This bibliography has been written as part of the literature review for the TASB Project. The reader of this Annotated Bibliography should be aware that many of the entries located here are sourced directly from Abstracts and Introductions from the associated papers.

Revised. August 27 2016
Teaching out of field: Annotated bibliography

Contents
Boundary Crossings ........................................................................................................... 2
Out of field teaching ........................................................................................................... 6
Teacher Certification/Transitioning .................................................................................... 17
Professional development .................................................................................................. 25
Identity/ Self-efficacy ......................................................................................................... 28
Teacher shortages/ attrition ............................................................................................... 32
Student impact .................................................................................................................... 36
Boundary Crossings


In this introduction to a special issue, the authors discuss how learning can be shaped by movements across boundaries. They provide a description of how boundaries can be crossed by people, objects and interactions and how this can lead to learning in different ways. They explain how the various contributions of the special issue are complementary by studying various forms of learning.


This paper reports on interviews with 35 new teachers as they graduate from teacher education programs and enter the profession, and details their learning about agency and role in community resulting in identity changes within this boundary space.


This article discusses forms of ‘boundary-work’ in school-based training for industrial work or, put another way, discourse and practices that cross, blur or reinforce boundaries between school and industry. The discussion builds on two ethnographic studies, one conducted in the 1980s and one in 2006, to provide insights on continuity and change in an activity system with two partly conflicting raison d’être: one linked to the educational mandate of the school and the other to industrial demands on the school.


This paper considers the formative effect of boundaries between activities in directing and deflecting the attention of actors who are seeking to develop innovatory practice at these boundaries. Specific attention will be directed to practices of communication at these boundaries and also to the way in which these boundaries shape the practices of communication themselves.


The article develops a 2005 account of relational agency. Relational agency in inter-professional activities is seen to be mediated by common knowledge which is built in interactions at the points where the boundaries of practices intersect. The focus will be the development of common knowledge, described by as a capacity to ‘represent the differences now of consequence and the ability of the actors involved to use it’, at the sites of intersecting practices.

An examination of the relationship between theoretical knowledge and the practical experience in expert cognition and learning. The authors explore the realm of polycontextuality and boundary crossing as two central theoretical concepts in the emerging landscape of expert cognition. Polycontextuality means that experts are involved both in multiple simultaneous tasks and in multiple communities of practices. Boundary crossing occurs when two different activities are linked together. They present and analyse three cases of collaborative problem solving and learning team environments to illustrate various aspects of boundary crossing and polycontextuality.


Using a theoretical perspective of communities of practice, this case study examines a prospective chemistry teacher's inquiry-based teaching during his practicum.


An analysis of examples of work/academic curriculum interactions through a socio-cultural learning theory, and in particular activity theory, lens.


A discussion at the beginning of a special issue on boundary crossing in education. The paper considers the origins and development of the concepts of the boundary crossing and boundary objects.


A qualitative pilot study using teacher interviews in 3 rural schools which examined meanings, support mechanisms and teacher identities associated with out-of-field teaching comes under consideration in this paper.


Book chapter that considers teacher experience and the need to define ‘field’ in the context of out-of-field teaching. The resultant discontinuity that occurs as a result of the out of field teaching experience is applied to ‘field’ in order to identify where learning can take place during a boundary crossing.


This paper analyses the learning processes needed when representatives of different professional and other occupational cultures start cooperation. The paper is positioned in the Finnish context.

The article analyses a collaborative effort of learning across workplace boundaries in a regional learning network in Finland.


To determine teacher working knowledge of transition best practices, the Transition Programs and Services (T-PAS) survey was administered to 2,000 middle and high school teachers and 70 school district transition contacts. Three questions were asked: (a) What barriers exist that hinder the transition process? (b) What effective practices facilitate the transition process? and (c) What suggestions do you have for improvement of the transition process? Analysis of information from each of the questions resulted in the identification of the same categories, themes, and subthemes across documents. Results show a need to (a) investigate the role of pre-service and in-service preparation of teachers, (b) identify structures that enhance a teacher's ability to facilitate transition processes, and (c) examine participation of students and other transition stakeholders in the activities crucial to transition planning.


The collaboration between members of two different communities of practice representing different economies of meaning, technicians and foundry workers, has been studied in this paper in the context of the deployment of an automatic control and surveillance system in a process industry. The collaboration has been analysed as a boundary practice and documented through ethnographic methods including video recordings. The results indicate that the negotiation of meaning – i.e. the site of learning in the social practice approach – between (and within) the communities is restricted and instrumental to running the system only; the workers learned very little about the system or its affordances.


This article reports on a qualitative study that investigated the experiences of one group of English language teachers from the Chinese mainland who completed their teacher training in Hong Kong and have taken up full-time teaching positions in secondary schools within Hong Kong. Using the concept of teacher identity construction, and drawing upon the work of Wenger and Fairclough, the study traced the trajectory of the participants’ identity formation from their experiences as students in mainland China and as pre-service teachers in a teacher education program in Hong Kong, to their employment as English language teachers in local secondary schools. The study examines the participants’ discursive and participative practices to illustrate how their experiences, both as students in the Chinese mainland and as pre-service teachers in Hong Kong, shaped their construction of teacher identities, as well as to show that their employment in Hong Kong schools represented a challenge to this identity formation process. Implications for attracting and retaining teachers for the Chinese mainland in Hong Kong are considered and implications for future research outlined.

The conceptualisation of student teaching as a space where conflicts can be generative for candidates’ learning is considered in this paper. The idea of productive friction—dissonance experienced by teacher candidates when two or more social worlds conflict that leads to more sophisticated practice—to consider student teaching as a potential boundary space that benefits from diverse perspectives is raised here.
Out of field teaching


The main findings in the Education Trust's report, 'All Talk, No Action: Putting an End to Out-of-Field Teaching', are examined. The findings indicate that 24% of classes are taught by teachers who did not study the subject in college.


This publication considers the reasons why administrators misassign staff, the degree of such misassignment, the places where it occurs, its effects, and, finally, who is responsible for it.


A conference paper that considers teachers with multiple discipline backgrounds and how they experience out-of-field teaching.


Extract from conference proceedings. Paper specifically examining out of field mathematics teaching and teacher interviews on the impact of out of field teaching.


