

TAKING AN INTERNATIONAL PERSPECTIVE ON "OUT-OF-FIELD" TEACHING:

Proceedings and Agenda for Research and Action from the 1st Teaching Across Specialisations (TAS) Collective Symposium

Edited by Linda Hobbs & Günter Törner

TAS Collective Symposium

August 30-31, 2014

Porto, Portugal

TAS Collective website: www.uni-due.de/TAS

First Published December 2014
by TAS Collective
<https://www.uni-due.de/TAS>

Edited and produced by Linda Hobbs and Günter Törner.

Subjects: College-school cooperation--Australia--Bibliography.
Other Creators/Contributors: TAS Collective.

Visit our website: <https://www.uni-due.de/TAS>

© TAS Collective . All rights reserved 2014

Recommended citation: Hobbs, L., and Törner, G. (Eds.)(2014). *Taking on International Perspective on "Out-of-Field" Teaching: Proceedings and Agenda for Research and Action from the 1st Teaching Across Specialisations (TAS) Collective Symposium*. TAS Collective. Available <https://www.uni-due.de/TAS>

Contents

The TAS Collective	1
The TAS Collective membership list	2
Introduction.....	3
Country Descriptions	4
TAS and the German Context: A Summary of Germany's dealings with TAS.....	5
TAS and the Irish Context	8
TAS in Australia: Out-of-field teaching a common practice	10
Paper Summaries	14
Underqualified Mathematics Teachers or Out-of-Field-Teaching in Mathematics in Germany - The Cultural Framework	15
Policy Change and Teaching Quality: An analysis of out-of-field teaching realities in upper secondary schools in Korea between 2008 and 2013	17
Out-of-field mathematics teaching and the need for professional development: The Irish context	19
The Professional Diploma in Mathematics for Teaching – Upskilling ‘out of field’ Teachers of Mathematics in Ireland	21
Ffunt@OWL - concept of a certificate course for out-of-field teachers in mathematics.....	23
Talking the talk...but walking the walk? How do non-specialist mathematics teachers come to see themselves as mathematics teacher	25
Out-of-field teaching practices as an unresolved global concern influencing teacher quality and effective classroom pedagogies	27
Removing the deficit: Possibilities for learning at the boundaries between in-field and out-of-field teaching..	30
The Practice of Out-of-Field Teaching in Mathematics Classrooms	33
Out-of-field teaching: An international agenda.....	35
An agenda for Research and Action.....	38
Taking an international perspective on research and action.....	39
Conclusion	49

The TAS Collective

Linda Hobbs

The Teaching Across Specialisations (TAS) Collective Symposium was intended to provide opportunities for researchers and educators to collaborate on issues associated with teachers who teach **in specializations for which they have no qualification**, often called “**out-of-field**” (OOF) teaching. The Collective focuses specifically on the issues for mathematics and science, however, anybody with an interest in the issues relating to TAS are invited to be part. The TAS Collective is an email community that designed to share research and practice. It emerged as a way of being in touch others. TAS is a worldwide practice that is named or not named in different ways, so finding others who are exploring the same issues in their contexts has been valuable in both understanding the problem worldwide but also enabling both greater insight into our local conditions that perpetuate the practice, as well as raising possibilities for research and action.

A key action of the TAS Collective has been the decision to ‘meet’. The 1st TAS Collective emerged as an opportunity for face to face sharing of research and practice. Represented at the Symposium were 15 representatives from Australia, Germany, South Africa, Ireland, England and South Korea. The Symposium consisted of presentations relating to the themes of:

- The current state around the world
- Responding to the issue
- Exploring the complexity of out-of-field teaching
- Developing a research agenda

In addition, a number of working sessions enabled focused attention on developing a group response to the issue. This group response has contributed to the “Agenda for Research and Practice” at the end of this volume.

This is an open and inviting group of people. The email list began as two, and now contains 30 members (as of December 2014). We have a website that is currently being developed. At the very least it contains the list of members on the list, and advertises activities of the Collective, and a list of references relating to TAS.



Participants in the 1st TAS Collective Symposium.

From left: Günter Törner, Marc Bosse, Cossette Crisan, Linda Hobbs, Máire Ní Ríordáin, Seo-hyun Kim, Steffen Lünne, Anne Price, Ee-Gyeong Kim, Ji-yoon Ahn, Ji-hye Kim, Jiayi Li, Hyun-jung Kim, Anna du Plessis.

Symposium Planning committee:

Linda Hobbs, *Deakin University, Australia*

Günter Törner, *University of Duisburg-Essen, Germany*

Marc Bosse, *University of Duisburg-Essen, Germany*

David Clark, *University of Melbourne, Australia*

Julie Luft, *University of Georgia, United States of America*

The TAS Collective membership list

(as of December 2014)

Linda Hobbs	l.hobbs@deakin.edu.au
Wayne Melville	wmelvill@lakeheadu.ca
Günter Törner	guenter.toerner@uni-due.de
Colleen Vale	colleen.vale@deakin.edu.au
Marc Bosse	marc.bosse@uni-due.de
Melissa Rodd	M.Rodd@ioe.ac.uk
Richard Ingersoll	rmi@gse.upenn.edu
Anna Du Plessis	anna.duplessis@uqconnect.edu.au
Anne Price	A.Price@murdoch.edu.au
Kari Smith	Kari.Smith@iuh.uib.no
Gina Donaldson	gina.donaldson@canterbury.ac.uk
Cosette Crisan	C.Crisan@ioe.ac.uk
David Clarke	d.clarke@unimelb.edu.au
Julie Anne Luft	jaluft@uga.edu
Coral Campbell	coral.campbell@deakin.edu.au
Jim Watters	j.watters@qut.edu.au
Paul Richardson	paul.richardson@monash.edu
Helen Watt	helen.watt@monash.edu
Ee-gyeong Kim	ekim@cau.ac.kr
Thomas Dee	tsdee1@gmail.com
Andrew McConney	A.Mcconney@murdoch.edu.au
Helen Forgasz	helen.forgasz@monash.edu
Peter Merrotsy	peter.merrotsy@uwa.edu.au
Ní Ríordáin, Máire	maire.niriordain@nuigalway.ie
Merrilyn Goos	m.goos@uq.edu.au
Fiona Faulkner	Fiona.Faulkner@ul.ie
Steffen Lünne	lunne@math.uni-paderborn.de
Raphaella Porsch	porsch@uni-muenster.de
Hyun-Jeong Kim	guswjddl108@hanmail.net
John Kenny	John.Kenny@utas.edu.au

Introduction

By Professor Günter Törner

It is a great pleasure for us, as the leaders of the conference, to hereby present the first preprint of our conference concerning TAS (Teaching Across Specializations), which was held in Porto (Portugal) August 30 – August 31, 2014. We have been arguing about how to name the conference for quite some time: TAS or out-of-field-teaching (OOFT), the term that has been used so far in order to deal with this topic, which is unfortunately only marginally discussed in specialized literature. School pedagogues as well as instructional methodologists are sufficiently aware of the fact that a considerable amount of lessons is taught by teachers who are not adequately qualified in order to teach the respective subject. This is not only due to a shortage of sufficiently qualified teachers, but also due to the fact that there is simply no way around it with regards to the organization of schools: schools rely upon the class-teacher-principle because they don't want to push their students too hard with a large number of subject teachers. This again raises a question that has been brought up repeatedly: Does certification matter?

The issues we are describing with regards to mathematics are also true for other subjects within the STEM-field, in Germany for example for the subject of musical education. If we focus on other subjects, do they face the same problems that we are faced with in mathematics? Will the problem become more and more acute or will it resolve itself? Is a teacher after 10 years of out-of-field teaching still out-of-field? Can we reach these teachers with the regular vocational training? Is their profile in terms of Continuous Professional Development the same as that of other teachers? In how far does the account of such an out-of-field teaching teacher differ from the account of a trained and qualified teacher? Do students notice the possibly existing deficits? Do we find expression of that in student assessment? Can we identify out-of-field teaching teachers during the actual lessons? These are just a few questions that have not adequately been dealt with in specialized literature and we have definitely not finished discussing them either.

The TAS-phenomenon affects our school system and our educational system in general on a great variety of different levels. Of course, it is relevant with regards to the problem of teachers' allocation and requirement; what's also interesting – maybe even more so – are the implications for the individual schools, the individual teachers, their specific lessons and last but not least the implications for students' learning processes. We still need to characterize the influence of out-of-field teaching regarding these specific zoom-stages within the education system and we surely haven't understood it completely.

What we have learned from this conference and what you can find in the summaries is the fact that the phenomenon is highly culturally embedded. We can offer inventory for specific countries and give first examples of fundamental theories, which can serve as a background for an academic analysis of observations. All of this is merely a first step which gives us reason to tackle more questions and issues in an academic way and motivates us to mobilize more fellow colleagues.



Country Descriptions

TAS and the German Context: A Summary of Germany's dealings with TAS

Marc Bosse & Günter Törner
University of Duisburg-Essen,
Germany

Terminology – What is considered as out-of-field in Germany?

In the following, when we will outline some general characteristics of the German out-of-field teaching, the German educational policy comprises a federal system. Each of the 16 federal states (*Bundesländer*) has the independent competence in education and therefore, the German educational system is not homogeneous. Certain things we are going to talk about are true 'in general' – but some federal states prescribe other rules and laws.

In Germany, teachers are politically and juristically not considered as out-of-field in a subject if they have a formal qualification – the so-called *Lehrbefähigung* – for teaching it. Usually, teachers study two subjects at university until they gain a master degree in both of their subjects. These studies at university comprise the content of the subjects, an education in the didactics of both subjects, method courses and some basics in general pedagogy, as well as two internships in school, which take about one semester.

After graduating, prospective teachers go into teacher training at school. Moreover, they attend pre-service courses at a teacher training college (*Studienseminar*) and are assessed and supervised by experienced teacher educators in both subjects as well as in general pedagogy. By the end of this second phase of teacher training, which takes up to two years (depending on

the requirements of the federal state), teachers graduate by completing their second state examination (*Zweites Staatsexamen*) in both of their subjects.

Primary teachers as well as (lower resp. upper) secondary teachers gain their formal *Lehrbefähigung* for teaching a specific subject at a specific school level, when they have gained both a master degree and the second state examination in their subject. At this point, teachers have the formal right to apply for appropriate job vacancies within the school system.

Besides, in some German federal states there are other possibilities of gaining the formal qualification for teaching a third subject which has not been studied at university. By means of an additional two years course in scarce subjects like mathematics or physics, teachers are able to gain their *Lehrbefähigung* for teaching this third subject extra-occupationally.

Then again, teachers with a diploma but without the second state examination in a subject are considered as out-of-field. As a consequence, the group of out-of-field teaching teachers as well as the group of formal qualified in-field teachers are both heterogeneous concerning their actual subject-related competences.

Status of the Teaching Professional

The status of the teaching professional and the corresponding teacher education system as a framework for becoming a professional teacher in Germany are both schizophrenic: On the one hand, the qualification procedure takes a long time (about seven years) and prospective teachers

have to pass two examinations in two subjects and in general pedagogy. Therefore, becoming a formal qualified teacher in Germany is a rigorous and strictly regulated administrative process.

On the other hand, once teachers are formally qualified and work at school, the school principal is legally allowed to assign them any subject – except for theology – without any explanation.

As a consequence, young teachers employed on the basis of temporary contracts consent in teaching a subject they are not qualified for (and do not like) because of the prospect of getting a permanent job. Other teachers agree to teaching a subject out-of-field because they have liked it during their own schooldays (Bosse & Törner, 2014). It is questionable whether such teachers are actually able to work in the field of the subject at a professional level.

Extent/Incidence/ Distribution of TAS

There is only little research aiming at a quantification of the TAS phenomenon. A recent study claims to show that up to 36% of mathematics teachers, up to 31% of biology teachers, up to 25% of chemistry teachers and up to 34% of physics teachers teaching in grade 9 have no formal qualification for teaching the respective subject (Richter, Kuhl, Haag, & Pant, 2013). Another inquiry lets us assume that up to 34% of German teachers and up to 50% of mathematics teachers in primary schools teach out-of-field (Richter, Kuhl, Reimers, & Pant, 2012).

However, due to methodological problems these numbers are with reservation (cf. Richter et al., 2013, p. 375). We have to assume that the actual numbers are even larger.

Concerning the subject mathematics, there is an undersupply of qualified

teachers. Strictly speaking, we have to distinguish between teachers of grades 1 to 4 (primary school), 5 to 9 (lower secondary school) and 10 to 12 (upper secondary school): It depends on the year level whether mathematics classes are rather taught out-of-field or not.

In primary school, each class teacher must regularly teach mathematics due to the class teacher principle. Until only recently, many federal states allowed graduating with a formal qualification as a primary school teacher without having studied mathematics at university. It is obvious that mathematics as qualifying subject at university is not very popular and that it is often avoided. Accordingly, the percentage of teachers without a formal qualification for mathematics is relatively large and mathematics in primary school is relatively often taught out-of-field. We cannot deny a certain disregard on the part of the school board if they think that mathematics can somehow be taught by every teacher in the first four years of children's education.

In secondary school, mathematics is taught – depending on the school type – either by a formal qualified teacher or by an out-of-field class teacher. If mathematics is taught out-of-field by class teachers, these teachers have often bypassed the challenging education at university. We should underline that secondary schools practicing the class teacher principle rather address low-performing students. This leads to an overlapping of two negative effects: Low-performing students are taught by an out-of-field teaching teacher who teaches mathematics on the surface as

a well-defined system of rules which has to be learned and whose procedures have to be followed.

Apart from these systemic structural deficiencies, secondary schools are affected by a general shortage of mathematics teachers.

Response: Nationally and at School Level

In the wake of the above-mentioned studies, politicians and administrators have become more sensitive to the phenomenon. Nevertheless, official statistics about TAS are almost not available as the school principals are responsible for assigning teachers to a subject or a year level. Oppositions in parliaments request official statistics on the distribution of TAS due to political reasons, especially regarding the STEM subjects (Bürgerschaft der freien und Hansestadt Hamburg, 2013; Landtag von Baden-Württemberg, 2013). In the case of the federal state of Hamburg, only non-aggregated data on the number of out-of-field taught lessons per year, school and year level has been provided after the opposition had requested the data.

Keeping in mind that that the schools have the administrative decision-making authority, it is not surprising that the ministries do not keep detailed statistics. In this regard, it seems as if the out-of-field teaching phenomenon is officially tabooed in Germany.

Professional development courses for supporting out-of-field teaching teachers are rare. Certification

programs organized by formal qualified teachers on demand of the local governments exist in some federal states; however, these courses are planned – more or less – at the responsible teacher's own discretion.

Since 2014, the German Centre for Mathematics Teacher Education (DZLM) has been providing courses explicitly addressing out-of-field teaching mathematics teachers and their needs in the federal states of Saarland and Bavaria as well as in the province of Detmold in the state of North Rhine-Westphalia. As a response to the discrepancy between the deficient status of TAS related research on the one hand and the actual figures of out-of-field teaching teachers on the other hand, the DZLM researchers strive to carry out research on the TAS phenomenon as one of their main assignments (Bosse, 2014; Bosse & Törner, 2013).

At the school level, teachers sometimes organize themselves in order to cope with the problem: Out-of-field teachers work together when preparing lessons, in-field teachers offer help and collaboration, institutionalized communities of practice (Wenger, 1998) build frameworks for compensating the missing subject-related training of a part of the teaching staff. However, it has to be emphasized that although the out-of-field teaching phenomenon is part of the everyday school life, it has not been systematically integrated in schools' workflows on the part of the administration. Whether the out-of-field teaching phenomenon can be mastered or not, lies – at least at the moment – in the hands of the teachers at school.

