsample can be studied additionally by means of qualitative methods, so that mediating processes can be reconstructed and explained in sufficient detail.

Instrumentation

In order to arrive at a multifaceted representation of both the outcomes and processes of long-term teacher learning, it is advisable to use multiple instruments for data collection (cf. for the original idea of a multitrait-multimethod matrix in social research, Campbell and Fiske, 1959). Not only self-report methods should be used, but also direct observation, so that attributions by any respondent group can be recognized for what they are and reliable accounts of actual professional performance can be achieved.

The operationalization of observations and measures is crucial for validity. Three epistemological perspectives, that is, assumptions about the nature of TE programs and effects can serve as a guide for operationalization: the ecological, genetic, and activity perspectives. The ecological perspective assumes that the research object in the social sciences always consists of a social system, which is at the same time internally structured and embedded within a wider, often institutional context (cf. Maschewsky, 1979; Tabachnick, 1981). The genetic perspective recognizes all learning as a set of processes, whose unfolding influences learning. This perspective assumes that understanding learning outcomes requires understanding the processes which produce them (cf. Davydov, 1977). The activity perspective entails a focus on the actions of people as these express the continual tension between their personal motives on the one hand and contextual constraints on the other (cf. Zeichner and Tabachnick, 1985).

In quantitative inquiry, low-inference measures should be employed wherever possible. In qualitative inquiry, a balance should be sought between self-report and direct observation data. On-site visits, video recording of teaching, and retrospective and stimulated-recall interviews are therefore suitable methods.

Data Collection

In an ecological inquiry of TE programs and effects, minimally, the main respondent groups should be involved, that is, prospective, beginning and/or experienced teachers, cooperating teachers, teacher educators, and/or professional development facilitators (cf. Cochran-Smith and Zeichner, 2005, p. 331–334).

An important consideration in designing TE effect research is which time spans should be covered in longitudinal data collection. Decisions on this point are obviously made depending on the research questions and available resources, but it should be borne in mind that learning effects need time to come to fruition and to manifest themselves. To determine long-term effects of TE, it is advisable to cover time spans of at least 2 years. When following respondents over time, it is of course necessary to identify them, secure their consent with continued participation, inform them of the study's progress, and take all other measures useful for guarding against attrition generally (Mednick *et al.*, 1984).

Analysis Methods

Having based research design on ecological assumptions, TE researchers face strategic choices in analyzing pluriform data sets. Formulating and accounting for these choices with the help of a predetermined analysis plan can make or break a study's success. Evaluating any specific TE program in an ecological fashion confronts the researcher with social

constellations and processes of unique complexity. Tracing distal causes and mediating factors will be prominent challenges (cf. Baltes *et al.*, 1977). An analysis plan should therefore serve careful hypothesis generation and explicate the reasons why certain analysis techniques are selected and how their use is sequenced.

Given the validity requirement that the explanation of learning outcomes should rest on a reconstruction of the learning processes involved, it is logical to make qualitative analyses preceding quantitative ones, so that hypotheses can be generated and explored in a controlled way. If multivariate analyses yield clear indications of testable relations and/or differences, then experimental or quasi-experimental analyses can follow. This sequence conforms to the plea by Chatterji (2004, 2006) for extended-term mixed-method evaluation (ETMM) designs.

Finally, in analyzing quantitative longitudinal data, caution is needed in handling missing values. Attrition of respondents can easily cause individual data pairs to drop out of specific correlations and regressions. This risk increases to the degree that data pairs are collected further apart in time. To contain this risk, techniques can be used for estimating missing values (Peugh and Enders, 2004).

Conclusion

Qualifying and retaining teachers requires building an empirical knowledge base which can underpin program design in TE. Answering questions relevant for explaining and optimizing long-term effects of preservice TE programs can be achieved by means of carefully planned longitudinal studies combining quantitative and qualitative methods. TE researchers are well advised to conceptualize their questions using explicit, ecological models, which help them to theorize about the crucial role of mediating processes in generating learning effects in teachers. Research design, instrumentation, data collection, and analysis should fulfill validity requirements which are congruent with research models aiming at causal-genetic explanation.

If TE effect research were to succeed in mastering its challenges, evidence-based decision making could become possible in policymaking for TE. At the beginning of the twenty-first century, the greatest challenge for research into the long-term effects of TE is to help solve the dilemma of countering teacher shortages while simultaneously maintaining, enhancing, and assuring the quality of the teacher workforce worldwide.

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Relevant Websites

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