Conference paper which looks at teacher identity as an approach for studying out of field mathematics teachers. It thinks about teacher identity as a unifying concept that is able to connect cognitive and affective-motivation perspectives.


Conference paper

Discusses the misassignment of teacher to out-of-field teaching, one of the most significant problems in education. How economic forces influence teacher supply; State certification, a second factor complicating the hiring of teachers; the need for a national policy; Developing a multi-phased solution.


Over periods of from 18 months to four years, this thesis investigated the experiences of six beginning primary trained teachers employed to teach secondary school science.


Discusses the dilemmas of teaching science out of field. In particular looks at the dilemma for the experienced out of field science teacher - whether to deliver a predictable, well scripted, teacher centred lesson following closely the textbook or curriculum guide, so as to remain 'faithful' to the content, or to allow the lesson to follow interesting side issues or student questions, with risky consequences in terms of explaining, understanding and connecting with the science content. This dilemma is illustrated with a case study of an experienced biology teacher teaching physics.


Blog/web based discussion on how frequently high-poverty schools employ teachers to teach a subject for which they don’t have an undergraduate degree.


The article focuses on the assignment of student teachers for their practicum. Student teaching is intended to expose student teachers to teaching. The present practice regarding the assignment of student teachers is the matching of an applicant with a situation on the basis of the applicant's grade or subject matter preference. Moreover, interviews are conducted to determine the suitability for certain types of communities of student teachers. However, these practices have the greater possibility of being inaccurate.


A paper that examines out of field teaching of mathematics in England.


This study examines whether subject-specific teacher certification and academic degrees are related to teacher quality.

Masters thesis on out of field teaching.


Teacher effectiveness and quality teaching receive international attention. This in-depth exploration of the implications of out-of-field teaching for teacher quality has unveiled complex teaching and learning environments. The out-of-field phenomenon defines teachers teaching outside their field of training or education (Ingersoll, 2002). The perspectives of educational directors, principals, teachers and parents across two countries suggest that out-of-field teaching practices are significant to content knowledge, pedagogical knowledge and pedagogical content knowledge. This qualitative investigation reveals information through interviews, observations and document analyses regarding the relations among real-life experiences, out-of-field teaching practices and perceived quality of teachers. The findings focus attention on leadership perceptions, understanding and decisions, school improvement policies and support programmes in relation to out-of-field situations in schools. The paper concludes with recommendations for education policies and further research on teacher quality linked to the out-of-field phenomenon.


Out-of-field teaching is a transnational common practice with developing concerns in countries such as the United States, United Kingdom, Turkey, South Africa and Europe (Norway and Germany). Understanding the interrelations between leaders’ perceptions, the real-life experiences of out-of-field teachers and what it means for their professional development is an under-researched field. Results from seven very different school settings in Australia and South Africa revealed assumptions and misconceptions about out-of-field teaching and its meaning for professional development. This paper critically reflects on the lived meaning of out-of-field teaching for professional development.


The lived experiences of novice teachers, how principals’ understanding and leadership style influence those experiences and what these experiences mean for school leaders is considered in this paper.


The lived experiences of novice teachers in out-of-field positions influence future career decisions and impact on their journey towards being competent and experienced practitioners, conversely their “life-world” is often misunderstood. The purpose of the study reported in this article is to investigate the lived experiences of these teachers, how principals’ understanding and leadership styles influence the lived experiences of novice out-of-field teachers, and what these lived experiences mean for school leaders. The article highlights perceptions of school leaders and novice out-of-field teachers about out-of-field teaching. It argues that the strategies implemented
by school leaders based on their understanding of novice out-of-field teachers’ lived experience greatly influence the development of these teachers. It draws on Gadamer’s theories to investigate the lived experiences and perceptions of four principals and four novice out-of-field teachers through the different lenses of these participants. It concludes with a discussion on the interrelationships between school leaders’ understanding, novice teachers’ lived experience and what it means for the teaching environment. Participants’ interpretation of specific lived experiences connected to out-of-field teaching shapes meaning in their attempt to understand and to “belong,” for example, confidence issues, self-esteem concerns, and disconnectedness. The investigation of these units of meaning provides an in-depth understanding of the interrelationship between leadership and the lived experiences of novice out-of-field teachers.


This paper will identify how the University of Northern Iowa Physics Department is attempting to address the needs of the high school physics teacher through its course offerings and professional development programs for teachers.


In this study, the realities of out-of-field teaching practice over five core subjects (Korean, English, math, science, and social studies) at Korean secondary schools are examined to understand in what academic subjects, school types, school levels, school sizes, and community types it takes place in and to what extent.


Book chapter. Book unable to be sourced.


A report on the development of the college section of the National Council of teachers of English. The impacts of out of field teaching are mentioned in this paper.


A newspaper article that gives an overview of the prevalence of out-of-field teaching the USA.


This study investigates the distribution of math teachers with a major or certification in math using data from the National Center for Education Statistics’ High School Longitudinal Study of 2009. The authors discuss the limitations of existing data sources for measuring teacher qualifications, such as the Schools and Staffing Survey, and show how HSLS:09 can be used to analyse the distribution of qualified teachers in mathematics. The results demonstrate that ninth-grade students in most need of a qualified math teacher are least likely to have one.


A qualitative pilot study using teacher interviews in 3 rural schools which examined meanings, support mechanisms and teacher identities associated with out-of-field teaching comes under consideration in this paper.


Blog article on out-of-field teaching data in Australia and how differentiation is occurring with data sources.


Out-of-field teaching symposium held in Porto, Portugal August 2014.


A report presenting national data on out-of-field teaching in national public secondary schools. It attempts to address the question of whether inequalities exist in the distribution of adequately qualified teachers across and within schools in the United States.

Educational policymakers point out the need for qualified teachers. Federal programs have been launched to ensure adequate training of teachers. Yet, the problem does not diminish. This is because schools continue to delegate to teachers coursework outside their field of expertise.


The purpose of this article is to summarize what my research has revealed about out-of-field teaching: how much of it goes on; to what extent it varies across different subjects, across different kinds of schools, and across different kinds of classrooms; and finally, the reasons for its prevalence in American schools.


Ingersoll responds to issues of do teacher qualifications matter and what do measures of out-of-field teaching really measure.


Teachers who are forced to teach classes that are out of their subject area offer a poor educational experience for children and the teachers themselves. Out-of-field teaching is used in many school districts to extend their use of existing personnel.