References

- Bosse, M., & Törner, G. (2013). Out-of-field Teaching Mathematics Teachers and the Ambivalent Role of Beliefs – A First Report from Interviews. In M. S. Hannula, P. Portaankorva-Koivisto, A. Laine, & L. Näveri (Eds.), *Current state of research on mathematical beliefs XVIII. Proceedings of the MAVI-18 Conference* (pp. 341–355). Helsinki.
- Bosse, M. (2014). Wie können fachfremd unterrichtende Mathematiklehrkräfte durch Lehrerfortbildungen effektiv unterstützt werden? In J. Roth & J. Ames (Eds.), *Beiträge zum Mathematikunterricht 2014* (pp. 221–224). Münster: WTM-Verlag.
- Bosse, M., & Törner, G. (2014, September). *The Practice of Out-of-Field Teaching in Mathematics Classrooms - A German Case Study*. Presentation at the 20th MAVI Conference, Falun (Sweden).
- Bürgerschaft der freien und Hansestadt Hamburg. (2013). *Drucksache 20/9979: Wird der Unterricht in Mathematik und Naturwissenschaften in Stadtteilschulen und Gymnasien gleichwertig von Fachlehrkräften erteilt?*

- Landtag von Baden-Württemberg. (2013). *Drucksache 15/4308: Lehrbefähigung der Lehrerinnen und Lehrer in den naturwissenschaftlichen Fächern und in Mathematik*. Retrieved from http://www9.landtag-bw.de/WP15/drucksachen/Txt/15_4308.pdf
- Richter, D., Kuhl, P., Haag, N., & Pant, H. A. (2013). Aspekte der Aus- und Fortbildung von Mathematik- und Naturwissenschaftslehrkräften im Ländervergleich. In H. A. Pant, P. Stanat, U. Schroeders, A. Roppelt, T. Siegle, & C. Pöhlmann (Eds.), *IQB-Ländervergleich 2012. Mathematische und naturwissenschaftliche Kompetenzen am Ende der Sekundarstufe I* (pp. 367–390). Münster/New York/München/Berlin: Waxmann.
- Richter, D., Kuhl, P., Reimers, H., & Pant, H. A. (2012). Aspekte der Aus- und Fortbildung von Lehrkräften in der Primarstufe. In P. Stanat, H. A. Pant, K. Böhme, & D. Richter (Eds.), *Kompetenzen von Schülerinnen und Schülern am Ende der vierten Jahrgangsstufe in den Fächern Deutsch und Mathematik. Ergebnisse des IQB-Ländervergleichs 2011* (pp. 237–250). Münster: Waxmann.
- Törner, G. & A. (2012) Underqualified math teachers or out-of-field-teaching in mathematics - a neglectable field of action? Chapter in Blum, W. et al. (2012) *Mathematikunterricht im Kontext von Realität, Kultur und Lehrerprofessionalität*. Festschrift zum 60. Geburtstag von Gabriele Kaiser. Berlin: Springer, S. 196-206.
- Wenger, E. (1998). *Communities of Practice: learning, meaning, and identity*. Learning in Doing. Cambridge et al.: Cambridge Univ. Press.

TAS and the Irish Context

Máire Ní Ríordáin

NUI Galway, Ireland

Terminology – What is considered out-of-field in Ireland

TAS is has not been widely investigated in the Irish context. The only research study to be undertaken was in the area of mathematics education (Ní Ríordáin & Hannigan, 2009). The definition of out-of-field teaching employed in the Irish context for this study was that of ‘teachers assigned by school administrators to teach subjects which do not match their training or education’ (Ingersoll, 2002, p.5). Therefore, these teachers generally possess a teaching qualification but will have little or no training or education in the area of mathematics education. The Teaching Council of Ireland has been established since 2006 in order to promote teaching as a profession and to regulate standards within the profession and have adapted this definition of out-of-field into their policy documents (Teaching Council, 2011). In order to teach mathematics¹ in a post-primary school in Ireland, the Teaching Council stipulates that teachers must:

- Have studied Mathematics as a major subject in the degree extending over at least three years and of the order of 30% at a minimum of that period.
- Provide details of the degree course content to show that the

breadth and depth of the syllabi undertaken are such as to ensure competence to teach Mathematics to the highest level in post-primary education.

- Provide explicit evidence of standards achieved in degree studies in Mathematics with at least an overall Pass result in the examinations in Mathematics.

(Teaching Council, 2009)

Status of the Teaching Professional

Teaching is well regarded within the Irish context. The majority of post-primary teachers gain qualification in two subject areas. There are specific qualifications required to teach at primary level education. No quotas exist in terms of subject areas/teacher needs so generally initial teacher education programmes are oversubscribed and many graduates emigrate in order to seek employment. Conditions of employment tend to be short-term and contractual and based on hours teaching each week (maximum of 22 hours for post-primary teachers). Therefore many newly qualified teachers end up on temporary contracts with a limited number of hours. With the establishment of the Teaching Council (2006), greater emphasis has been placed on teaching as a profession within the Irish context. The Teaching Council is a statutory body, is the regulator of the teaching profession and promotes professional standards in teaching. It acts in the interests of the public good while upholding and enhancing the reputation and status of the teaching profession. All teachers have to register with the Teaching Council in order to be permitted to teach at any level of education and subject qualification is noted on registration for post-primary teachers. However, at a post-primary school level,

deployment of teachers to teach particular subjects/year groups is at the discretion of the Principal. There is no regulation in terms of out-of-field teaching. Similarly, there is no history of engagement in professional development by in-service teachers. The Teaching Council are currently moving towards continuous professional development being a condition of annual registration, which may promote a greater culture of engagement in further professional studies.

Extent/Incidence/Distribution of TAS

The following are key findings from in relation to out-of-field (OOF) mathematics teaching in the Irish context (Ní Ríordáin & Hannigan, 2009):

- 48% of the teachers did not have a mathematics teaching qualification.
- The OOF teachers taught an average of 10 hours of mathematics a week with a range of 1 to 22 hours. 25% of teachers taught less than 7 hours of mathematics a week.
- The most popular subjects for OFF teachers to teach with mathematics were science (33%), Business Studies (18%), Biology (15%), Resource (14%), Chemistry (13%), CSPE or SPHE (13%), ICT (12%), Physics (11%) and Accounting (11%).
- Of the 156 (48%) of teachers without a mathematics teaching qualification, 35% had a BSc. primary degree (without a significant mathematics component), 34% had a B. Commerce /Business primary degree (without a significant mathematics component) and 27% had a concurrent teacher education degree without mathematics.
- In total, teachers without a teaching qualification in mathematics were teaching 6,294 students in the 51 schools compared to 14,579 students who were taught by teachers with a teaching qualification in

¹ Criteria are changing from January 2017 in which newly qualified mathematics teachers will be required to have studied 60 ECTS credits of mathematics in specific content areas in their degree programmes.

mathematics. The total number of students taught by the teachers who responded to the survey was 20,873 students. According to the Department of Education website there are 26,634 students in the 51 schools so the teachers who responded teach 78% of students in those schools. 22% of the students in the schools are, therefore, taught by the teachers who did not respond to the survey.

- Qualified mathematics teachers are primarily assigned to Higher and Ordinary Level mathematics classes, and particularly the examination years. Out-of-field teachers for the most part are assigned Ordinary Level (non-exam years in particular), Foundation, LCA (Leaving Certificate Applied) and resource teaching hours. Therefore, younger and weaker students are generally taught mathematics by OOF teachers.
- Older teachers tended to be more likely to have a teaching

qualification in mathematics. Only 40% of the teachers aged 35 or under had a teaching qualification in mathematics compared to 65% of the teachers aged over 35.

Response: Nationally and at School Level

All stakeholders in Irish education agreed that any new initiatives in mathematics education could not be successfully implemented and the existing issues could not be resolved without significant improvements in the quality of mathematics teaching. While changes and improvements in initial teacher education in mathematics will lead to improvements long term, compensatory actions such as continuous professional development and other up-skilling opportunities were considered necessary to improve quality and support practicing teachers in the

medium term. The Irish government resolved to tackle this issue by funding a programme to up-skill these 'out of field' teachers of mathematics. Accordingly a 'Professional Diploma in Mathematics for Teaching' (PDMT) is currently being delivered by the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL) in the University of Limerick, Ireland. The PDMT commenced in September 2012 and the Government has funded three intakes (approximately 300 teachers per intake). The PDMT is a two-year, part-time, blended learning, national programme with a focus on developing teachers' content knowledge (60 credits of mathematics) and pedagogical knowledge (15 credits of mathematics pedagogy related material). At a local level, Principals have welcomed this initiative and are encouraging OOF teachers of mathematics to participate in the up-skilling.

TAS in Australia: Out-of-field teaching a common practice

Ann Price

Murdoch University,
Australia

Linda Hobbs

Deakin University, Australia

Terminology – what is considered out-of-field?

In Australia the term most commonly used is *Teaching Out Of Field* (TOOF).

Examples of the term used in public reports include:

- McKenzie, P.; Rowley, G.; Weldon, P; Murphy, M, 2011, “Staff in Australia’s School 2010: Main report on the survey”
- Australian Government Productivity Commission, 2012, Schools Workforce Productivity Commission Research Report.
- McConney, A and Price, A., (2009). An assessment of the phenomenon of “Teaching-out-of-Field” in WA schools.

A definition is: *Teaching “out-of-field” means teaching in a subject or field for which the teacher has neither a major or minor tertiary (university) teaching qualification. Also it means teaching at a level of schooling (e.g.) primary for which a teacher is not formally qualified* (McConney and Price, 2009). A teacher is considered “in-field” in mathematics, for example, if they hold a major or minor in tertiary mathematics as well as a teacher qualification that includes teaching methods in mathematics.

There are two main categories of ‘out of field’ mathematics and numeracy teachers:

- Teachers of other subject areas who only occasionally teach mathematics or teach only a class ... who are unlikely to identify themselves as ‘mathematics teachers’.
- Teachers originally from other subject areas or primary teachers who now identify as mathematics teachers but lack qualifications which provide content expertise.

(National Numeracy Report, COAG, 2008)

In all states and territories apart from New South Wales teachers graduate and are registered as “Teachers”, but not as subject specialists (such as a Maths teacher), or teacher for a year level (such as a primary teacher). In New South Wales, teachers are accredited with Approval to Teach certain subjects. School appointment is at the discretion of the Principal, therefore, schools can appoint a teacher at any year level for any subject area, even in New South Wales.

Status of the teaching professional

While this is difficult to establish beyond anecdotes, indicators of status include relative salaries, level of education required, and teacher satisfaction.

Teachers’ salaries represent the largest single cost in formal education and have a direct impact on the attractiveness of the teaching profession. They influence decisions to enroll in teacher education, become a teacher after graduation (as graduates’ career choices are associated with relative earnings in teaching and non-teaching occupations, and their likely growth over time), return to the teaching profession after a career interruption,

and/or remain a teacher (as, in general, the higher the salaries, the fewer the people who choose to leave the profession) (OECD, 2005). OECD says that experienced teachers salaries in Australia have not changed in real terms 1995 – 2009 (Productivity Commission, 2012, p. 111), and that teacher salaries have not been keeping pace with salaries of other professions. The *OECD At a Glance Report 2014* indicate that Australian teacher salaries are only slightly above the OECD average and well below South Korea, Japan and Finland.

While there are alternative entry pathways in to PST courses for non school leavers, the most common pathway into pre-service teacher education courses for school leavers is via the Australian Tertiary Admissions Rank (ATAR). The ATAR denotes a student’s ranking relative to his or her peers upon completion of their secondary education. For example, an ATAR score of 99.0 means that the student performed better than 99% of his or her peers, and ranks lower than 0.95% of peers (as the maximum score is 99.95). Teacher education courses within Universities set their own ATAR level each year. There has been significant public debate recently that has been critical of the relatively low ATAR score used by many Schools of Education. The entrance score for a Bachelor of Education could be below 70 for example where as entry into veterinary science, dentistry or engineering could be above 90. In a bid to “raise the caliber” of teaching graduates there have been calls for a minimum ATAR, for example an ATAR of 70 in Western Australia (Sunday Times) and 80 in New South Wales have been suggested for education courses. Alongside this have been calls for Entry or Graduation level literacy and numeracy testing of PSTs. A Teacher Education Ministerial Advisory

Group (TEMAG) has been established to investigate the “right mix of academic and practical skills needed for the classroom” (TEMAG website see Issues paper, TEMAG 2014). The group is due to report to the Federal Government in 2014.

The Staff in Australia’s Schools survey (SiAS, 2011, p. xix) reported that while teachers indicated generally high levels of satisfaction for the job with regard to relationships with colleagues and parents/guardians, one of the areas of least satisfaction was “*the value society places on teacher’s work*”. Similarly school leaders nominated “*a more positive public image of school leadership positions*” as an important strategy to attract and retain leaders.

Extent / incidence / distribution of TAS

The Productivity Commission (2012) report noted that some subject-based shortages in Australian Schools were substantial. The 2010 Staff in Australia’s School Survey (SiAS) estimated there were 400 unfilled positions for mathematics in secondary schools and that 8% of schools had such a vacancy. The Commission noted that there is evidence to suggest that Australian students are more likely to be enrolled in schools with a lack of maths and science teachers than other OECD countries. Also in the 2009 PISA data 30% (24%) of 15 year olds were enrolled in schools where school leaders reported a lack of mathematics teachers. The OECD average is about 18%. “*A large body of anecdotal evidence suggests there is a reliance on out-of-field teachers in particular secondary subjects*” (p 90). The commission notes that it is difficult to determine how widespread TOOF is “*a range of surveys indicate that somewhere between 15-25% of teachers in some subjects are not qualified for the role.*” (p 90). The magnitude in some subjects has increased over time. The 2011 Staff in Australia’s Schools survey estimated more than half teachers in IT and lower secondary maths did not have a three year

qualification in the subject as did 50% in upper secondary physics (p 90).

The recent Australian Council of Learned Academies (ACOLA) Report, (Marginson et al., 2014) drawing on data from various reports, claims that 38% of students in Year 7-10 did not have a mathematics teacher with two tertiary level mathematics. 39% of teachers were regarded as out-of-field, and 23% had no tertiary mathematics at all. Twelve percent of Year 11 and 12 teachers in metropolitan areas and 16% in rural areas were out-of-field.

Based on 535 survey responses from a 2007 and 2008 study the overall rate of teaching out-of-field in Western Australia was estimated at 24 %. Given the response rate the researchers can be 95% sure that the true percentage of the actively teaching population teaching out-of-field in WA schools was between 20% and 28% (McConney and Price, 2009). The report found that the incidence of TOOF was higher in Catholic and Independent schools and considerably higher in country schools across all sectors. Relief (substitute) teaching or teaching in primary school without a primary qualification was cited as the main reasons.

Interestingly, a plurality of teachers teaching out of field had over 21 years experience – calling into question conventional wisdom that it is often new teachers assigned to teach out-of-field (McConney and Price, 2009).

There has been an acknowledged lack of available data in Australia on pre service teacher education and the teaching workforce. The 2007 annual Staff in Australian Schools survey (SiAS) made the recommendation to “develop a process to achieve common core data sets and definitions” (National Teaching Workforce Dataset [NTWD], 2014, p.10). In the following years a series of committees and working groups were established under the auspice of the Teacher Quality National Partnership (TQNP) agreement between the federal and state governments:

“*A key reform under the TQNP was to improve the quality and availability of teacher workforce data to inform workforce*

planning. Better data is needed to assess current teacher shortages, identify future career intentions and the impact of significant events (such as the global financial crisis) on teacher labour markets, as well as potentially informing national teacher labour reforms being developed and implemented under the TQNP” (NTWD, 2014,11).