This analysis specifically focuses on a little recognized source of underqualified teaching-the problem of out-of-field teaching-teachers being assigned by school administrators to teach subjects that do not match their training or education.


A focus on the unequal distribution of quality teaching-out of field placement in schools that serve low-income or minority students.


This article is concerned with the empirical measurement of the phenomenon of out-of-field teaching -- teachers assigned to teach subjects for which they have inadequate training and qualifications. This problem has received much attention in recent years and it has now become common for major education reports and studies to include indicators of out-of-field teaching in their assessments of educational systems. However, there are a large number of different ways of defining and assessing the extent to which teachers are assigned to teach in fields for which they are inadequately qualified and, as of yet there is little understanding of the variety of measures available, nor their differences and limitations. This article seeks to address this issue by describing,
comparing and evaluating a wide range of different measures of out-of-field teaching that have been developed over the past decade.


A report focussing on underqualified teachers across years 7-12 teaching in the core academic fields.


Out-of-field teaching discussion paper.


In 2001 the Australian Government commissioned the Australian Council for Educational Research (ACER) to conduct an investigation of effective mathematics teaching and learning in Australian secondary schools (Years 7 to 10). The purpose of the research project was to examine a range of factors including the knowledge, beliefs, understandings and practices of teachers of mathematics and their qualifications, professional development and relevant personal experiences, and how these impact on student learning outcomes in the high school years.


This report has a state-by-state analysis of the new 1999-2002 Schools and Staffing Survey data on the percentage of core academic secondary school classes taught by a teacher without major or minor in the subject. The report documents the huge and growing problem of disproportionate numbers of classes in high-poverty and high-minority secondary schools being taught by out-of-field teachers. The report also includes a list of recommendations which states, districts and schools can act on immediately to help reduce out-of-field teaching.


This article discusses what it is like to teach physics without a degree in the field and ways to develop into effective physics teachers when one is inexperienced.


This case study describes an 'out of field' teacher's use of the Internet to teach a range of mathematical topics in a modified Year 8 (13 year olds) mathematics class.

teachers-dont-degrees-subjects-teach.html.

Newspaper article (21 April 2011) discussing teachers in the UK teaching out of field.


A conference paper that consider both in and out of field teachers.


A former head of the American Federation of Teachers, Albert Shanker, once called out-of-field teaching education's 'dirty little secret'. The practice of allowing or assigning teachers to teach subjects or year levels for which they do not have any formal qualifications has led to considerable debate within the educational community. Such concerns over the possible negative impact of out-of-field teaching on students, teachers and the broader school community, and its potential to mask teacher shortages, led the Western Australian College of Teaching (WACOT) to commission an exploratory empirical study of the extent of the phenomenon in Western Australia. This article presents the main findings from the empirical study and literature review and seeks to contribute to a greater understanding of the extent, causes, impact and possible solutions to the phenomenon of out-of-field teaching.


A UK study on teacher shortages in which 250 science teachers (Non-physicists) showed significant differences between the difficulty anticipated in teaching physics and what was actually experienced. The findings of this study indicate that in-service physics education for science teachers should be school-based and grounded in a constructivist model of teachers’ learning in science.


A report that delivers the findings of a study of teacher deployment in mathematics and science departments in four English secondary schools.


This study uses mixed methods to examine the knowledge of beginning physics teachers. Through semi-structured interviews, classroom observations, and concept maps, the pedagogical content knowledge, subject matter knowledge, and practices of three groups of beginning secondary physics teachers were explored.

Book chapter.


The various sets of data obtained from the ethnographic research shows that various forms of classroom interactions help students in learning science by making them develop their own identity, as well as a group membership. The analysis reveals that the various out of field activities of the teachers, especially in the urban schools widely help the students in developing solidarity, as the risk of using science language is highly reduced.


The study examined pre-service teachers’ perceptions and attitudes towards issues of cultural diversity, once a student has moved from the traditional classroom. Some questionnaires were completed during their teaching practicum.


Reports profiling America’s teachers are drawing increased attention to concerns about teachers’ subject-matter preparation and out-of-field assignments. In this article, we focus on two 1st-year high school teachers who graduated from the same teacher preparation program in the same year. One is credentialed in the subject area, and the other is not.


A report on teacher quality in Ireland post-primary classrooms and how out-of-field teaching is influence teaching.


A web-based article that comments on the outcome of a 50 state US survey on out-of-field teaching.

Previous studies have treated teacher efficacy as a unitary trait without considering how teachers’ expectations of their ability to produce student learning varies within teaching assignments. In this study, teachers in nine restructuring secondary schools in one district estimated their ability to perform common teaching tasks in four of the courses they expected to teach in the coming school year. Although the portion of the variance explained was small, the study found that teacher efficacy
was lower for courses outside the teacher’s subject. The effects of teaching outside one’s area were greater than the effects of track and grade—two course characteristics that have been linked to teacher efficacy in previous research. This study also found that teacher efficacy was influenced by teacher leadership roles. Teachers who were expected to promote student learning across subjects had lower teacher efficacy than teachers in traditional positions of added responsibility (department heads) and teachers who were not in leadership positions.


Staffing practices which are ‘questionable’ are discussed in this article.


This study examined the similarities and differences in experienced secondary science teachers’ planning, teaching and reflecting on their teaching, when teaching in their science area of certification and when teaching in another science area. The study also focused on the influence of these teachers’ content knowledge, pedagogical knowledge, and pedagogical content knowledge on their planning, teaching, and reflecting.


Queensland rural and remote schools have difficulty in attracting experienced, in-field mathematics teachers. Thus, when such teachers arrive, much is expected of them to increase the mathematics knowledge of students. This paper looks at one such teacher who, against the high expectations placed upon him as an in-field teacher, experienced challenges in teaching mathematics to underperforming Indigenous1 Australian students. The paper considers implications of in-field mathematics teachers in underperforming classrooms.


The article discusses a report from California’s Commission on Teacher Credentialing which found that there were more than 11,000 out-of-field instructors of English-language learners from 2003 to 2007. This number accounted for more than half the total out-of-field assignments reported during that period in California.


A report which is heavily data focussed on teacher qualifications, teacher reporting and a discussion and summary on the prevalence of out-of-field teaching in the US.

Examination of out-of-field teaching in rural Western Australia.


Out-of-field teaching in Physical Education teaching.


The combination of teacher shortage and out-of-field teaching is brought together in this paper on teaching in the USA.


Discusses some factors that must be addressed in order for the add-on or out-of-field approach in supplying needed technology education teachers to become viable. Recruitment of technology teachers; Teacher preparation; Details on the utilization of the approach in South Carolina.


This article examines the implications of the out-of-field phenomenon for school management. An empirical investigation entailing the use of a qualitative approach was employed for the study. Data were gathered through semi-structured interviews with selected participants who shared their experiences of the phenomenon. Findings indicated that the out-of-field phenomenon and its implications should be recognised in order to provide effective and quality teaching, substantial teacher support and sufficient staff development programmes.


This report details that the highest rates of out-of-field teaching appear in high-poverty and high-minority schools, the very schools where students desperately need good teachers. Out-of-field teaching is rampant in disciplines in which shortages do not exist and in states with a surplus of teachers for available vacancies in all fields. Although out-of-field teaching in core subjects is unacceptably high, the problem is especially acute in secondary school mathematics classes.


This attempt at stock-taking deals with out-of-field teaching in mathematics - examined both from the German perspective and from an international perspective. It is obvious that there is much more out-of-field teaching in math in schools than generally assumed. Therefore, the community of mathematicians as well as the mathematics lecturers at university have to notice a field of action which requires our permanent and full attention: On the one hand there is no way to avoid enhanced training courses for certain groups and types of school, on the other hand you have to set a suitable course via regulations for the education of teachers so that the teaching staff who are subsequently responsible for the math classes in schools has obtained a basic education in the first phase of their qualification. Since all in all an increasing shortage of qualified math teachers is
anticipated, measures to enhance the attraction of this specialist teaching profession - as far as possible in combination with another affine subject - are essential.


A paper that outlines programs at Victoria University designed to support teachers of mathematics who are out-of-field.


A professional learning program for teachers of junior secondary mathematics regarding the content and pedagogy of senior secondary mathematics is the context for this study of teachers' mathematical and pedagogical knowledge. The Victorian Certificate of Education (VCE) Mathematics Professional Learning Program was designed for practicing 'out-of-field' teachers of junior secondary mathematics, that is, teachers who had not completed a sub-major in tertiary mathematics and may not have undertaken initial teaching education in mathematics, to prepare them to teach senior secondary mathematics. The analysis of teachers' reflections on their learning explored teachers' understanding of mathematical connections and their appreciation of mathematical structure. The findings indicate that a professional learning program about senior secondary mathematics can enable practicing teachers to deepen and broaden their knowledge for teaching junior secondary mathematics and develop their practice to support their students' present and future learning of mathematics. Further research is needed about professional learning approaches and tasks that may enable teachers to imbend and develop awareness of structure in their practice.


A comprehensive book that considers out of field teaching in one US state: North Carolina in the early 1980s.


Magazine article on teacher certification and out-of-field teaching.


The characteristics of the emerging and existing teaching force are explored in relation to supervision. Key trends that exacerbate teacher shortages include out-of-field teaching, increases in student population, critical subject-area shortages, attrition, and retirement. This paper calls for a high-stakes form of supervision as a long-term solution to working with the constantly changing nature of the teaching force.
Teacher Certification/Transitioning


Conference paper that considers the supply of teachers in mathematics.


Conference paper that considers the supply of teachers in mathematics.


Paper on the No Child Left Behind Act and how teach content knowledge and preparation is impacted by a de-emphasis on pedagogy and teaching practicums.


A paper that discusses early career maths and science teachers and how they deal with the challenges associated with all aspects of being new to the profession.


A study that examines early career teachers and their needs. It looks at how those needs inform the content and delivery of pre-service teacher programs.


A study that focusses on two beginning primary-trained teachers who are transitioning to secondary science.


A study that focusses on two beginning primary-trained teachers who are transitioning to secondary science.

This paper examines a within-case and cross-case analysis of 15 cases at four distinct time points within a 5-year period leading to the authors' identification of multiple patterns of teaching practice linked to early career decisions, which reflect considerable variation in quality of teaching and career trajectory.


An examination of ways in which teacher qualifications and other school inputs are related to student achievements in US states using data from a 50-state survey of policies, state case study analysis and other surveys.


Response to a 2000 article that claims that teacher certification has little bearing on student achievement.


Two discourses of current relevance to national and international educators—early professional learning (EPL) and curriculum change—are considered here.


An examination of specific state-by-state differences in teacher licensure requirements and if these arrangements systematically affect student achievement.


For newly qualified teachers (NQTs), the induction period of support is an important phase which has the potential to deepen learning that has already taken place in initial teacher education (ITE) as well as preparing the NQT for future learning. A particularly crucial time in the induction process is the first term of teaching, when NQTs are likely to be facing a ‘reality shock’ in relation to their new responsibilities. Data were collected by questionnaire from a volunteer sample of student teachers of science and mathematics close to the end of their ITE course and then by questionnaire from the same sample towards the end of their first term as NQTs.


This article highlights the findings most relevant for the university sector, and examines the policy implications, including those for the curriculum design of both science and teacher education programs when considering the shortage of qualified science teachers in Australian schools.

US paper that considers if there is a positive relationship exists between mathematics teacher certification and teaching effectiveness.


This paper explores the development of pre-service teachers during a one-year programme of initial teacher training and education of secondary physical education in England.


This qualitative, year-long study aims to explore and describe the induction experiences of eight beginning teachers as they negotiated their first year of teaching. Data gathered through interviews and emails indicated that these teachers required further development on: catering for individual differences, assessing in terms of outcomes, relating to parents, relating to the wider community, and understanding school policies; however, relating to students and understanding legal responsibilities and duty of care were not issues.


Consideration of the differences between schools and why inequities occur between schools which lead to out-of-field teaching.


Ingersoll gives an account of his work to date.


The objective of this report is to present the results from a collaborative, comparative study that examined the preparation and qualifications of elementary and secondary teachers in six nations and one autonomous region: China, Hong Kong, Japan, South Korea, Singapore, Thailand, and the United States. Unlike other recent cross-national teacher studies, this project adopted a relatively specific focus on one key issue linked to the performance and quality of teachers—the qualifications and preparation of teachers. The objective of the study was to compare how each system itself defines teacher qualifications and standards and then to address the question: how well are the different educational systems succeeding in ensuring all students are taught by qualified teachers? The study addressed this overarching issue by examining comparative data from each of the seven educational systems on three specific research questions: (1) What are the preparation requirements and standards to become a teacher?; (2) What are the levels of qualifications of the current teaching force?; and (3) What proportions of teachers are not qualified in the subjects they teach?