The ACOLA Report (Marginson et al., 2014) recommends that

“*a national timetable for elimination of out of field teaching in STEM in Australia, coupled with monitoring of graduates from teacher training and rigorous discipline-specific professional development training programs, linked to monetary incentives and leading to a qualification, for teachers currently teaching ‘out of field’ in science and maths*” (p. 23).

State-based figures derived from education unions and subject associations have the figures higher still. In Victoria and New South Wales, the incidence of out-of-field teaching is at 40% or above in mathematics and around 15% to 18% for mathematics (see State of Our Schools Survey 2010, AEU for Vicotiran figures and MANSW Discipline Profile of the Mathematical Sciences, 2104 for New South Wales).

Possible causes of subject shortages

The Australian Government’s Productivity Commission Report (2012) speculated on a number of factors that contribute to subject shortages. The report noted that the greatest subject shortages occur in subjects where remuneration for the relevant subject specific knowledge is much higher outside of teaching. In Australia teacher pay schedules within awards do not differentiate between subject areas. The report also noted that there was a small pool of graduates in maths and sciences across the board, as a result of a continuous decline in numbers of students selecting maths or sciences in Year 12 (p 91). Reasons postulated were that secondary students might view these subjects as difficult and irrelevant or that it might be as a result of the way they have been taught in Primary School. Geographical factors were also considered to be influential as it was

often difficult to attract qualified teachers to some of Australia's very remote locations. In these locations unqualified teachers are often allowed to teach with a Limited Authority to Teach (or Permission to Teach) certification. However most schools assign teachers out of field and / or narrow subjects offered due to lack of staff. Regardless of the causes, the Productivity Commission reflected a generally held although not uncontested view that student learning could be compromised whether by reducing subject range or resorting to out-of-field teaching (p95).

Responses nationally

The Australian Government 2012 Productivity Commission report emphasised the need to address imbalances in teacher supply and demand in Australia. In particular it noted the

“persistent surpluses of general primary teachers in metropolitan areas” and “at the same time shortages in certain secondary disciplines, and more generally in rural, remote and Indigenous schools. Some low socioeconomic status schools in urban areas are also difficult to staff. And there are reports that special-needs teachers are in short supply (p 87)”.

The Commission suggested a number of changes to policy settings that could improve the demand-supply balance some of which have relevance for discussions around teaching out-of-field. These include:

- A more targeted approach to university fee repayment discounts for pre service training, eg. in high needs areas.
- A more flexible approach to discipline-specific knowledge required by the national accreditation body (AITSL) to enter postgraduate teaching courses. E.G. skills learnt in “highly-related degrees should be considered evidence of sufficient content knowledge.
- Consider trialling measures that enable principals to use

remuneration incentives to fill hard to staff positions.

The introduction of Pre Service Teacher Education national standards by AITSL can be viewed as something of a Catch-22 in that while their aim is to raise teacher professional standards they may limit the number of high quality individuals eligible to enter a Post Graduate course without a discipline specific qualification. An example might be an Engineering graduate may not have completed the required number of maths specific units and therefore not eligible to enrol in a Maths Secondary teaching program. The Commission (2012) therefore urged AITSL to revisit its accreditation standards to

“take account of subject knowledge gained outside traditional discipline programs. Specifically, the criteria for determining whether an individual has sufficient content knowledge to teach a particular subject should be broadened to include skills learnt both in more specific degrees and through professional experience” (p. 107).

Provision for supporting guidelines and independently administered subject knowledge tests could be used to assist universities to assess subject knowledge.

Government and non government operators have introduced initiatives to address shortages but the Commission (2012) considers there has been a paucity of publicly available Australia specific program evaluation and there is a particular need for a greater understanding on the impact on teacher quality (p. 101).

In NSW Teacher Retraining programs have been established with the provision of funding for current teachers to reskill into disciplines (for example, maths, science, IT special-needs and LOTE). The scheme includes full payment of university course fees and allowances on top of usual salary but graduates must agree to teaching in a designated ‘hard to staff’ school for a certain period. The Commission (2012) recommended that some TOOF teachers would be suitable candidates for such programmes and this is supported by the OECD (2012), which

advocates improvements to content knowledge of TOOF as a short-term way to ameliorate its impact until other measures take effect (2012, p103).

As a response to the policy initiative to move students in Year 7 of Primary School To Secondary, the Western Australian state government developed the SWITCH program as a way to address the estimated shortage of 1000 suitably qualified Secondary teachers. Universities tendered for the program. As an example Edith Cowan University in WA delivered the Graduate Certificate in Education (Social Science Education) in 2014. The aim was *“to build subject content knowledge to ensure they can teach lower secondary S&E with confidence”.*

The course comprised four units available on line and able to be completed part time over two semesters. The WA Department of Education paid for the fees and teacher relief for any on campus requirements. Similarly primary teachers from Queensland, which also had Year 7 in primary school, are being encouraged to upgrade to secondary teachers through the following ways (Queensland College of Teachers):

- enrolling in miscellaneous units (including from a secondary preservice teacher education program) to build an appropriate sequence of units in the chosen field/s and competency in subject-specific pedagogy
- enrolling in a Graduate Certificate in the chosen field/s
- completing specific professional development courses/further study required by the employer.

In Tasmania, the STEMCrAFT Project from University of Tasmania has been developed to assist out-of-field STEM teachers to judge the usefulness of a STEM resources for their teaching.

The Productivity Commission (2012) suggested that technology offers the potential for schools to provide alternative modes of delivery where qualified teachers are unavailable especially in remote locations (p 109).

More potentially controversial though was the Commission's suggestion for subject-based incentives or remuneration. Currently some state Principals can offer up to \$7000 extra but uptake is rare perhaps as a result of a sense of a culture of unfairness (p 113). The commission notes though that differentiated remuneration for teachers does exist in UK and Sweden where, while it was originally unpopular, the practice has grown in acceptance even among unionised teachers. Wage differentiation also exists in a number of OECD countries including Finland and Korea. Other international studies found variations in pay important determinant of recruitment and retention of teachers (p 114).

Responses at School Level.

Staff supply and demand issues present Principals with the need to make choices about how best to

manage the imbalances that can occur annually or throughout the year. Fairly large numbers of principals reported they have difficulties in suitably filling staff vacancies across all areas of the curriculum. Six percent in the primary and 9% in the secondary sector report it is a major difficulty with a further 21% primary and 31% secondary reporting it as a moderate difficulty. Government schools reported the greatest difficulties (SiAS 2011, p. xx). The highest rates of unfulfilled vacancies in secondary schools were reported in Maths. Eight percent reported at least one vacancy for maths, five percent English and six percent LOTE. The SiAS survey (2011 p 194) also noted that Principals' perceptions of difficulties in filling vacancies by Aboriginal and Torres Strait Islander focus schools is considerable higher. With 35% ranking it as a major difficulty as compared to a figure of 9% for all schools. Suggesting that the incidence of TOOF for schools

with high numbers of Aboriginal and Torres Strait Islander students is likely to be high.

Principals identified a number of strategies they use at the school level to address these imbalances. These strategies included requiring teachers to teach out of field (15% Government principals, 5% Catholic, 19% Independent). Alternatively they could combine classes across year level or recruit teachers on short-term contracts. The use of these strategies was more prevalent among Secondary Principals for whom assigning teachers to teach out of field was reported by 47% Government, 57% Catholic and 14% Independent Principals. One quarter reported recruiting less qualified teachers or teachers on short-term contracts as a strategy to address imbalances.

References

- Australian Government Productivity Commission (April 2012). Schools Workforce Productivity Commission Research Report. http://www.pc.gov.au/_data/assets/pdf_file/0020/116651/schools-workforce.pdf
- Australian Government (2014) National Teaching Workforce Dataset Project Report: Retrieved Oct 31 2014 from <http://docs.education.gov.au/node/36285>
- Du Plessis, A.E., Carroll, A., and Gillies, R.M. (2014a) The meaning of out-of-field teaching for educational leadership. *International Journal of Leadership in Education*, . doi:10.1080/13603124.2014.962618
- du Plessis, A.E., Gillies, R.M. and Carroll, A. (2014b) Out-of-field teaching and professional development: a transnational investigation across Australia and South Africa. *International Journal of Educational Research*, 66 90-102.
- Hobbs, L. (2012). Teaching out-of-field: Factors shaping identities of secondary science and mathematics. *Teaching Science*, 58(1), 32-40.
- Hobbs, L. (2013). Teaching 'out-of-field' as a boundary-crossing event: Factors shaping teacher identity. *International Journal of Science and Mathematics Education*, 11(2), 271-297.
- Marginson, S., Tytler, R., Freeman, B., & Roberts, K. (2013). STEM: Country comparisons: International comparisons of science, technology, engineering and mathematics (STEM) education. Final report. Australian Council of Learned Academies, Melbourne, Vic. Accessed 29/10/2014 at http://www.acola.org.au/PDF/SAF02Consultants/SAF02_STEM_%20FINAL.pdf
- McConney, A and Price, A., (2009). An assessment of the phenomenon of "Teaching-out-of-Field" in WA schools. (Report prepared under contract to Western Australian College of Teaching.)
- McKenzie, P.; Rowley, G.; Weldon, P; Murphy, M. (2011). "Staff in Australia's School 2010: Main report on the survey" . http://research.acer.edu.au/tll_misc/14
- National Teaching Workforce Dataset Project Report. Canberra: Australian Government (2014). National Teaching Workforce Dataset Project Report. Canberra: Australian Government. http://docs.education.gov.au/system/files/doc/other/ntwd_project_report.pptx
- OECD (2014). *Education at a Glance 2014: OECD Indicators*. OECD Publishing. <http://dx.doi.org/10.1787/eag-2014-en>
- Sharplin, E.D. (under review). Teaching out-of-field: The experiences of rural teachers. Educational Research.
- Teacher Education Ministerial Advisory Group (TEMAG) (2014). Teacher Education Ministerial Advisory Group Issues Paper. Canberra: TEMAG. From http://studentsfirst.gov.au/files/temag_issues_paper_-_april_2014_4.pdf



Paper Summaries

Underqualified Mathematics Teachers or Out-of-Field-Teaching in Mathematics in Germany - The Cultural Framework

Günter Törner

University of Duisburg-Essen,
Germany

It is our intention to present a short report on the issues of out-of-field teaching (OOF) with its cultural specifics in Germany (for a larger summary see Törner & Törner, 2012).

First of all, Germany is very complicated with respect to the administrative structures in school education. Germany consists of 16 federal states with each state having independent competence with regards to its educational policy.

We can say that the situation is somehow schizophrenic: The process of admission for becoming an official school teacher is carefully regulated. Prospective teachers need to pass their university studies (for teachers), they need to obtain a degree, then pass their preparatory courses (which takes about one to one and half years) and finally pass some kind of examination. However, the question of being hired and finally being engaged with tenure depends on the market (and the scores he/she has obtained in his/her final examination).

The Administrative Part

There is a lack of mathematics teachers, who are able to teach the subject; hence, mathematics has to be taught by formally not qualified teachers. This phenomenon has been ignored and tabooed for a long time, but meanwhile politicians have become aware of the problem. The recently founded National Center for Professional Development of

Mathematics (DZLM) explicitly attends to qualify these out-of-field teaching mathematics teachers. By doing so, the topic clearly has been brought up for political discussion. However, we cannot neglect that also other subjects (e.g. Music) need to compensate a shortage of formally qualified teachers.

Without going into further details - The lack of mathematics teachers for lower and upper secondary grades is a problem which is caused by universities **and** the educational administration in equal parts. However, since it's the school principals who need to guarantee lessons which meet the demand, it is finally up to them to arrange the allocation of their teachers on a local level. Unfortunately, the ministries themselves don't really engage in this process, which makes it hard to get a hold of reliable data.

The Problem of Terminology

To some extent we can say that the term *out-of-field-teaching*, which is commonly used in Germany, is discriminatory: The term implicitly states a certain deficit on the part of the respective teacher, which doesn't facilitate the process of getting support. Therefore, we have come to realize: If you intend to support teachers, you need to cherish their work and value them first. In terms of academics there is a question which calls for careful consideration: Is an OOF-teacher after ten years of practice still OOF? OOF-teachers might actually be much more engaged than formally qualified teachers! How can we measure *qualification*? Certainly not by 0 or 1! Should we offer vocational training specifically designed for this group of teachers or address them

together with others? Indeed, there are opposing opinions. We have decided to assess the *out-of-field* status of a teacher based on formal criteria, even though we know that the respective teacher would possibly not be considered as OOF in different educational cultures. The continual discussion on the conference's name *Teaching Across Specialization* versus *Out-of-Field-Teaching* has clearly underlined this conflict in terminology.

The Problem of Quality

During our investigations in the context of Marc Bosse's PhD thesis, we have come to the following conclusions: (a) OOF-teaching in primary grades is quite different from teaching in lower and upper secondary grades. The lack of formally qualified mathematics teachers in primary schools is basically rooted within the conditions of the respective course of study at German universities. Furthermore, we can assume that mathematics is not one of the best liked subjects for studying. The rate of OOF in primary schools comprises 70 – 80%. (b) Secondary schools placing lower demands usually fall back upon the so-called class teacher principle. Students with an increased need for support may come across OOF-teachers: In Germany the quotes for grades 5 – 10 vary between 0% and 36%.

First Insights into the Development of Support Systems

What is NOT suitable from our point of view: Basically OOF-teachers simply lack a few courses, let them attend these courses and the problems should disappear. OOF-teachers should consequently not be discriminated against!

What are constitutive elements of any kind of support? OOF- or TAS-teachers' problems are deeply rooted in the context of their professional development as teachers. OOF- or TAS-teachers should become members of professional learning communities and administration needs to support such initiatives.

Problems with In-Service Teaching Measures in Germany

OOF-teachers are important for the everyday math classroom. You cannot cancel their teaching just to run further training courses a few times per week:

They are not easily substituted. The group of OOF-teachers which needs to be addressed is very large and additionally extremely heterogeneous.

Issues and Conclusions

We sure need to gain more insight into the domain, thus there are three levels for problem solving as well as taking action:

- Research level
- Designing courses
- Implementing initiatives

Consequently it would be helpful to establish some kind of an international working group in order to:

- inform about research results, design courses and implement initiatives
- exchange insights and experiences on an international level
- have an informative homepage available

Last but not least, we have to address and sensitize the political audience for:

- supporting OOF-teachers
- developing OOF-measures

References

Bosse, M. (2015) (in preparation).

Törner, G., & Törner, A. (2012). Underqualified Math Teachers or out-of-field Teaching in Mathematics - a Neglectable Field of Action? In Blum et al., *Mathematikunterricht im Kontext von Realität, Kultur und Lehrerprofessionalität*, (pp. 196-206). Springer.

Policy Change and Teaching Quality: An analysis of out-of-field teaching realities in upper secondary schools in Korea between 2008 and 2013

Ee-gyeong KIM & Hyun-jung KIM,

Chung-Ang University, South Korea

Introduction

Successful implementation of a policy aiming at raising the quality of school education requires teachers with appropriate qualification. Policy interventions at the school level more often than not yield adverse effect, when teachers are not adequately supplied to meet the demands. With the launch of a conservative government in 2008 in Korea, the school policy focusing on competition and autonomy has been implemented. High schools were given discretion to determine 20% of their curriculum based on 'the School Autonomy Plan (SAP).' While it was believed that the more school autonomy would raise the quality of education, there is much criticism that the quality of classroom teaching has been deteriorated due to out-of-field teachers. This requires us to investigate the realities of out-of-field teaching at high schools in Korea between 2008 and 2013. This paper seeks to analyze the trend and characteristics of out-of-field teachers in five core subjects including Korean, English, math, science, and social studies to draw implications for policy makers.