In recent years there has been a growing interest in support, guidance, and orientation programs—collectively known as induction—for beginning elementary and secondary teachers during the transition into their first teaching jobs. This study examines whether such supports have a positive effect on the retention of beginning teachers. The study also focuses on different types and components of induction, including mentoring programs, collective group activities, and the provision of extra resources and reduced workloads. The results indicate that beginning teachers who were provided with multiple supports, were less likely to move to other schools and less likely to leave the teaching occupation altogether after their first year. Some forms of assistance and support, however, did not appear to increase beginners’ retention.


This review critically examines 15 empirical studies, conducted since the mid-1980s, on the effects of support, guidance, and orientation programs—collectively known as induction—for beginning teachers.


This article discusses a research on the growing interest in teacher certification policies in the U.S. in the 1940s.


Teachers’ subject-specific cognition is seen as an important factor for the quality of instruction and, accordingly, student learning. However, in-depth research on these relations can only be carried out if a sound theoretical model for subject-specific teacher cognition (knowledge and competence/practical skills) and—in the case of a quantitative research approach—corresponding measures are available. The subject-specific cognition can be modeled as basic professional knowledge (BK) complemented by two further components of reflective competence (RC) and action-related competence (AC) with a close connection to professional demands. In order to implement these subject-specific demands rigorously, we developed innovative standardized measures for primary mathematics teachers. In particular, we argue that video-based items that are implemented in a speed condition and rated as holistic observations are well suited to realize the assessment of action-related competence. This article gives a detailed insight into the test development as well as the coding and scoring procedure and focuses on validation efforts. The study is based on the data of 85 in-service primary mathematics teachers and shows the viability of the approach. Classical scale analyses as well as confirmatory factor analyses and the comparison of different models as well as teacher groups (mathematics certified vs. non-mathematics certified teachers) give evidence for the validity and reliability of the measures.


This study is a longitudinal, qualitative, interpretive inquiry into the work motivation of four novice EFL teachers at public secondary schools in Japan.

A policy report that discusses the results of a four year study of America's education schools. It focuses on the classroom teacher education.


To determine teacher working knowledge of transition best practices, the Transition Programs and Services (T-PAS) survey was administered to 2,000 middle and high school teachers and 70 school district transition contacts. Three questions were asked: (a) What barriers exist that hinder the transition process? (b) What effective practices facilitate the transition process? and (c) What suggestions do you have for improvement of the transition process? Analysis of information from each of the questions resulted in the identification of the same categories, themes, and subthemes across documents. Results show a need to (a) investigate the role of pre-service and in-service preparation of teachers, (b) identify structures that enhance a teacher's ability to facilitate transition processes, and (c) examine participation of students and other transition stakeholders in the activities crucial to transition planning.

This paper examines several contextual aspects affecting mentoring in the current educational landscape: the differentiated impact of teacher supply, appointment and retention; changing teacher entry and career pathways; an expanded knowledge base for teaching, accompanied by increased accountability; systemic preparation and reward of mentors; and improved communication technology.


Critical reading of science-based media reports is an authentic context in which to explore the mutual interests of teachers of Science and English, who want to use science in the media to promote their subject discipline while encouraging cross-curricular learning. This empirical study focused on 90 teachers of science and English to explore their aptitude and capability for critical reading of science-based news reports. The influences of specialist subject culture and the extent of classroom experience contributed to the distinctive nature of the responses. The study revealed features in critical reading that were characteristic of the subject background of the participants. It suggested approaches to initial teacher education and ongoing professional development that would be mutually beneficial to teachers from different disciplines in promoting among pupils a critical approach to science-related news media.


This paper details a study which tracked 16 early career teachers through their first year of teaching. The teachers and their mentors were interviewed on three occasions in an attempt to provide a clear understanding of how these early career teachers achieve control over their professional growth and the role mentors played in this process.


This study looks at how beginning biology and chemistry teachers conceptualize their science knowledge for teaching. This is separate from the traditional knowledge bases and from the science knowledge of scientists. An analysis of interviews from 16 teachers shows that advances in complexity and structure do not necessarily occur with experience. The cases of two teachers highlight the critical role of teacher content knowledge in persisting in a challenging context and the critical role of a supportive context for a beginning teacher with limited content knowledge.


Mentoring teachers during their early career induction has the potential to pay long-term benefits in respect of improved teacher effectiveness and retention. To add to understanding of mentoring beginning teachers, this paper documents the experiences of thirty-eight teachers in their first year of teaching Science or Mathematics who participated in an innovative mentoring program.

This study assessed whether or not there is a difference in teacher qualifications that might help predict the academic performance of middle school students on the mathematics portion of a state wide test. Does teacher preparation, certification and teaching experience have a relationship to mathematics achievement for school students?


In secondary schools within the UK there are many teachers of mathematics who are qualified teachers, but have not been trained to teach mathematics. There are various courses, some of which have been supported by government that ‘retrain’ these teachers so that they are ‘specialist secondary mathematics teachers’ and this paper draws on experience of providing several of such courses.


The author asks why, despite a succession of reports and studies over thirty years, we still struggle to develop national policies for teaching and the initial and continuing education of teachers.


In recent years there has been an increase in the number of programs offering support, guidance, and orientation for beginning teachers during the transition into their first teaching job. This study examines whether induction programs have a positive effect on the retention of beginning teachers.


A paper on the interrelatedness of certification, supply and demand.


TEMAG Report on teacher education.


This study compares teacher candidates who followed three pathways leading to certification in adolescence education while attending the same university. A limited number of factors were held constant among pathways, and only factors inherent to the routes were varied. The dependent variables were (1) teacher effectiveness, as measured through Danielson’s Observation Scale, and (2)
teacher efficacy, as measured through Gibson and Dembo's Teacher Efficacy Scale. No significant differences in efficacy or effectiveness were found, suggesting that the policy of offering a variety of pathways leading to certification might be one that produces similarly qualified teachers.


The current study examined the work environments of early career secondary school science teachers and their career aspirations. Because the subject department is the site of secondary school teachers’ daily work, it was the departmental-level work environment that was the focus in this thesis.


Thesis that examines attrition rates of teachers and determines if an induction and mentoring program impacts upon attrition rates.


An examination of pre-service teachers approaches to learning in science and their approaches to science teaching.


This article presents information related to the certification of teachers in the United States. There are two categories of problems involved in teacher certification. The first category of problems concerns the status of teacher. The other category of problems concerns the lack of justification of the present practices followed in teacher certification. The current status of teacher certification is of interest to many professional workers who are concerned with the education of children in the U.S.


Examines collaborative teacher induction programs involving higher education institutions and local education agencies, focusing on the California experience. Four themes include the importance of multiple support or a triad model of support, unique opportunities offered by Professional Development Schools, the role of teacher educators in smoothing the transition for beginning teachers, and the need to emphasize collaborations with site administrators.

This study explores principals' roles in a large, urban, standards-based induction program.


The purpose of this essay is to describe quality teacher induction that has evolved from "fourth-wave" (1997-2006) teacher induction program development and research. A definition of quality induction is proposed, and a set of induction goals and components are outlined. Understandings gained from fourth-wave programs are described, including ways in which quality induction programs are delineated by their comprehensive systems of organized, educative mentor assistance, professional development, and formative assessment of novice teachers in their first-through-third years of teaching. More empirical studies are needed on the effects of induction on novice teacher performance and student achievement, and on subject-based and urban teacher induction.


Book (unable to locate any abstract or a copy of the book).


Magazine article on teacher certification and out-of-field teaching.
Professional development


This paper presents findings from an impact study of OPD courses in fractions, algebraic thinking, and measurement on 79 fifth grade teachers’ pedagogical content knowledge and pedagogical practices as well as their students' mathematics achievement.


This paper will identify how the University of Northern Iowa Physics Department is attempting to address the needs of the high school physics teacher through its course offerings and professional development programs for teachers.


Two discourses of current relevance to national and international educators—early professional learning (EPL) and curriculum change are considered here.


This article examines data from an action research study that explored the impact of cooperative learning (CL) pedagogy on the professional learning of early career teachers. It focuses on the experiences of two early career teachers, one in her first year of teaching and the other in her third year, who participated in professional development on cooperative learning.


An article that considers how it can be assured that teachers work within a highly functional system providing meaningful evaluations, high-quality professional development, reasonable class sizes, reliable and stable leadership and time for planning and collaboration.


Six mentoring programs for teachers in Wisconsin for beginning teachers are examined in this conference paper.

Drawing on analyses of data from a large-scale, mixed-method study of new entrants to the teaching profession in England, this article presents new findings on beginner teachers’ experiences of post-induction support for their professional development, about which little was previously known.


This study examined the experiences of three new STEM teachers who entered teaching through different pathways, focusing on those experiences related to the effectiveness of mentoring and the meaningfulness of professional development.


Critical reading of science-based media reports is an authentic context in which to explore the mutual interests of teachers of Science and English, who want to use science in the media to promote their subject discipline while encouraging cross-curricular learning. This empirical study focused on 90 teachers of science and English to explore their aptitude and capability for critical reading of science-based news reports. The influences of specialist subject culture and the extent of classroom experience contributed to the distinctive nature of the responses. The study revealed features in critical reading that were characteristic of the subject background of the participants. It suggested approaches to initial teacher education and ongoing professional development that would be mutually beneficial to teachers from different disciplines in promoting among pupils a critical approach to science-related news media.


A report that delivers the findings of a study of teacher deployment in mathematics and science departments in four English secondary schools.


Chief scientist report on STEM into Australia’s future.


A professional learning program for teachers of junior secondary mathematics regarding the content and pedagogy of senior secondary mathematics is the context for this study of teachers' mathematical and pedagogical knowledge. The Victorian Certificate of Education (VCE) Mathematics Professional Learning Program was designed for practicing 'out-of-field' teachers of junior secondary mathematics, that is, teachers who had not completed a sub-major in tertiary mathematics and may not have undertaken initial teaching education in mathematics, to prepare them to teach senior secondary mathematics. The analysis of teachers' reflections on their learning explored teachers' understanding of mathematical connections and their appreciation of mathematical structure. The findings indicate that a professional learning program about senior secondary mathematics can enable practicing teachers to deepen and broaden their knowledge for teaching junior secondary
mathematics and develop their practice to support their students’ present and future learning of mathematics. Further research is needed about professional learning approaches and tasks that may enable teachers to imbed and develop awareness of structure in their practice.


In this magazine article, Allan White examines nine issues he feels compromise the effective teaching and student learning of mathematics in secondary schools in New South Wales, Australia.
Identity/ Self-efficacy


The studies considered in this review of research from the early 2000s on teachers’ professional identity is categorised into three categories: (1) studies in which the focus was on teachers’ professional identity formation, (2) studies in which the focus was on the identification of characteristics of teachers’ professional identity, and (3) studies in which professional identity was (re)presented by teachers’ stories. In the studies reviewed, the concept of professional identity was defined differently or not defined at all. Four essential features of teachers’ professional identity could be derived from the studies.


This paper reviews recent empirical studies related to the resilience of early career teachers. Resilience is shown to be the outcome of a dynamic relationship between individual risk and protective factors. Individual attributes such as altruistic motives and high self-efficacy are key individual protective factors.


This paper explores how teachers translate the ‘relevance imperative’ evident in contemporary rhetorics surrounding quality education, into their mathematics and science teaching. Interview data and critical incidents from classroom practice are used to explore how six teachers attempted to make the subject matter meaningful for their students.


This paper explores results from classroom observations and interviews with two early career teacher participants after professional development in cooperative learning (CL).


The aim of this study is to investigate how a community of practice focused on becoming a teacher of secondary school mathematics emerged during a pre-service teacher education programme and was sustained after students graduated and began their first year of full-time teaching in schools.

Conference paper that examines teaching mathematics and teacher identity.


Four studies examined teacher socialization processes from four perspectives to document what happens during the learning process and what transition pattern occurs. Analysis of student/teacher journals indicated that pre-service and beginning teachers go through similar transition processes in becoming teachers. Six themes dominated the transition process in teacher socialization.