Method

Using national database on high school teachers obtained from the National Center for Educational Statistics, we identify the number of out-of-field teachers by comparing the subject(s) that each teacher teaches with the subject(s) that each teacher is certified to teach. We calculate the number and percentage of teachers in five core subjects (Korean, English, math, science, and social studies) whose teaching subjects do not match with his/her certified subjects. We also identify the number and percentage of out-of-field teachers according to teachers' characteristics (teachers' years of services) and schools' characteristics (school type, school size, and school location).

Finding

The result of data analysis shows that a total of 1,625 (2.26%) teachers are turned out to be out-of-field among 71,851 high school teachers in 2008. The number continued to rise to reach its peak of 2,046 (2.82%) in 2010, then decreased to 1,229 (1.59%) in 2013.

When the number and percentage of out-of-field teachers are calculated based on the subjects, social studies shows the highest percentage followed by English, Korean, math and science. In terms of the years of service, there are more out-of-field teachers among veteran teachers than teachers with less years of service. In addition, out-of-field teaching is more prevalent in private schools than in public schools, in smaller schools than in larger schools, and schools in

remote and rural areas than those in urban areas.

Discussion

Despite the government's efforts to reduce the number of out-of-field teachers, it is generally accepted that the SAP pushed more teachers to teach out-of-field subjects. As college entrance is the biggest concern of high school principals, their autonomy motivated them to increase the unit hours spent on core subjects, while reducing the hours of such subjects as music, art, or physical education. The criticism by the general public and teachers made the government pay close attention to the SAP to regulate the school's discretion in 2010, which led to a gradual decrease of the number of out-of-field teachers in the core subjects since then.

When the number of out-of-field teachers is calculated based on different background variables, it generally supports the previous research outcomes. Out-of-field teachers are likely to be assigned to teach social studies and Korean than math and science, as those subjects are easier to teach without proper qualification. Veteran teachers are more likely to be assigned to out-of-field classes than teachers with less years of service, as principals know that veteran teachers can cope with the situations better with less resistance. More out-of-field teachers are found at schools in rural and remote areas, as it is hard to assign enough subject teachers to smaller schools due to smaller number of students.

Conclusion & Implication

It is evident that the number of out-of-field teachers in five core subject increased between 2008 and 2010, and then gradually decreased by 2013. It means that the government

intervention without an adequate supply of teachers can bring about reverse effects, despite the government's good intention to improve the quality of teaching-learning. In addition, it has been identified that social study and Korean

teachers, veteran teachers, teachers in smaller schools and in remote areas are more likely to become out-of-field. It implies that future policies aiming at reforming schools must consider teacher supply at the planning stage in order to yield desirable effect.

Out-of-field mathematics teaching and the need for professional development: The Irish context

Máire Ní Ríordáin
NUI Galway, Ireland.

An Overview of the Irish Education System and Teacher Education

The Irish education system consists of a primary level of eight years of schooling from approximately ages 5-12 years and a post-primary level of 5-6 years of schooling from approximately ages 12-18 years. Students can apply to attend third level/further education thereafter. Specific degree and postgraduate programmes are in place to qualify teachers to teach at primary level education. There is no subject specialism at this level of education – all primary teachers teach a range of subjects. Teachers qualifying to teach at post-primary education can pursue two entry routes and generally qualify to teach two subject areas. The first option is through a concurrent teaching degree programme (4 years) whereby prospective teachers study their subject areas and teaching qualification simultaneously. The consecutive route entails prospective teachers completing their degree studies in their subject areas first and then pursuing a postgraduate qualification in teaching (Masters Level). A statutory Teaching Council exists in Ireland and all teachers must be registered with them in order to teaching in a school in Ireland. There is very little history of teachers in Ireland engaging in professional development throughout their careers, although this is due to change with imminent legislation proposed by the Teaching Council, with professional

development due to become a condition for annual registration.

Out-of-Field Mathematics Teaching in the Irish Post-Primary Context

Teacher quality and qualification is believed to be one of the most important factors affecting student learning, and research has demonstrated that students learn more from skilled and experienced teachers who know what and how to teach (Darling-Hammond & Youngs, 2002). Out-of-field (OOF) mathematics teaching is prevalent in the Irish context with findings from a national statistical study revealing that 48% of teachers teaching mathematics at post-primary education are unqualified and are primarily assigned to the lower years and weaker student groups (Ní Ríordáin & Hannigan, 2009). The OOF teachers taught an average of 10 hours of mathematics a week with a range of 1 to 22 hours. 25% of teachers taught less than 7 hours of mathematics a week. The most popular subjects for OOF teachers to teach with mathematics were science (33%), Business Studies (18%), Biology (15%), Resource (14%), Chemistry (13%), CSPE or SPHE (13%), ICT (12%), Physics (11%) and Accounting (11%). Qualified mathematics teachers were primarily assigned to Higher and Ordinary Level mathematics classes, and particularly the examination years. Out-of-field teachers for the most part are assigned Ordinary Level (non-exam years in particular), Foundation, LCA (Leaving Certificate Applied) and resource teaching hours. Therefore, younger and weaker students are generally taught mathematics by OOF teachers. Accordingly, a two-year part-time Professional Diploma in Mathematics for Teaching (PDMT) has been established (2012) nationally to up skill these teachers.

Example of the Mathematical/Pedagogical Knowledge of Out-of-Field Mathematics Teachers commencing a Professional Diploma in Mathematics for Teaching

Current research in the Irish context seeks to evaluate the development of teacher knowledges and skills/practices, through engaging in this 2-year PDMT. A quantitative approach to data collection and analysis is utilised. This involves the development and administration of detailed instruments assessing the development of teachers' knowledges and competencies in teaching mathematics (pre and post testing) and an evaluation of the effectiveness of the professional development model in delivering the programme and achieving its goals. Teachers' knowledge is assessed by a paper-and-pencil test and underpinned by the TEDS-M Conceptual Framework (Tatto et al., 2008). All items are aligned to key strands (Statistics and Probability, Geometry and Trigonometry, Number, Algebra, Functions) and associated sub-topics of the Irish post-primary curriculum, which teachers are required to teach and assess. Initial pre-testing has taken place with the out-of-field teachers who commenced the PDMT in September 2013 (n=202). Findings indicate wide variations and significant areas of weakness in out-of-field teachers' conceptual understanding of mathematical topics. For example, in relation to the Probability questions, only 25% of teachers correctly answered the question on 'choice'; 64% correctly answered the question on 'combinations'; and 36% correctly answered the question on 'chance'. Post-testing of teachers' knowledges

will take place in June 2015, in conjunction with an analysis of the effectiveness of the professional development model. Results also indicate underdeveloped pedagogical knowledge regarding the teaching, learning and assessment of mathematics. Table 1 shows examples

of some of the teachers' feedback to students in relation to a pedagogical question on the Gambler's Fallacy (c is the correct answer students should have chosen).

Overall, such findings have significant implications for understanding areas in

which out-of-field mathematics teachers need support and for designing effective continuing professional development (CPD) programmes.

Table 1. Examples of feedback to students

a. BGGGBB	c. Same Chance for Each	d. Not Enough Information
Probability of ½--- Boys ½ --Girls ½	No as the probability of getting a boy is ½	Told the probability of getting is half so the students had enough info to work out the sum
50:50 chance	Can't determine---but theoretical 50:50	No way of knowing
Excellent, correct answer	If 6 babies were born & half is more likely to be a boy—3 boys, 3 girls—so answer A is correct	There is enough info as you are given the probability and amount of outcomes
Excellent answer—well done—nice to see that you showed all workings	Show workings for working out probability for a and b then try to answer again	Work with the information given in a—has the same number of boys as girls being born---this means equal chance of it being a boy or girl---3/6 or ½ probability now look at (b) what is the probability of it being a boy? p/6 ???
You are right because you have even chances	It is possible but it is more likely because of even chance to have 3 boys and 3 girls	You have enough information!
3 boys, 3 girls = probability of ½	5 boys, 1 girl = probability of 5/1, Even though is a possibility – likelihood of 3 boys, 3 girls is more probable	Work harder at maths
Not likely to occur in every situation	Good	Time
Correct students, understood probability	Incorrect, students do not understand probability	Correct small sample
Well done, your choice is the same answer as the rest of the class	Well done... you chose the same answer as 1/3 of the class	Well done. You are an organized thinker and close. The answer only 5/29 and 1/6 of class close

The Professional Diploma in Mathematics for Teaching – Upskilling ‘out of field’ Teachers of Mathematics in Ireland

Fiona Faulkner
NCE-MSTL, Ireland

The Irish Context

The Irish government have rolled out a revised mathematics curriculum in all post primary (secondary) schools in Ireland which aims to address issues in the Irish education system relating to students’ understanding of mathematical concepts, their ability to problem solve and over reliance on rote learning procedures. All stakeholders in Irish education agreed however that such an initiative could not be successfully implemented and the existing issues could not be resolved without significant improvements in the quality of mathematics teaching. The problems which exist with implementation of the new curriculum are intensified by a concentration of ‘out of field’ teachers at lower secondary school (Junior Cycle) (Ní Ríordáin and Hannigan 2009). While changes and improvements in initial teacher education in mathematics will lead to improvements long term, compensatory actions such as continuous professional development and other upskilling opportunities were considered necessary to improve quality and support practicing teachers in the medium term. The Irish government resolved to tackle this issue by funding a programme to up-skill these ‘out of field’ teachers of mathematics. Accordingly a ‘Professional Diploma in Mathematics for Teaching’ (PDMT) is currently being delivered by the National Centre for

Excellence in Maths and Science Teaching and Learning (NCE-MSTL) in the University of Limerick, Ireland.

About the Professional Diploma in Mathematics for Teaching (PDMT)

The PDMT is a government funded 2 year part-time blended learning programme which is offered free of charge nationwide. The requirements for the structure of the programme were set out by the Minister for Education and Teaching Council regulations in Ireland when determining the requirements. The Teaching Council regulates the teaching profession in Ireland and outlines criteria which teacher education programmes have to meet if they are to be recognised by the council. As such it is a 75 ECTS level 8 programme. This can be broken down into 60 ECTS credits towards mathematics modules (5 modules per year worth 6 credits each) and 15 ECTS credits towards mathematics pedagogy (2 modules: 1 worth 9 credits and 1 worth 6 credits). The participants complete the pedagogy elements of the programme concurrently with the mathematics modules. Upon completing the first 5 mathematics modules in year 1 of the programme participants are required to attend a week long summer institute on mathematics pedagogy which is offered in 2 venues in Ireland; University College Dublin and the University of Limerick. This summer institute informs much of the pedagogy continuous assessment which must be completed as part of the programme. Participants are also required to attend 5 pedagogy workshops which take place on Saturdays throughout year 1 and 2 of

the programme informing them directly on best mathematics pedagogical practices for second level mathematics teaching with a particular focus on the revised mathematics curriculum in all Irish post primary secondary schools.

Eligibility for the Professional Diploma in Mathematics for Teaching

Similar to the programme structure the eligibility for the programme is set out by the Minister for Education. Applicants to the PDMT must meet the following criteria in order to be considered for a place on it:

- They must be currently teaching mathematics in a second level school in Ireland.
- They must be a qualified second level teacher in a discipline other than mathematics and be registered by the Teaching Council.
- The above 2 criteria points must be signed off by the principal of the second level school in which the applicant currently teaches.

In terms of academic eligibility there is no specific mathematics requirement for the programme however there is an expectation that the teachers applying have mathematics to a standard which is beyond second level i.e. an expectation that they have studied some undergraduate mathematics. Participants are entitled to apply for exemptions in a maximum of 2 mathematics module and no exemptions are given for any pedagogy element of the programme.

The Blended Learning Platform

Participants have the option of attending 9 different lecture venues and 19 different tutorial venues in a variety of higher education institutions around Ireland. The blended learning format allows for participants to attend live lectures for approximately 50% of the mathematics content modules and use an on-line platform to engage with the rest of the material. On the evenings of live lectures one lecture venue is responsible for delivering the material and this lecture delivery is streamed live to all other 8 venues for participants to watch. At 3 different intervals during the live lectures there is a break in the live streaming for participants to engage in onsite problems related to the content being delivered. Each lecture venue has a qualified mathematics lecturer onsite to facilitate the 3 hour lecture with the onsite lecturer playing a particularly important role when the live streaming breaks for onsite problems to be completed. The onsite

lecturer also serves as a fail-safe option should the technology break down for any reason they will take over the delivery of the lecture. Participants are required to attend 3 2 hour tutorials per 6 week module and these are all live onsite tutorials.

Preliminary Analysis of Teachers' Perceptions of the Programme

A general evaluation of participants' perceptions of the programme upon completing the first year highlighted their satisfaction with the programme website and levels of support received in live lectures and tutorials but also raised concerns surrounding some lecturers' ability to deliver lecture material effectively and the quality/effectiveness of the technology as well as its ability to transmit live lectures. These early participants placed a large emphasis on their lack of awareness surrounding the commitment level required for the programme and made constant reference to material in content

lectures not relating to mathematics at secondary school level highlight possibly misconceptions on their part regarding what the programme was preparing them for. While the teachers found the course to be extremely intense they acknowledged its benefit in terms of career development and building confidence in their ability to teach mathematics.

The programme dealt with a lot of teething issues to begin with (technology, lecturing styles) however all aspects of the programme have now been rolled out and things are improving all the time. The external examiners report for the programme was very positive and the third cohorts of 300 participants approximately have just begun engaging in the 2 year programme. Anecdotal evidence suggests that participants' content and pedagogical knowledge have improved over the course of the programme however in-depth analysis will have to be carried out in order for this to be quantified fully.

Ffunt@OWL - concept of a certificate course for out-of-field teachers in mathematics

Steffen Lünne

DZLM, University of Paderborn

The German school system has a shortage of maths teachers in all of its school types. It is for this reason, that teaching across specialisations is common practice in Germany even for secondary schools. Several district governments of North Rhine-Westphalia offer certificate courses for up-skilling teachers in teaching mathematics.

The DZLM at the University of Paderborn cooperates with the district government of Detmold to develop and implement such a certificate course. The first common certificate course begins in school year 2014/2015. Twenty two teachers of different secondary school types participate in this course, which is held at the University of Paderborn every Wednesday. Its focus is on training in content and pedagogical knowledge in combination with reflection of classroom situations to change the view on teaching mathematics. The participants have to keep a portfolio containing reflection about several teaching situations and other work for preparation and follow-up processing of specific maths lessons.

Teaching out-of-field is common practice in German schools even in secondary schools. The German education system has a lack of math teachers in all of its school types. As a result principals of many schools must assign non-specialist teachers to teach those lessons (satisfying demand). Another reason for teaching out of field is, that it enables class teachers to teach their own class as often as possible.

(pedagogical reason) (Törner & Törner, 2012, p. 197). Official data on teaching out of field in mathematics are rare. It is the decision of the principal to assign teachers to lessons and there is no obligation to inform the supervisory authority in detail. (Törner & Törner, 2012, p. 199) According to the report of the IQB-Ländervergleichsstudie 2012 13,6% of the surveyed math teachers are teaching without an official qualification in teaching mathematics. This value varies greatly between the different federal states in Germany (Richter, Kuhl, Haag, Pant; 2013; p. 373). It is further pointed out that teaching out of field in secondary schools leads to lower mathematical skills of students (Richter, Kuhl, Haag, Pant; 2013; p. 382).

Teacher training is independently organized by the sixteen federal states of Germany. In North Rhine-Westphalia the five district governments offer certificate courses for up-skilling teachers in teaching mathematics. As required the district governments offer so called certificate courses, that are given by experienced teachers. An analysis of the curricula showed, that there are several differences between these courses from district to district, although focus is on content knowledge in all districts. There is no common material pool nor a cooperation between all five districts. Differences in training out-of-field-teachers exist therefore not only between the federal states, but also in terms of North Rhine Westphalia even within a federal state.

The DZLM² starts at this problem. One goal of its activities is to develop joint working material and handouts as well as a concept for training out-of-field teachers in teaching mathematics, which can be found Germany-wide. For this purpose, it supports a course for training out-of-field teachers for grades 5 and 6 in Saarland and another course in Bavaria, where experienced teacher are qualified to train out-of-field teachers in teaching mathematics. In North Rhine-Westphalia, the DZLM at the University of Paderborn cooperates with the district government of Detmold to develop and implement a certificate course for out-of-field teachers in school year 2014/2015. This course named Ffunt@OWL will be presented in more detail below.

The certificate courses in North Rhine Westphalia are distinguished by the peculiarity that the participants acquire an official permission for teaching mathematics at the end. After completing the course the teachers are no longer officially out-of-field-teachers. The course consists of 40 training days of six hours each day. All contents of the secondary school in maths are covered and there is an obligation to attend all training days. On training days the participants do not teach at their regular school. Additional conditions have been provided for the course Ffunt@OWL. The participants must have an expertise on high school level, have to keep a portfolio, which collects

² The DZLM (Deutsches Zentrum für Lehrerbildung Mathematik, engl. German Center for Mathematics Teacher Education) is a consortium of several universities in Germany, which is funded by the German Telekom Foundation. The DZLM organizes teacher training for mathematics in Germany.

reflections about teaching, need to have a positive attitude towards mathematics and have to be assigned to a fifth or sixth grade in the current school year.

The development of the concept of Ffunt@OWL assumes the DZLM-team in Paderborn under the direction of Rolf Biehler. The individual training days are designed in collaboration with four experienced teachers of the district government. Preparation of the current course began in March 2014. A first version of our training concept was developed in July 2014. The training itself started on 08/27/2014 and will last until 06/24/2014.

One objective of this course is that the participants are working on technical content of secondary schools to

enhance their expertise. Another objective is to present teaching situations, which are discussed and reflected by the participants. We think that this reflection has an impact on the beliefs about mathematics and about teaching mathematics. Based on these objectives we decided that we work on technical content in the morning of a training day. We continue in the afternoon by taking up these contents in the form of teaching materials, student products and video sequences of math lessons, which are analysed and reflected by the participants. In parallel participants create their own products, they try in the classroom and report in the training or in the portfolio.

According to the district government the training year is structured in four parts, arithmetic, algebra and functions, geometry and statistics. Aspects of pedagogical content knowledge are integrated in the sense of a spiral curriculum and serve as a basis for reflection in the afternoons.

Parallel to the further development of the course the DZLM is planning to collect information about the needs and reactions of our participants to this training offer to improve the concept for a possible follow-up course the next school year. At the same time we want to establish an exchange between the trainers of the other DZLM-courses in Germany, to improve training material, which can then be used in Germany for training out-of-field teachers.

References

- Bosse, M. (2014). *Wie können fachfremd unterrichtende Mathematiklehrkräfte durch Lehrerfortbildungen effektiv unterstützt werden?* In J. Roth & J. Ames (Eds.), *Beiträge zum Mathematikunterricht 2014* (pp. 221-224). Münster: WTM-Verlag.
- Bosse, M.; Törner, G. (2013): *Out-of-field Teaching Mathematics Teachers and the Ambivalent Role of Beliefs – A First Report from Interviews*. In: M. S. Hannula, P. Portaankorva-Koivisto, A. Laine & L. Näveri (Hrsg.), *Current state of research on mathematical beliefs XVIII. Proceedings of the MAVI-18 Conference* (pp. 341–355). Helsinki.
- Richter, D.; Kuhl, P.; Haag, N.; Pant, H. (2013): *Kapitel 12. Aspekte der Aus- und Weiterbildung von Mathematik- und Naturwissenschaftslehrkräften im Ländervergleich*. In: Pant, H.; Stanat, P.; Schroeders, U.; Roppelt, A.; Siegle, T.; Pöhlmann, C. (Hrsg.) (2013): *IQB-Ländervergleich 2012. Mathematische und naturwissenschaftliche Kompetenzen am Ende der Sekundarstufe I*. (pp. 367-390) Münster (Waxmann Verlag GmbH).
- Törner, G.; Törner, A. (2012): *Underqualified Math Teachers or Out-of-Field-Teaching in Mathematics - A Neglectable Field of Action?* In: W. Blum, R. Borromeo Ferri & K. Maaß (Eds.), *Mathematikunterricht im Kontext von Realität, Kultur und Lehrerprofessionalität. Festschrift für Gabriele Kaiser* (pp. 196–206). Wiesbaden: Vieweg+Teubner Verlag.

Talking the talk...but walking the walk? How do non-specialist mathematics teachers come to see themselves as mathematics teacher

Cosette Crisan and Melissa Rodd

*Institute of Education,
University of London*

In this TAS 2014 presentation we reported on a research project which was set up to investigate how teachers on the in-service programmes offered by our institution developed as teachers of mathematics. We orientated our research around a central research query: *How do already qualified, non-specialist mathematics teachers come to see themselves as mathematics teachers?*

Background

To address the shortage of mathematics teachers in England, UK,

serving teachers, qualified in subjects other than mathematics yet teaching secondary mathematics (whom we refer to as *non-specialist mathematics teachers*), were eligible to participate in SKE (Subject Knowledge Enhancement) courses commissioned and funded by the Teacher Development Agency (2011). Various providers in different regions of England offered these courses and had the freedom to design their own curriculum. The curriculum designed by the mathematics education team at the Institute of Education, University of London deliberately avoided mathematics National Curriculum classifications and arranged the SKE curriculum to cover four broad mathematical content themes: Infinities, Uncertainties, Structures and Spaces. Mathematics pedagogical knowledge was taught by example, discussion and by setting school-based tasks that were supervised by the school-based mentor.

The research project

We chose a purposive sample of five case study teachers each of whom had come via a different training route. The research took place alongside the course and was subordinate to the course. Data of the following types were collected as part of teaching: autobiographical data; a 'needs analysis' (of their mathematics subject knowledge and capacity to diagnose pupils' errors/misconceptions); collection of their: maths work; school-based work; mentor feedback; assignments; reflections; observations in university sessions. Some of the biographical details of the case study teachers are presented Table 1 below under their pseudonyms:

Table 1. Participants

	Jessie	Sara	William	Nas	Lech
ITT route	BA/QTS	PGCE	BEd	Teach First	EU QTS
Subject specialism	Primary (PE)	ICT	PE	Citizenship	PE
School phase training	Primary	Secondary	Secondary	Secondary	Secondary
While on the course taught some mathematics for ...	10 years	3 years/three hours per week	2 years/ one lesson a week	2 years/ one or two lessons a week	9 years/ teaches some maths

Theoretical framework

In our work with the non-specialist teachers, we found that while they were aware of the need to gain and improve their maths knowledge domains (both subject knowledge and pedagogical knowledge), the teachers were also preoccupied with whether and how they will be recognised as maths teachers by their colleagues, school or potential employing schools and maths departments. And so our conceptualisation of mathematical knowledge for teaching has changed and we began to view it as an aspect of teacher identity rather than a property of a teacher. The teachers were just as pre-occupied with imagining their new identity as they were with their SK and so we turned our attention to Etienne Wenger's communities of practice framework, which we used to analyse and interpret teachers' reifications, practice and participation in the learning of mathematics.

References

- Teacher Development Agency. 2011. Join the free Return to Teaching (RTT) Programme. <http://www.tda.gov.uk/teacher/returning-to-teaching/ske-for-returners.aspx> (accessed 3 December 2011)
- Wenger, E. 1998. *Communities of practice: Learning, meaning and identity*. New York: Cambridge.

Data analysis and some findings

We reported 'horizontally' across the cases studies and we presented our findings under themes that came from analysis of the data overall using the communities of practice lens. Analysis of data considers the participants' developing mathematics teacher identity in terms of 'engagement, imagination and alignment' (Wenger 1998), supported with excerpts from some of our case studies to illustrate how the participants negotiated their own trajectories of learning towards a new identity, that of mathematics teachers.

Conclusion

As the non-specialist mathematics teachers' confidence in their own mathematical ability increased, we noticed a change on how they talked about themselves as potential mathematics teachers. The teachers became preoccupied with whether and how they will be recognised as mathematics teachers by their colleagues on the course, current school or potential employing schools and mathematics departments.

In Wenger's terms, these teachers are newcomers to the maths teaching community and as such they must negotiate their own trajectories of learning to become maths teachers. These teachers negotiate their contribution to the practice of mathematics teaching community. They are aware of their limitations and instead of positioning themselves as outsiders (as they do not have a strong mathematical background), they focus their attention on the meanings that really matter to them: their struggle with mathematics gives them a special insight into understanding pupils' difficulties with mathematics and this privileged viewpoint offers them access to participating and contributing to the mathematics teaching profession. Experiencing the joy and satisfaction of doing maths, beginning to see connecting themes in maths and experiencing being a maths learner on the course positioned them on the trajectory of learning towards a new identity, that of mathematics teachers.

Out-of-field teaching practices as an unresolved global concern influencing teacher quality and effective classroom pedagogies

Anna du Plessis

*University of Queensland,
Australia*

The global focus on teacher quality underlines the urgent need to understand out-of-field teaching practices and what it means for classrooms as learning environments. The presentation will share literature and research about the meaning of out-of-field teaching and the lived experiences of these teachers. Tucker (2012) underlined that there is “a key to high student achievement, the quality of teachers is that key” (p. 42). School leaders’ perceptions and understanding of the lived meaning of out-of-field teaching influence their decision-making.

The competitive neoliberal education environment turns focus towards teacher quality and countries invest significant effort into the improvement of the quality of teachers.... In the United States Lewis (1996) noted that initiatives include setting standards for teachers, reinventing teacher preparation, improving teacher recruitment and reward schemes while Goldhaber and Walch (2014) noted the development of policies to encourage people with higher academic credentials into the teaching profession. However, a very obvious silence about the out-of-field teaching phenomenon underlines a taken-for-granted attitude towards this influential phenomenon. An OECD (2011) survey in the UK highlighted “golden handcuffs” (p. 102) as a strategy to lure

inexperienced teachers into taking positions in hard to staff schools through additional financial incentives in an effort to improve teacher quality – again, silence about the effect of these young teachers in positions outside their qualifications...

During March this year (2014) an Australian news channel reported on possible new strategies and policy plans in the state of New South Wales - the education department and government want to regulate teacher dress codes and contemplating an extra year for teacher preparation in an effort to improve the quality of teachers in the state.... (ABC News: Early Edition (ABC News, March 23, 2014, 5:30pm) - nothing was mentioned about assignments or the placement of teachers outside their field of qualification. Clearly the out-of-field phenomenon is a phenomenon that gets overlooked in discussions about teacher quality. My argument in this paper is that ignorance is a concern that is rooted in misunderstanding and misconceptions which is an issue that needs to be addressed.

Contextualising the out-of-field phenomenon makes it necessary to be aware of the importance of understanding how teachers in positions outside their qualification often struggle with not feeling “at home” or “belongingness” in the field or year level they teach. These experiences widely influence a stable teaching workforce with implications for quality education. Ingersoll indicated that teacher attrition in the US after five years of teaching is between 40 and 50 percent...maths and science teachers are more likely to leave

within the first five years – he mentioned that these attrition rates have implications for turnover and retention of teachers which further develops into recruitment and placement issues and concerns. My argument is that assigning teachers to out-of-field positions without understanding the different layers of their lived experiences has significant meaning for the support and development that is offered and how effectively these teachers are managed - with possible implications for teacher attrition rates.

The focus on teacher quality cannot produce effective transformation if implications of the out-of-field phenomenon do not receive attention. (We are all familiar with the “Dirty little secret” phrase, - Ingersoll, 2005). I argue that educational leaders’ misconceptions and misunderstandings about the lived meaning of out-of-field teaching hugely influences decision-making and policy-making, and I share Linda Hobbs’ concerns when she claimed in 2013 that there is an urgent need to understand the complexities surrounding out-of-field teaching.

Literature and research show that out-of-field teaching is a common practice in schools across cultures; Darby-Hobbs (2012) notes that on average 16% of science teachers and 24% of mathematics teachers in Australia lack suitable qualifications for their positions. It is noted that 39% of all science teachers in South Africa are unsuitably qualified (Silva, 2010). Taking note of a school workforce report in Australia in 2010 that 39% of metropolitan principals and between 42 and 66 % in remote areas admit that they experience recruitment and placement difficulties. In another report principals admitted that 50% of school

leaders would assign a teacher in an out-of-field position. Lingard mentioned in 2010 that we should remember there is always a lot more going on behind the numbers and that is exactly what this paper aims to do - looking beyond the numbers at the lived experiences in relation to out-of-field teaching practices.

If teachers feel out of their depth, out of place, misplaced, a misfit – they leave and research in the US claimed that teachers who are leaving provide dissatisfaction as the main reason, with time management, workload, behaviour management, school policies and placements as specific issues ... It points towards educational leadership concerns. My argument is positioned with Vygotsky's learning theories in mind, that students develop effective learning with the guidance of a more knowledgeable other – focus therefore turns to teachers outside their field of qualifications or expertise, who do not have the content background to be the 'knowledgeable other' in the classroom. Leaman (2006, p. 7) suggested 'A teacher needs to possess knowledge before they are able to share it'. Student teachers choose the profession because they want to share a love or passion for a specific subject but then they are assigned to something else....

Essential to effective classroom pedagogies is finding the balance between content knowledge and classroom management strategies - this is underlined by Lingard, Hayes, Mills and Christie (2003). They also suggested that productive pedagogies manifest in multiple ways in classrooms, for example, through intellectual quality, connectedness, supportiveness, engagement with difference. My research showed that all of these aspects became a challenge when a teacher is in an out-of-field position.

This paper draws from a larger qualitative study based on Gadamer's (1975) hermeneutic philosophies and with specific attention to his theory of understanding through a 'fusion of horizons' – looking at the out-of-field teaching experience through different lenses to develop an in-depth understanding. Determining essential

themes allows for the development of narrative elaborations of the lived meaning of out-of-field teaching (Van Manen, 1990). The 'way of inquiry' ensured triangulation through close conversation, semi-structured interviews, close classroom and staffroom observations and document analysis, detailed reflections in field diary, the data were gathered over a period of one-and-a-half years. This transnational study across two cultures has significant meaning because it challenges some of the assumptions and taken-for-granted perceptions that educational leaders might have while it changes the way we think about novice teachers who are teaching outside their field. The study employed a representative sample of 48 participants and 7 schools from high schools and primary schools. Schools included suburban, metropolitan and remote schools across cultures. It explores the very different environments. The Human Development Index of the two countries is very different 2nd and 1118th, low and high socio-economic environments.

Denzin and Lincoln (1998) spoke about the "taking for granted" lived experiences, the danger is when we think we know...but do we really understand the lived meaning? It might seem so obvious, we know these teachers are experiencing stress, and we know leaders have an influence but do we really understand the lived experiences of out-of-field teachers and what it means for the quality of their teaching? Can we manage the situation effectively if we do not have a deeper understanding of their real-life experiences? It is necessary to acknowledge that some teachers in these positions provide high quality teaching but it is always through extremely hard work and many extra hours...BUT this paper, however, focuses on the meaning of these lived experiences, perceptions, perspectives about 'being out-of-field' and why it influences the quality of teaching. The embodied experiences of

teachers in these positions are closely connected to the quality of teaching and learning that takes place in their classroom and its ripple effect through to the effectiveness of the school environment. The inter-relationship between the teacher and experiences of self-critique, lack of confidence, lack of self-esteem, implications of the lack of content knowledge, the kind of support, expectations, communication and insecurities influence what happens in their classrooms.