Teachers are crucial to the success of any educational system and the success of any nation in general. In fact, it is not an overstatement to say the teacher is the most important educational resource in school. The world is not static but dynamic. Therefore, systems in a dynamic world are changing every day. Based on this conjecture this paper reviewed three educational constructs as related to teacher development in a changing world. These are teacher self-efficacy, pedagogical content knowledge (PCK) and out-of-field teaching. The paper observed that these constructs are paramount to the success of any teacher because studies indicate their influence on students’ academic performance. The conclusion of the paper was that these constructs are yet to be taken seriously by the stakeholders in the Nigerian educational system. The paper suggested some recommendations for improving teachers’ self-efficacy, PCK and reduction in out-of-field teaching in Nigeria.


This study is a longitudinal, qualitative, interpretive inquiry into the work motivation of four novice EFL teachers at public secondary schools in Japan.


The various sets of data obtained from the ethnographic research shows that various forms of classroom interactions help students in learning science by making them develop their own identity, as well as a group membership. The analysis reveals that the various out of field activities of the teachers, especially in the urban schools widely help the students in developing solidarity, as the risk of using science language is highly reduced.


This paper reports on interviews with three middle years teachers in South Australia, and focuses on the emotional labour associated with maintaining relationships, the complexity of developing relationships in difficult middle school environments, and how these teachers sustain themselves in this demanding work, not just for a term, or for a year, but over a career.

This study focusing upon teacher identity examines how beginning teacher interns who are part of an alternative route to teacher certification construct a professional identity as science educators in response to the needs and interests of urban youth.


This conference paper draws on a small qualitative study inquiring into the way early career teachers in the Australian state of Victoria have experienced their first and second years of teaching.

In secondary schools within the UK there are many teachers of mathematics who are qualified teachers, but have not been trained to teach mathematics. There are various courses, some of which have been supported by government that ‘retrain’ these teachers so that they are ‘specialist secondary mathematics teachers’ and this paper draws on experience of providing several of such courses.


Previous studies have treated teacher efficacy as a unitary trait without considering how teachers’ expectations of their ability to produce student learning varies within teaching assignments. In this study, teachers in nine restructuring secondary schools in one district estimated their ability to perform common teaching tasks in four of the courses they expected to teach in the coming school year. Although the portion of the variance explained was small, the study found that teacher efficacy was lower for courses outside the teacher’s subject. The effects of teaching outside one’s area were greater than the effects of track and grade — two course characteristics that have been linked to teacher efficacy in previous research. This study also found that teacher efficacy was influenced by teacher leadership roles. Teachers who were expected to promote student learning across subjects had lower teacher efficacy than teachers in traditional positions of added responsibility (department heads) and teachers who were not in leadership positions.


This study examined the influence of field placements settings with varying demographic profiles on pre-service elementary teachers. Data were gathered at three points during the participants’ final year in their teacher preparation program in order to chart changes over time in science teaching self-efficacy beliefs. These measures were supplemented by interviews to investigate attitudes about teaching science in diverse settings.


This study compares teacher candidates who followed three pathways leading to certification in adolescence education while attending the same university. A limited number of factors were held constant among pathways, and only factors inherent to the routes were varied. The dependent variables were (1) teacher effectiveness, as measured through Danielson’s Observation Scale, and (2) teacher efficacy, as measured through Gibson and Dembo’s Teacher Efficacy Scale. No significant differences in efficacy or effectiveness were found, suggesting that the policy of offering a variety of pathways leading to certification might be one that produces similarly qualified teachers.


PhD thesis examining how substitute teachers and training on efficacy impacts upon the individual teacher and the school student.

This investigation examines the difficulties encountered by one graduate teaching assistant as she taught Physics for Elementary Education, a large-enrolment, inquiry-based science course taught at a public Midwestern university. The methodological approach of hermeneutic phenomenology served as the lens to investigate the research question, “What is the lived experience of a graduate teaching assistant as she learned to teach physics through inquiry to elementary education students?” The paper summarises the findings in terms of the blending of two conceptual frameworks: orientations to science teaching and professional identity. It demonstrates the learning that fundamental beliefs about the nature of science support certain orientations, and if those beliefs remain unchallenged, then the orientation is unlikely to change. Finally, it discusses the implications for strategies that may assist college-level instructors with changing their orientation to teaching science.


A report on a three year ethnographic study with an experienced science teacher and describes the role of her positive and negative emotions in constructing her science pedagogy, curriculum planning, and relationships with children and colleagues.
Teacher shortages/attrition


Article that considers how US district administrators craft incentives to attract and retain teachers.


Newspaper article on maths teacher shortages in NSW.


Research on the retention of early career teachers is outlined in this article.


The paper reports data from the first phase of a longitudinal research project (1997-2002) designed to understand more fully the forces that shape the work patterns of beginning and early career teachers both within and outside the classroom. The data reported in this paper focus specifically on the survey, interview and narrative data of University of Sydney graduates. The paper examines features of the pre-service teacher education program that participants perceived as valuable in preparing them to teach alongside the structures that were in place to support and sustain them as they began their professional journey.


An assessment of why there was a problem with training sufficient teachers to meet demand and some solutions to overcoming the issue.

A study of 191 teachers across 27 remote and rural NSW schools.


Contemporary educational theory holds that one of the pivotal causes of inadequate school performance is the inability of schools to adequately staff classrooms with qualified teachers. Contemporary theory also holds that these staffing problems are primarily due to shortages of teachers, which, in turn, are primarily due to recent increases in teacher retirements and student enrolments. This analysis investigates the possibility that there are other factors that might have an impact on teacher turnover levels, and, in turn, the staffing problems of schools, factors rooted in the organizational characteristics and conditions of schools. There are significant effects of school characteristics and organizational conditions on teacher turnover which have largely been overlooked by previous research. The amount of turnover accounted for by retirement is relatively minor, especially when compared to that resulting from teacher job dissatisfaction and teachers
pursuing other jobs. Low salaries, inadequate support from the school administration, student discipline problems, and limited faculty input into school decision-making all contribute to higher rates of turnover. Staffing problems are neither synonymous with, nor primarily due to, teacher shortages in the conventional sense.


An article that investigates the possibility that organisational characteristics and conditions of schools are driving teacher turnover. Data is sourced from a variety of teacher surveys.