Bourdieu and Passeron (1994) suggest that not only knowledge, but the specific milieu in which knowledge is relayed, affects the success of learning which occurs. Teachers influence what happens inside the classrooms (Hattie, 2003; Hattie, 2009). Not feeling at home in a subject or year level influences teacher competency, Kristjánsson (2007) explained that their emotions and behaviour are intertwined, neither one being more important than the other.

Teachers' lived experiences while they are in out-of-field positions influence their teaching characteristics. A concerning 'taken for granted' conception is that teachers' lack of content knowledge only affects high school teaching -- that out-of-field teaching only affects quality education in secondary schools. Data, however, revealed that a senior primary qualified teacher teaching in a pre-primary classroom experienced difficulties – and I add, influences these young teachers' career decisions and options. Out-of-field teachers find it hard to challenge students to take part in in-depth subject discussions; they often just touch the surface of themes and concepts. This makes the difference between high order thinking and low order thinking or the difference between deep and surface learning which in our current global expectations are so important.

Teacher dispositions are influenced by the out-of-field teaching experience. Educational leadership styles, models, support and understanding can make or break out-of-field teachers. My research revealed that instructional leadership models with extreme focus on results leave out-of-field teachers feeling

exposed and vulnerable. On the other hand, caring and positive transformational leadership models support, encourage and understand and this often successfully develops out-of-field teachers into teachers with expertise who see themselves as specialists after three or five years in a specific position. A taken-for-granted attitude about out-of-field teaching influences open discussions – how do educational and school leaders know what the needs of these teachers are if they do not engage, connect and communicate? Zepeda (2006) noted that communication is fundamental for developing effective development and support and to address insecurities. Confidence and quality teaching are interconnected, confidence opens possibilities to take risks and explore strategies and methods. However, out-of-field teachers explained the feelings and issues they experience to act and pretend as if they are confident. They mentioned during interviews that they experiences feelings of being: out-of-place, out-of-depth, not belonging. One

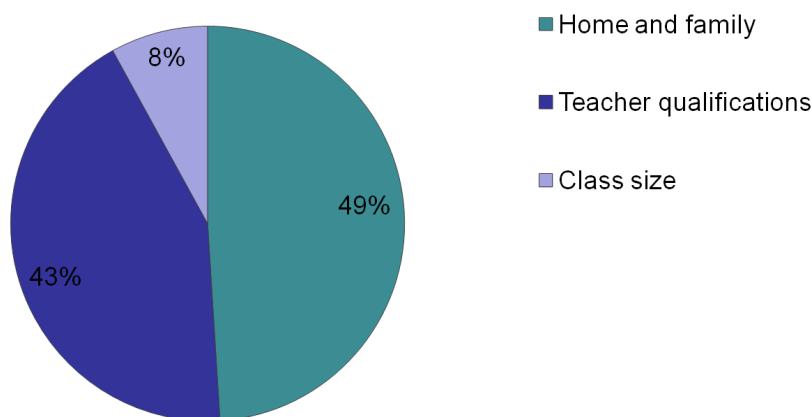
participant shared: *A ‘good’ teacher would connect it all, tell the kids how this relates to that but I can't see it.* Another out-of-field teacher shared her concerns about not keeping up with quality expectations *“I am scared I am going to be left behind”*.

The quality of teaching and the effectiveness of teachers influence students’ subject choices in secondary schools as well as the school choices. Parents shared that it stretched beyond the school and even affects their children’s performance and success during their tertiary education. These concerns about quality teaching and learning add to the strained relationships within the school community, stakeholders – parents’ doubt about the quality education their children receive is rooted in their real-life experiences with teachers teaching outside their field of qualification. A break down in trust-relationships hampers collaboration and partnership to

form and in the current international expectations of education – we need collaboration and partnerships.

What is there to learn? The research showed that it is possible to have success in out-of-field positions but it takes effort through active connectedness and engagement from all of the stakeholders. It costs the Australian Government \$40,000 to prepare a teacher over four years. As we have already heard, 50% of principals in a study in Australia admit that they would assign a teacher to a position outside their field – then we assign teachers outside their qualification but expect the same quality as if they are teaching in their qualified field. The paper highlighted the influence that feelings of at-homeness and belongingness have on the quality of teaching as well as the implication of different leadership models under two main models – transformational and instructional as suggested by Hattie (2009).

Influence of teacher qualifications on student achievement (Darling-Hammond & Post, 2000)



Removing the deficit: Possibilities for learning at the boundaries between in-field and out-of-field teaching

Linda Hobbs

Deakin University, Australia

Introduction

Whether teaching in a qualified specialisation (in-field) or a different specialisation (out-of-field), sameness and continuity reside in the fact that all specialisations involve such things as pedagogy, curriculum and meeting learning outcomes. However, teachers can experience *discontinuity* when teaching an out-of-field subject negatively impacts on their efficiency in teaching or confidence to effect positive learning outcomes. Despite the obvious discontinuity relating to lack of content knowledge, there are many personal and contextual factors that disrupt the rhythm of a teacher when teaching out-of-field, such as their adaptability, support, and school and leadership demands (Hobbs, 2013a). While the 'field' of a teacher is determined by their qualifications, 'field-ness' is determined by experience of these factors as discontinuities.

Discontinues arise when crossing a boundary, in this case, when teaching out-of-field where, metaphorically, the boundary is between the familiar practices of the in-field subject, and the unfamiliar practices of the out-of-field subject. Where the teacher is not aware of the different practices of the two fields—i.e., there is no discontinuity—the boundary can be seen as porous; in these situations actions and interactions run smoothly without cost or deliberate choice (Akkerman & Bakker, 2011). This

is something that might arise after years of teaching a subject out-of-field when re-establishment of practice has occurred. A porous boundary might also indicate a teacher who is not willing to engage in learning and might, for example, perpetuate poor and unreflective practice.

When discussing the crossing of boundaries it is important to define the discontinuities, that is, in which way a teacher might 'feel' out-of-field, in order to identify where learning can take place. To really understand a teacher's learning needs, it is important to consider the following questions:

1. Where is discontinuity experienced?
2. Where is each teacher's point of need?
3. Where are the possibilities for learning?
4. What is the influence on the teacher's professional identity?
5. What is needed to maximise learning at the boundary?

These questions can assist teachers to embrace a boundary as an opportunity for learning. The environment of the teacher must also be conducive to learning and responsive to the learning needs. The boundary can lead to learning in a number of ways.

Dialogical Learning Mechanisms of Boundaries

Learning can arise because of encountering a boundary. There are dialogical interchanges between fields. For example, a teacher brings what he knows about student

learning from his in-field teaching into his out-of-field teaching; in turn, because of the boundary, he can observe students' learning differently in this new context, which then impacts on his in-field teaching. Akkerman and Bakker (2011) describe four dialogical learning mechanisms in order to describe the learning potential of boundaries. These are described below with illustrations from out-of-field teachers from my research (Hobbs, 2013a, 2013b).

1. Identification of the discontinuities experienced by teachers

To identify the discontinuities means to recognise the differing practices from both fields, and the issues that can arise as a result. There is an 'othering' that can occur where on encountering a boundary a teacher recognises differences and reconstructs the boundary, but without necessarily overcoming the discontinuities. Learning involves determining relationships between the practices of each site. Learning arises when there is recognition and appreciation for the differing practices and identities that each involves.

For example, Kevin was asked after 34 years as an Economics teacher, to teach an applied version of Year 10 mathematics. Discontinuities emerged in the first instance: this was a new discipline, although he felt comfortable with the content it would require new teaching methodology, and the students had different learning needs. So for him, learning through recognising discontinuities involved initially working out in what ways these differences might impact on his practice: "I'm not a trained maths teacher; and obviously there is different

ways of delivering the content... there's always that, you know, how would a qualified maths teacher of some years' experience approach this?" Without recognising those differences, simple transference of his Economics pedagogy would have been a disaster.

2. Coordination of boundary objects that assist in negotiating boundaries

Boundary objects are those people (also called boundary spanners), artefacts or processes that have elements of both fields and so intersect both worlds, acting as bridges or anchors (Star & Griesemer, 1989; Wenger, 1998). They provide support while re-establishing practice. Learning involves coordinating or finding and applying these boundary objects. Learning arises out of establishing continuity in order to facilitate easy movement between sites (Akkerman & Bakker, 2011).

For example, Karen, a first year science teacher was told by her lecturers to apply for mathematics positions. Her hands-on pedagogical approach from science has been a way for her to establish herself in mathematics. Her principal, who is a mathematics teacher, strongly supports and pushes a hands-on approach in mathematics. No textbooks has meant no reliance on traditional teacher-centred pedagogical approaches; activity kits promoting hands-on problem solving resonate with Karen's natural inclination for hands-on involvement of students in their learning, acting as boundary objects to enable re-establishment of practice.

3. Reflection on practice and identity

Learning requires reflection. There is potential for a boundary to enhance this reflection, which can lead to a new construction of identity that can inform future practices. When a teacher is given an out-of-field subject, they are forced to encounter something new, negotiate the differences in practice, and reconcile the unfamiliar with the familiar. Learning arises out of "coming to realise and explicate differences between practices and thus to learning

something new about their own and others' practices" (Akkerman & Bakker, 2011).

For example, Kevin's understandings of teaching were disrupted when given his new applied mathematics class. Kevin recognised this disruption as arising because "you get into a comfort zone and you stay there". Disruption has meant that he has learned about "the way kids learn. You look back and say, gee, perhaps I should step back a bit... I'm learning at the same time". For Karen, teaching out-of-field has meant gaining new experiences and gathering resources, more so than a reflection on current practice: "as much as it's sort of a disadvantage being the first year out and sort of having nothing, I guess it makes you, after a few years you've had to make up the units yourself so you would take away so much knowledge about how to put together things."

4. Transformation of identity and practices.

Transformation occurs when confrontation from this intersection between social worlds leads to a reconsideration of practice and identity. In these situations, learning arises out of a recognised need for change.

For Kevin, this experience has had a positive impact on his practice and identity. He has a renewed sense of himself as pedagogue as he is learning to "watch the kids learn and how they learn". He is affirmed in his capacity to adapt in the face of disruption due to this new respect for the learner:

"You apply that and use that to further your educational outcomes. Respect for the students and their abilities. If you've got that common respect then obviously I think you are able to take on board new areas of learning that may be outside your comfort zone."

Being ready for learning

The notion of boundary crossing provides a platform for re-conceptualising these out-of-field

teaching experiences as opportunities for professional learning occurring within schools as communities of practice, where teachers are supported and enabled to adapt to new fields and expand their professional identity (Hobbs 2013a, 2013b). Kevin, for example, had a strong identity in relation to his in-field areas. As a result, on encountering the boundary he could see clearly the demands of the new subject. Teachers like Kevin engage with 'provisional' versions of a new self (Ibarra, 1999) on their way to developing a fully elaborated professional identity. This developing professional identity expands by re-conceptualising the task of teaching, relationships, their understanding of and respect for learners, and a belief in a capacity to adapt. In comparison, as a first year teacher, Karen's learning was perhaps more focused on building practices and resources. Crossing the boundary highlighted for her how central the hands-on approach was to her pedagogy. Both teachers were learning, but in different ways.

So while out-of-field teaching has the potential to be devastating for teachers, recognizing only the deficit impact perhaps neglects the possibilities for learning that might occur, provided there is a supportive environment. In preparing pre-service teachers to be adaptable, or in supporting out-of-field teachers through continuing professional development, the dialogical learning mechanisms of boundaries can be a useful learning framework to highlight differences in practices and how these differences can act as discontinuities, the types of boundary objects that can support re-establishment of practice, how reflection is needed to notice differences and learn something new, and recognize the need for change in practice and themselves as pedagogues. It is by encountering a boundary and identifying the discontinuities that such learning can occur. For a teacher who does not recognize the discontinuities, there is no potential for learning.

References

- Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of Educational Research*, 81(2), 132-169.
- Hobbs, L. (2013a). Teaching 'out-of-field' as a boundary-crossing event: Factors shaping teacher identity. *International Journal of Science and Mathematics Education*, 11(2), 271-297.
- Hobbs, L. (2013b). Boundary crossings of out-of-field teachers: Locating learning possibilities amid disruption. In, Janice Langan-Fox & Cary L. Cooper (Eds.), *Boundary-Spanning in Organizations: Network, Influence, and Conflict* (pp. 7-28). New York: Routledge.
- Ibarra, H. (1999). Provisional selves: Experimenting with image and identity in professional adaptation. *Administrative Science Quarterly*, 44, 764-791.
- Star, S. L. (1989). The structure of ill-structured solutions: Boundary objects and heterogeneous distributed problem-solving. In L. Gasser & M. N. Huhns (Eds.), *Distributed artificial intelligence* (Vol. II, pp. 37-54). London: Pitman.
- Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.

The Practice of Out-of-Field Teaching in Mathematics Classrooms

Marc Bosse

University of Duisburg-Essen,
Germany

Introduction

Out-of-field teaching in mathematics has not only implications for the teachers' experiences in school – we can further assume that a missing formal qualification for teaching mathematics has a statistically significant impact on student test scores (Dee & Cohodes, 2008; Goldhaber & Brewer, 2000; Hawk, Coble, & Swanson, 1985). In Germany, a recent study claims to show that particularly low-performing students do even worse when they are taught out-of-field (Richter, Kuhl, Haag, & Pant, 2013).

In a competence-oriented kind of research, like the one above, the line of reasoning for these findings is as follows: Low mathematical content knowledge due to missing studying at university level leads to a low mathematical pedagogical content knowledge, resulting in a sort of teaching that is neither challenging nor activating. As a consequence, student achievement is low (cf. Richter et al., 2013).

This monocausal explanation may be questioned as teachers' affective-motivational characteristics (Bosse, 2014) and the lived professional practice in school beyond teaching (Plessis, 2013) are ignored.

Against this background, we may ask the question what practices of out-of-field teaching in mathematics classrooms actually are. It is reasonable

to look not only at the individuals' cognitive competences but also at their relation to mathematics and to mathematics education. In this regard, it may be fruitful to ask not only for the deficits of teaching but also for the variety of the resources used: How do out-of-field teaching mathematics teachers actually teach mathematics although they have never been trained to do so?

Theoretical Framework

The practice of out-of-field teaching is considered as a hierarchy of three levels within the framework of teacher identity. The concept of teacher identity as an “analytic lens” (Grootenboer & Zevenbergen, 2008) allows us to zoom out of the discourse on teacher competences, to respect teachers' affective-motivational characteristics in a holistic view (Grootenboer, Lowrie, & Smith, 2006), to connect different facets of a teacher as a professional practitioner (Bohl & van Zoest, 2002) and to account for both contextuality (Hobbs, 2013) and the historic-temporal dimensions of learning and practicing (Sfard & Prusak, 2005).

On a *macro level*, this means to consider practice and identity as two sides of the same coin (Wenger, 1998): The question of how out-of-field teaching mathematics teachers compensate the missing education is also the question of how job-embedded learning works as a process of social participation in practices beyond the actual teaching of mathematics.

On a *meso level*, it is relevant how identity becomes meaningful in the practice of teaching mathematics: Which implications do specific mathematical identities have on the quality of mathematical classrooms?

Schoenfeld, Floden, and the Algebra Teaching Study and Mathematics Assessment Project (2014) suggest five dimensions of mathematical powerful classrooms within the so-called *TRU Math Scheme*, which is helpful for describing and assessing teaching: The mathematics, the cognitive demand, the access to mathematical content, the field of agency, authority and identity, and the uses of assessment are named as indicators of teaching quality.

On a *micro level*, facets of teachers' identity – so-called *orientations* (Schoenfeld, 2011) – are functionally important when one wants to understand teachers' decision-making – which is at least an important part of the teachers' practice in mathematics classrooms.

Methodological Considerations

In order to answer the research question, qualitative, semi-structured interviews based on an interview guideline were held with 20 secondary school teachers teaching mathematics out-of-field. The structure and the content of the interview guideline were generated with respect to the concept of teacher identity, i.e. considering biographical, mathematical, educational, pedagogical and professional realms. In addition, 4 teachers of the sample were observed while teaching mathematics. The interviews and filmed lessons were transcribed and have not been systematically analyzed until now.

As a general remark one should emphasize that it seems to be very difficult to convince out-of-teaching teachers to participate in the study. Only 10% of the asked teachers have actually been interviewed and only 2% agreed to being filmed while teaching. The out-of-field teaching phenomenon has not only been tabooed by the teachers but also by the political

administrators and educational stakeholders who were asked for permission to carry out the research.

Some Observations

The interviews show that the group of out-of-field teaching mathematics teachers is heterogeneous – but patterns concerning motivational aspects seem to occur: The teachers often state that they have a lot of fun doing mathematics themselves and especially like to teach additionally mathematics in a specific class they educate as a class teacher.

Furthermore, the interviewed teachers do not reflect much on their own teaching and indicate only little needs; if needs are articulated, they refer to the understanding of students' thinking and the coping with heterogeneous classes.

Concerning the teachers' mathematical worldviews, mathematics is often seen as a matter of calculating and solving

tasks by following given procedures. Furthermore, mathematics is what is in the textbook and what colleagues say what mathematics is about.

Mathematics in the out-of-field teaching teachers' views is (almost) neither an epistemological access to the world, nor a means of modeling problems (in terms of mathematical modeling), nor authentic mathematics but only very elementary school mathematics. The interviewees frequently underline that they only like to teach mathematics in grades 5 and 6.

Another peculiar characteristic of practice seems to be that the extent of integration in local communities of practice, in terms of Wenger (1998), has implications for the degree of subject-related professionalism (e.g. the ability to reflect on the own practice). An analysis of one lessons with the help of the *TRU Math Scheme* showed a

poor teaching performance despite the teacher's claim to be a good mathematics teacher (Bosse & Törner, 2014).

First Conclusions

Of course, the individuals' shortcomings in mathematical content knowledge as well as mathematical pedagogical content knowledge have to be overcome if we want to improve the practice of teaching mathematics in out-of-field taught classrooms. In the wake of the gathered interview and classroom data, we additionally have to be aware of the fact that also affective-motivational identity characteristics should be addressed explicitly: Through activities of self-reflection and activities of new mathematical experiences, both the level of professionalism and the width of a desirable mathematical worldview can be increased.

References

- Bohl, J. V., & van Zoest, L. R. (2002). Learning Through Identity: A New Unit of Analysis for Studying Teacher Development. In A. D. Cockburn & E. Nardi (Eds.), *Proceedings of the 26th PME International Conference* (Vol. 2, pp. 137–144).
- Bosse, M. (2014). Wie können fachfremd unterrichtende Mathematiklehrkräfte durch Lehrerfortbildungen effektiv unterstützt werden? In J. Roth & J. Ames (Eds.), *Beiträge zum Mathematikunterricht 2014* (pp. 221–224). Münster: WTM-Verlag.
- Bosse, M., & Törner, G. (2014, September). *The Practice of Out-of-Field Teaching in Mathematics Classrooms - A German Case Study*. Paper presented at the 20th MAVI Conference, Falun (Sweden).
- Dee, T. S., & Cohodes, S. R. (2008). Out-of-Field Teachers and Student Achievement: Evidence from Matched-Pairs Comparisons. *Public Finance Review*, 36(1), 7–32. doi:10.1177/1091142106289330
- Goldhaber, D. D., & Brewer, D. J. (2000). Does Teacher Certification Matter? High School Teacher Certification Status and Student Achievement. *Educational Evaluation and Policy Analysis*, 22(2), 129–145.
- Grootenboer, P., Lowrie, T., & Smith, T. (2006). Researching identity in mathematics education: The lay of the land. In P. Grootenboer, R. Zevenbergen, & M. Chinnappan (Eds.), *Identities cultures and learning spaces. Proceedings of the 29th annual conference of the Mathematics Education Research Group of Australasia* (Vol. 2, pp. 612–615). Canberra, Australia: MERGA.
- Grootenboer, P., & Zevenbergen, R. (2008). Identity as a Lens to Understand Learning Mathematics: Developing a Model. In M. Goos, R. Brown, & K. Makar (Eds.), *Navigating currents and charting directions. Proceedings of the 31st Annual Conference of the Mathematics Education Research Group of Australasia* (Vol. 1, pp. 243–249).
- Hawk, P. P., Coble, C. R., & Swanson, M. (1985). Certification: It Does Matter. *Journal of Teacher Education*, 36(3), 13–15.
- Hobbs, L. (2013). Teaching 'out-of-field' as a Boundary-Crossing Event: Factors Shaping Teacher Identity. *International Journal of Science and Mathematics Education*, (11), 271–297.
- Plessis, A. E. du. (2013). *Understanding the Out-of-Field Teaching Experience* (Dissertation). The University of Queensland.
- Richter, D., Kuhl, P., Haag, N., & Pant, H. A. (2013). Aspekte der Aus- und Fortbildung von Mathematik- und Naturwissenschaftslehrkräften im Ländervergleich. In H. A. Pant, P. Stanat, U. Schroeders, A. Roppelt, T. Siegle, & C. Pöhlmann (Eds.), *IQB-Ländervergleich 2012. Mathematische und naturwissenschaftliche Kompetenzen am Ende der Sekundarstufe I* (pp. 367–390). Münster/New York/München/Berlin: Waxmann.
- Schoenfeld, A. H. (2011). *How we think: A theory of goal-oriented decision making and its educational applications*. New York: Routledge.
- Schoenfeld, A. H., Floden, R. E., & the Algebra Teaching Study and Mathematics Assessment Project. (2014). *An introduction to the TRU Math Dimensions*. Retrieved from <http://ats.berkeley.edu/tools.html>
- Sfard, A., & Prusak, A. (2005). Identity That Makes a Difference: Substantial Learning as Closing the Gap between Actual and Designated Identities. In H. L. Chick & J. L. Vincent (Eds.), *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 1, pp. 37–52). Melbourne: PME.
- Wenger, E. (1998). *Communities of Practice: learning, meaning, and identity. Learning in Doing*. Cambridge et al.: Cambridge Univ. Press.

Out-of-field teaching: An international agenda

Linda Hobbs

Deakin University

In 1990, Brodbelt described “teaching out-of-field” as “education’s dirty little secret”. The label ‘out-of-field’ has been used since the early 1980s to refer to when qualified (or certified) teachers teach a subject for which they have no formal qualification. While the term “teaching out-of-field” is used in the literature, it is still a relatively contemporary label that is not widely used by practitioners, and sometimes not willingly associated with miss-assigned teachers. The term “Teaching Across Specialisations” (TAS) has been adopted by the TAS Collective in an attempt to be inclusive of the different perspectives on this issue.

TAS is an international phenomenon that is manifested differently throughout the world. There is national and international variability in its extent, affects and contributing factors. This variability can hamper international comparisons of TAS; if we are to learn from each other, we need to take this variability into account. There is much we can learn from each other in both understanding the issue, its effects and also how to respond. Cross-national conversations potentially enable researchers and practitioners to listen to and learn from each other.

Working towards an agenda for action and research, with recommended priority actions, is one way to draw together current understandings and to provide a framework for future action and research. While there is not a large body of literature around teaching out-of-field, the literature that exists

is disparate, often focusing on specific contexts, and few cross sector, international studies exist to take a cross-system review of the issue. An agenda must give legitimacy and power to past, current and future research and action. In addition, because in some countries this practice ‘flies under the radar.’ there is a need for an agenda that raises the profile of this practice, subject it to scrutiny, and hopefully induce some action by Governments to attend to the issue seriously and in a coordinated and sustained way.

In every country, there are key stakeholders who have an interest in teachers’ suitability for teaching particular subjects. Governments, school leaders, teachers, students, the broader school community, the teaching profession generally, higher education and providers of teacher learning, and subject associations and Learned (discipline) societies relating to the individual subjects, all stand to influence, be influenced by, or to have a potential voice in who is teaching what and the quality of that teaching. While certification or qualifications do not necessary guarantee that a teacher will be an effective teacher, they are our best means by which we can ensure teachers have been exposed to and hopefully engaged with the requisite theory and knowledge needed to be an effective teacher.

As a profession, we can respond in two ways: Research and Action. At present, Governments are mostly influenced by the numbers: who is teacher what and in what numbers. But the issue is complex and not just a matter for the statisticians. All the key stakeholders should be considered when understanding the issue.

Agenda items

The TAS Collective has developed an Agenda for Research and Action that

incorporates the perspectives and responsibilities of all key stakeholders. We focus our attention on the relationships between the various key stakeholders, thereby ensuring that all who stand to be impacted on and by out-of-field teaching are considered in this agenda. Our focus is on five agenda items, each with underpinning assumptions:

1. Impact of the out-of-field issue on the Teacher

Assumption: Teachers are impacted on by having to teach different subjects out-of-field.

Subject teachers teach out-of-field because of many different factors and with varying effects. The extent of the out-of-field phenomenon differs across different nations. The teacher stands to be impacted on by out-of-field teaching, although this may not always be acknowledged.

2. Impact of Governments and policy on Schools

Assumptions: There are problems with the supply and demand of qualified and suitable teachers in certain subjects; and there are problems with teacher quality.

Government’s relationship with the out-of-field issue include: the provision of adequate resources, their awareness of and attitude towards out-of-field teaching, which voices they listen to, the data used for making decisions (such as international comparative data), and accountability measures and standards defining the profession (such as professional standards).

3. Impact of School-related factors on the out-of-field Teacher

Assumption: There is an imperative to get a teacher in front of every class.

The school is the immediate context of the teacher. Different school sectors exist within many countries, and there is varying control over school governance and accountability. Regardless of country or sector, the adequacy of support and resources for out-of-field teachers, and the attitudes towards teacher assignment across year levels and subjects are, to varying degrees, the domain of school leadership.

4. Impact of out-of-field teaching on the Student

Assumption: Teachers are the highest in-school factor determining student achievement.

The students are on the receiving end of decisions about out-of-field teaching. Affected can be student learning outcomes and achievement, and students' engagement with and attitudes towards the subject. In addition, pipelining of students into Science, Technology, Engineering and Mathematics (STEM) beyond school, which is on the downturn in many western countries, may be at risk where out-of-field teaching practices are not informed by strong

disciplinary and pedagogical knowledge.

5. Impact of those responsible for Teacher Learning on the Teacher

Assumptions: Teacher qualifications determine a teacher's ability and suitability to teach a subject and year level. The Profession is subject to scrutiny and has status within the broader society.

Teacher learning and those responsible for teacher learning, both pre-service and in-service, are fundamental to the growth of teacher knowledge and expansion of teacher identity.

Agenda item: Impact of...	Variables
1. The out-of-field issue on the Teacher	<ul style="list-style-type: none"> • Factors that make teachers feel out-of-field • Teacher knowledge, attitudes/motivations/passions, identity • Negative/challenges and positive/opportunities impacts of out-of-field teaching • Incidence • Experience versus Certification debate
2. Governments and policy on Schools	<ul style="list-style-type: none"> • School autonomy (hiring, firing) • Accountability • Governance control • Responsibility • State and international variability • Lobby groups teacher unions, professional associations • Periodic change of government and impact of that change • Market driven employment practices
3. School-related factors on the out-of-field teacher	<ul style="list-style-type: none"> • Leadership and school governance style and attitude towards teacher quality, qualifications, experience • System of teacher allocation • Development of school and subject culture • Mobility (or not) of teachers across levels of schooling • Culture of teacher learning
4. The out-of-field teacher on the Student	<ul style="list-style-type: none"> • Teacher quality (knowledge, practice) • Teacher certification • Student factors • Pedagogical contract: relationships, learning outcomes, attitudes to subject, learning and teacher
5. Those responsible for Teacher Learning on the Teacher	<ul style="list-style-type: none"> • Certification and Certification-Systems • International variability • Quality of initial and in-service teacher education provision • Accessibility and resources (including funding) • Evidence of teacher change or development • Hierarchy and status

Priority actions

Emerging from these agenda items linked to three aims, which are :

1. Reducing the need for out-of-field teaching.

2. Improve the quality of out-of-field teachers.
3. Increasing readiness of teacher graduates to face the challenge of out-of-field teaching.

If the aim is to have enough qualified teachers, increasing the supply of science teachers is imperative. This may be achieved through governmentally supported initiatives to promote career change of professionals in the sciences, or to encourage recent science graduates to enter teaching. Yet another approach is for school leadership and management to ensure that adequately trained teachers are hired, allocated and resourced.

If the aim is to improve teacher quality, then attending to the professional

learning of out-of-field teachers is paramount. At both the school and the policy levels, there needs to be greater support for the re-training of out-of-field teachers so that they can be given the funding, time and space to understand new and emerging teaching approaches. At the school level, conversations can be had with the teacher about subject allocation and the degree of support available and required.

If the aim is to ensure that teachers are adequately prepared for the reality of teaching, then some responsibility falls on teacher education programs to prepare adaptable and flexible teachers. Pre-service teachers can be exposed to the likelihood of teaching out-of-field, the skills, knowledge and attitudes needed to be adaptable and flexible, and the variety of support mechanisms that can be provided,

sought out or constructed by them. Focusing on the development of resilience in pre-service teachers may help them to, once in schools, accommodate new and different ways of thinking, challenge their own beliefs, assumptions, values and practices when faced with the dilemmas and tensions of teaching, and help them to employ proactive learning strategies.

Conclusion

Discussions around policy and practice are needed in order to make these 'priority actions' possible and targeted to the specific context. Further research is needed to inform such discussions. It is thus vital to set a research agenda that is concerned with exploring the complexity of this issue worldwide.



An agenda for Research and Action

Linda Hobbs,

Deakin University, Australia

With contributions from participants at the 1st TAS Collective Symposium

Taking an international perspective on research and action

TAS is an international phenomenon that is manifested differently throughout the world. There is national and international variability in its extent, effects and contributing factors. This variability can hamper international comparisons of TAS; if we are to learn from each other, we need to take this variability into account.

There is much we can learn from each other in both understanding the issue, its effects and also how to respond. The TAS Collective symposium enabled a group of researchers and practitioners to listen to and learn from each other. Emerging from these discussions was an Agenda for Research and Action that may serve to both raise the profile of and inform our response to the issue. A forthcoming book will interrogate poignant themes.

This section addresses the following:

1. Key stakeholders and developing an agenda;
2. Themed agenda items that define the variables and questions for research and action;
3. Priority actions for attending to the issue, linked to the questions from the agenda items; and
4. Summary of relationships between the agenda items and priority actions

This report can be used to guide research and action. While there is not a large body of literature around teaching out-of-field, the literature that exists is disparate, often focusing on specific contexts, and few cross sector, international studies exist to take a

cross-system review of the issue. This document serves to give legitimacy and power to past, current and future research and action. Because in some countries this practice ‘flies under the radar’, the actions of the TAS Collective, including this document, may help to raise the profile of this practice, subject it to scrutiny, and hopefully induce some action by Governments to attend to the issue seriously and in a coordinated and sustained way.