A paper that seeks to consider whether the problems that schools have staffing classrooms with qualified teachers is not due to increases in student enrolment or increases in teacher retirements.


Empirical research on the supply and demand of math and science teachers finds some surprising results. The employment of qualified math and science teachers has more than kept pace with the demand, and most schools find qualified teachers for those positions. However, about a third of public schools—particularly high-poverty, high-minority, and urban public schools—have difficulty finding math and science teachers. This is caused by the high rates of teacher turnover in these schools.


This study examines the magnitude, destinations, and determinants of the departures of mathematics and science teachers from public schools. The data are from the National Center for Education Statistics' nationally representative Schools and Staffing Survey and its longitudinal supplement, the Teacher Follow-up Survey.


A paper discussing the past two decades of work in recruiting new minority teachers and the success in recruitment but lack of success with retention.


A research report of attrition of beginning teachers.

This study seeks to empirically ground the debate over mathematics and science teacher shortages and evaluate the extent to which there is, or is not, sufficient supply of teachers in these fields.


This paper considers that in recent years, researchers and policymakers have told us again and again that severe teacher shortages confront schools. They point to a dramatic increase in the demand for new teachers resulting from two converging demographic trends: increasing student enrolments and increasing numbers of teachers reaching retirement age. Shortfalls of teachers, they say, are forcing many school systems to lower their standards for teacher quality.


This report summarizes a series of analyses that have investigated the possibility that there are other factors - tied to the organisational characteristics and conditions of schools - that are behind school staffing problems. It is reprinted from A Research Report Co-sponsored by The Consortium for Policy Research in Education and The Center for the Study of Teaching and Policy, September 2003.


This paper highlights why science teachers are leaving the profession and considers ways that educational researchers and policymakers can improve and retain qualified science teachers in classrooms.


This paper examines several contextual aspects affecting mentoring in the current educational landscape: the differentiated impact of teacher supply, appointment and retention; changing teacher entry and career pathways; an expanded knowledge base for teaching, accompanied by increased accountability; systemic preparation and reward of mentors; and improved communication technology.


This paper provides an overview of national trends that indicate changes in teacher supply and demand and the impacts on the relationship between responses to shortages and comprised quality. The paper concludes by assessing who should take responsibility for working on problems related to teacher shortage and surplus.


Strategies to address teacher shortages.

This conference paper reports on a qualitative study of stakeholders' perceptions of the characteristics of successful teachers in the first three to five years and the factors that support or hinder their development.


This paper presents the findings from a South Australian study of six successful early career teachers (in their 3rd to 5th year of teaching) and their principals. It examines the impact of the principal's role in the development of successful early career teaching in the absence of sustained quality teacher education for teachers in the first five years. The findings reveal what early career teachers and principals want from each other, and how school leaders contribute to the success and ongoing education of early career teachers.


A report stemming from a project commissioned by the NSW Department of Education and Training. This four and a half year research project had the aims of tracking a cohort of final year (2005) pre-service teacher education students through their post-graduation experience into 2006, 2007, 2008 and 2009, in order to understand more clearly the reasons why some early career teachers (ECTs) in NSW public schools choose to leave the profession, and why others choose to remain; and in order to develop strategies to increase the retention rate of effective teachers during their early years of teaching.


In recent years there has been an increase in the number of programs offering support, guidance, and orientation for beginning teachers during the transition into their first teaching job. This study examines whether induction programs have a positive effect on the retention of beginning teachers.


Examines why a teacher shortage is occurring the US in mathematics.
Student impact


Conference paper that considers the supply of teachers in mathematics.


This study examines how and why teacher quality is inequitably distributed, by reviewing research and examining data on school funding, salaries, and teacher qualifications from California and New York—two large states that face similar demographic diversity and educational challenges. The authors find that districts serving the highest proportions of minority and low-income students have about twice as many uncredentialed and inexperienced teachers as do those serving the fewest.


This research examines whether teacher licensure test scores and other teacher attributes affect elementary student achievement. The results are based on longitudinal student-level data from Los Angeles.


Teachers often describe their first teaching job following graduation as a shocking experience. This description raises several questions: Do novice teachers actually have a lower level of coping than experienced teachers? Are there factors in the work environment that make coping difficult for all teachers at a school? This paper compares the ability of novice and experienced teachers to cope with their work, and how this ability is affected by the level of collegial and superior support and collaboration offered. Although we find few differences between novice and experienced teachers’ coping level, these two groups of teachers do differ in terms of the levels of collegial and superior support and collaboration. In addition to receiving a lower level of professional support from their superiors, novice teachers generally lack ways to articulate their own needs to colleagues. The ability of novice teachers to cope with their work should be considered a collective responsibility in schools rather than the fate of the individual teacher. This paper is based on observations, interviews and survey data from Norwegian schools.


This paper presents findings from an impact study of OPD courses in fractions, algebraic thinking, and measurement on 79 fifth grade teachers' pedagogical content knowledge and pedagogical practices as well as their students' mathematics achievement.

The influence of traditional and alternative teacher preparation programs on student achievement and instruction in high-need urban secondary schools was investigated through a mixed-method comparative design. Three research questions were addressed: (a) Does the type of teacher training influence the academic achievement of students in mathematics? (b) Does teacher preparation influence the implementation of the process standards set forth by the National Council of Teachers of Mathematics? (c) Does the frequency with which teachers use process and content standards influence student achievement?


An observation of 12 biology and 12 physics graduates as part of an integrated science curriculum. From this study, it was concluded that informational approaches to teaching were twice as likely to be encountered when the teacher was teaching outside his discipline area and that this was at the expense of more effective problem-solving and inquiry approaches.


This paper reports on a study undertaken with the primary aim of investigating the role of wonder in the learning process. The study was carried out by a 9th grade science teacher in collaboration with a university professor.


This paper focusses on what is viewed as the most important factor in student achievement: the teacher.


The focus of this study was to investigate whether there were differences between the way in-field and out-of-field teachers in Malaysian secondary schools perceived and practiced History education, and the way their students perceived the teaching and learning of History. Both, teacher and student data were examined. A statistical analysis was conducted to validate the survey and test the relationships between variables. The results showed that there were significant differences between in-field and out-of-field teachers in the teacher characteristics of experience and student variables of classroom climate and History learning outcomes, but not on teaching approaches and methods.