Key Stakeholders and developing an Agenda

In every country, there are key stakeholders who have an interest in teachers’ suitability for teaching particular subjects. Governments, school leaders, teachers, students, the broader school community, the teaching profession generally, higher education and providers of teacher learning, and subject associations and Learned (discipline) societies relating to the individual subjects, all stand to influence, be influenced by, or to have a potential voice in who is teaching what. While certification or qualifications do not necessarily guarantee that a teacher will be an effective teacher, they are our best means by which we can ensure teachers have been exposed to and hopefully engaged with the requisite theory and knowledge needed to be an effective teacher.

Teaching out-of-field arises for many and varied reasons, and there are many and varied effects. As a

profession, we can respond in two ways: Research and Action. At present, Governments are mostly influenced by the numbers: who is teacher what and in what numbers. But the issue is complex and not just a matter for the statisticians. All the key stakeholders should be considered when understanding the issue.

As a result, the TAS Collective has developed an Agenda for Research and Action that incorporates the perspectives and responsibilities of all key stakeholders. We focus our attention on the relationships between the various key stakeholders, thereby ensuring that all who stand to be impacted on and by out-of-field teaching are considered in this agenda. Our focus is on five agenda items:

1. Impact of the out-of-field issue on the Teacher
2. Impact of Governments and policy on Schools
3. Impact of School-related factors on the out-of-field Teacher
4. Impact of out-of-field teaching on the Student
5. Impact of those responsible for Teacher Learning on the Teacher

Each of these themes will be explored in terms of: characteristics relevant to this theme, the underpinning assumptions, variables that can form the basis for research and action, questions for research, and questions for actions.

Agenda item 1. Impact of out-of-field teaching on the Teacher

Subject teachers teach out-of-field because of many different factors and with varying effects. The extent of the out-of-field phenomenon differs across different nations. The teacher stands to be impacted on by out-of-field teaching, although this may not always be acknowledged.

The assumption

Teachers are impacted on by having to teach different subjects out-of-field.

Variables

- Factors that make teachers feel out-of-field
- Teacher lived experience, knowledge, attitudes/motivations/passions, identity
- Negative/challenges and positive/opportunities impacts of out-of-field teaching
- Incidence
- Experience versus Certification debate

Questions for research and action

1. Why do teachers choose to/agree to/ teach out-of-field?
2. How do teachers perceive teaching of a 'non-specialist' subject?
3. What qualifies a teacher as out-of-field (background, subject content knowledge, pedagogical content knowledge, certification, experience etc)?
4. What are the common problems (of cognitive and affective nature) that out-of-field teachers have in teaching a specific subject, and what are the requisite knowledge to be addressed by professional development?
5. What does it mean to be a 'good teacher' in a specific subject?
6. How do we evaluate the content-related needs of the out-of-field teachers and how do we support them to develop?
7. How does number of years of teaching experience in the out-of-field subject and their in-field subject affect out-of-field teaching? How do we regard experienced out-of-field teachers?
8. What is required for transformation of practice?

Agenda item 2. Impact of Governments and policy on Schools

Government's relationship with the out-of-field issue include: the provision of adequate resources, their awareness of and attitude towards out-of-field teaching, which voices inform policy, the data used for making decisions (such as international comparative data), and accountability measures and standards defining the profession (such as professional standards).

The assumption

There are problems with the supply and demand of qualified and suitable teachers in certain subjects.

There are problems with teacher quality.

Variables

- School autonomy (hiring, firing)
- Accountability
- Governance control
- Responsibility
- State and international variability
- Lobby groups such as teacher unions, professional associations
- Periodic change of government and impact of that change
- Market driven employment practices

Questions for research and action

1. Considering educational governance, which levels of the government who are responsible for out-of-field teachers?
2. What are the perspectives of government and stakeholders regarding out-of-field teaching?
3. How do government policies and system level procedures interact to impact on the incidence of out-of-field teachers and the quality of teaching by out-of-field teachers?
4. What state-based or national retraining or professional learning programs exist for out-of-field teachers?
5. What incentives motivate out-of-field teachers to undertake professional training?
6. What government policies meet the needs of out-of-field teachers?
7. To what extent and in what ways is the practice of allowing teaching out-of-field a deliberate part of a broader global trend in teacher employment practices towards deskilling the profession and increasing employment flexibility?
8. What are the issues being raised internationally regarding out-of-field teaching (considering such contexts as well performing education systems such as Norway and Finland, and minority groups)
9. What is the impact of rapid and regular curriculum change on out-of-field teaching?
10. What is the economic, social and personal cost of out-of-field teaching?
11. What role do status of the profession play in the attraction and retention of quality teachers in hard to staff subject areas and in hard to staff schools?

12. To what extent would the following practices impact on out-of-field teaching:
 - a. Collecting data on numbers and classes in relation to out-of-field teaching, teachers and subject?
 - b. Historical data on the phenomenon?
 - c. Making at least two majors mandatory at pre-service education stage?
 - d. Analyzing current international debates and reports to find international solutions?
 - e. Making connections, and forming lobby groups around the out-of-field teaching phenomenon?

Agenda item 3. Impact of School-related factors on the out-of-field teacher

The school is the immediate context of the teacher. Different school sectors exist within many countries, and there is varying control over school governance and accountability. Regardless of country or sector, the adequacy of support and resources for out-of-field teachers, and the attitudes towards teacher assignment across year levels and subjects are, to varying degrees, the domain of school leadership.

The assumption

There is an imperative to get a teacher in front of every class

Variables

- Leadership and school governance style and attitude towards teacher quality, qualifications, experience
- System of teacher allocation
- Development of school and subject culture
- Mobility (or not) of teachers across levels of schooling
- Culture of teacher learning

Questions for research and action

1. How does school culture impact on out-of-field teaching?
2. How do Teacher Standards allow for teachers in out-of-field positions to reflect on and develop their practices?
3. How effective are induction and orientation for out-of-field teachers within the school culture?
4. How important are mentoring programmes within schools?
5. How do schools communicate with parents about the out-of-field situation within schools?
6. How do other teachers (department heads, parents, students) view and experience out-of-field teachers?
7. How do we prepare school leaders to manage out-of-field teachers and teaching within a school?
8. How do schools support heads of departments to deal with out-of-field teachers?
9. To what extent might a traveling teacher scheme within a local area be effective in dealing with out-of-field teaching issues, and what might this look like?
10. How does the level of teaching experience influence teacher allotment and the pattern of out-of-field teaching?

Agenda item 4. Impact of the out-of-field teacher on the Student

The students are on the receiving end of decisions about out-of-field teaching. Affected can be student learning outcomes and achievement, and students' engagement with and attitudes towards the subject. In addition, pipelining of students into Science, Technology, Engineering and Mathematics (STEM) beyond school, which is on the downturn in many western countries, may be at risk where out-of-field teaching practices are not informed by strong disciplinary and pedagogical knowledge.

The assumption

Teachers are the highest in-school factor determining student achievement.

Variables

- Teacher quality (knowledge, practice, attitude)
- Teacher certification
- Student factors: confidence in the teacher, achievement, attitudes to subject, background, non-school factors
- Pedagogical contract: relational pedagogy, learning outcomes, attitudes to subject, instructional pedagogy, school culture

Questions for research and action

1. What is the relationship between teacher certification and student learning outcomes?
2. What aspects of the student experience should be considered when investigating the effect of an out-of-field teacher on students, and how might these aspects be measured or captured?
3. What do students want in a teacher of a subject? Does this change for different subjects?

Agenda item 5. Impact of those responsible for Teacher Learning on the Teacher

Teacher learning and those responsible for teacher learning, both pre-service and in-service, are fundamental to the growth of teacher knowledge and expansion of teacher identity. Teacher learning occurs at pre-service teacher level and is generally the responsibility of universities and colleges. Continuing professional development is offered by a range of providers and funded in multiple ways. There are different expectations for continuing professional development internationally.

The assumption

Teacher qualifications determine a teacher's ability and suitability to teach a subject and year level

The Profession is subject to scrutiny and has status within the broader society.

Variables

- Certification and Certification-Systems
- International variability
- Quality of pre-service and in-service teacher education provision
- Accessibility and resources (including funding)
- Evidence of teacher change or development
- Hierarchy and status
- Responsibility for continuing professional development
- Continuing professional development versus retraining

Questions for research and action

1. What can we learn from other countries' responses to the out-of-field issue?
2. What is the role of the learned societies and conferences in addressing the out-of-field issue?
3. Who and what drives the out-of-field agenda?
4. What are the nature, content and structure of effective continuing professional development or retraining for in-service teachers?
5. What assumptions are informing the development of continuing professional development courses?
6. What role does context (national and international) play in the design of continuing professional development?
7. How can teachers be encouraged to shift from teacher to learner in order to maximise teacher learning?
8. What counts as evidence in one's professional identity development/change?

Priority Actions

The following list of priority actions arise out of the former agenda items in that all key stakeholders as they all have a part to play or are influence by attending to the issue of out-of-field teaching. It is unlikely that out-of-field will be eradicated, especially in some countries like Australia where teachers are formally registered as ‘teachers’, not teachers of a subject area or year level. Many other factors determine why out-of-field teaching emerges and persists. The first Priority Action deal with why it exists, that is a common belief that teacher attraction is limiting supply of some teachers. The second priority action accepts that if it is to stay, then we should attend to teacher quality but in a way that recognises that the teachers are not necessarily at fault if they are assigned out-of-field and are unsupported, and thus the need for targeted and on-time professional learning. The third priority action attends to the new teachers entering the system that are potentially un-prepared for the complexities of teaching, and especially out-of-field teaching. There is a question as to whether teacher education accepts the challenge of preparing teachers for teaching out-of-field. Summary fo the actions and relationship to the agenda items follows.

Priority Action 1. Reduce the need for out-of-field teaching

Attraction and retention are at the heart of the supply and demand issues being faced in some countries. Also retirement of an aging workforce presnts challenges in getting the right teachers into schools, especially those in rural and regional or hard to staff areas. Increasing the supply of science and mathematics teachers is imperative. In many countries Governments are adopting initiatives to assist mathematics and science professionals and recent graduates to move into teaching.

At the school level, school leaders should aim to get the right people to teach science and mathematics as much as is possible. Where teaching out-of-field teaching is unavoidable due to inadequate teacher supply, adequate support and resources are imperative to prevent teacher stress and attrition. Also, out-of-field teachers may benefit from teaching a subject or year level multiple times in order to develop expertise and enable reflection on practice.

A prerequisite for any attempt to attract more high quality teachers to the workforce is to make the teaching profession attractive. In many countries around the world, teaching attracts inadequate remuneration, and teacher quality is often under scrutiny. State criticism and increasing accountability is unlikely to raise teacher quality. Alternatively, where education is overtly valued and adequately remunerated, there is greater attraction of high quality teacher applicants, often resulting in an oversupply of high quality teachers and/or strict entry requirements for teacher education programs. This is a policy issue first and foremost.

Recommended actions:

- 1.1 *Increase the supply of high quality and qualified teachers*
- 1.2 *School leaders should aim to appoint and assign the appropriately qualified teachers to teach science and mathematics*
- 1.3 *Raise the profile of, and level of respect accorded to, education and teaching as a career*

Priority Action 2. Improve the quality of out-of-field teaching

Teaching out-of-field has been common practice for some time, although silent and tabooed in some countries. Therefore, improving the quality of out-of-field teaching requires serious attention. Such improvement requires continuing professional learning. Whether these teachers seek out or participate in formal professional development or retraining programs depends on many factors: availability, accessibility due to context, time, identity-related issues, school leadership and professional development cultures, and state incentives, funding and support. The last factor is essential if high quality and targeted professional development and retraining opportunities are to be available.

Identity-related factors can determine how teachers approach an out-of-field teaching assignment. Teachers who embrace the challenge and are willing to see themselves as learners are more likely to seek out or engage with professional development seriously, leading to increased knowledge, improved practice, and expanded professional identities. However, these types of transformations require recognizing where their practice could be enhanced, recognizing their strengths, reflection on practice, and risk taking to embrace new practices. Research is needed to establish the key features of effective professional development that leads to such transformation in identity and practice for out-of-field teachers.

At the most fundamental level, this type of professional learning requires substantial support. Where does this support come from? At both the school and policy levels, there needs to be greater support for the re-training of out-of-field

teachers. Teachers need funding, time and space to adapt, understand, and try out new and emerging teaching approaches.

School cultures that promote continuing professional learning offer the best environment for in-school teacher learning. Developing subject departments that act as communities of practice may help to move out-of-field teachers from the periphery to full participation as members of a supportive learning community. Professional learning communities within and beyond schools also present opportunities for learning. However neither of these communities emerge on their own; they must be fostered and require 'champions' to ensure that they are developed and that out-of-field teachers are welcomed and benefit from participation. The principal and leadership team are central, and training may be needed for leadership to develop the skills and attitudes needed to drive such initiatives.

The issue of teacher quality in many countries has emerged as an issue partly because of international testing regimes. The problem with such testing is that there are many factors, some qualitative in nature, that contribute to a student's experience at school and possibility of participating in society. A data driven approach to education can fail to acknowledge these qualitative factors; it also funnels the curriculum. While at the one hand it has the potential to reflect the extent and effect of out-of-field teaching (although there is no evidence of this), there are ethical issues if such testing is used to measure the performance of an out-of-field teacher. Use of a balance between high stakes testing, local school data, and other qualitative measures that are encompassing of school contexts and supply/demand issues is therefore needed when imposing accountability measures.

Recommended actions:

- 2.1 *Provide high quality in-service teacher learning opportunities through professional development and funded certified retraining programs*
- 2.2 *At school and policy level, provide funding, time and space for out-of-field teachers to adapt to and understand new teaching approaches in order to maintain quality teaching, as well as to avoid losing teachers due to stress created from teaching out-of-field*
- 2.3 *Support school leaders to appreciate the demands of out-of-field teaching, and to foster school communities that respect and support continued learning of teachers*

Priority Action 3. Increase the readiness of teacher graduates to face the challenge of out-of-field teaching

Out-of-field teaching is a systemic issue. It is a reality, widespread, and many teachers worldwide will encounter it at some point in their career. Early career and experienced teachers are mis-assigned, either as common long-term practice (such as science teachers teaching mathematics) or in order to complete a teacher's load. Consequently, new teachers would benefit from being made aware of the reality of out-of-field teaching. Pre-service teacher education programs that build teachers' capacity to engage in teacher learning-oriented reflection practices, and to embrace an identity of teacher-as-researcher-learner may enable graduate teachers to be more ready when they receive an out-of-field teaching load. They will need to know where to get resources, what support to ask for, and how to draw from their previous experiences and in-field teaching practices. Also, resilience and risk taking will be important when they encounter subject content matter that they are not familiar with.

Tensions exist in initial teacher education because teacher education programs are often subject to strict accreditation requirements. Maintaining a balance between strict subject specialization and preparing students for the reality of teaching is difficult within these requirements.

Continued partnerships between schools and universities may be a way to support graduate out-of-field teachers by providing on-demand professional development, either on a user-pays basis or with support from state funding.

Further research is needed to understand the role that universities can play in preparing and supporting new teachers.

Recommended actions:

- 3.1 *Teacher education programs to raise an awareness of, capacity to respond to, and expand identity in the face of the out-of-field challenge, while still maintaining commitment to subject-related requirements*

Summary of “Priority Actions” and relationship to “Agenda items”

1	Priority action 1. Reduce the need for out-of-field teaching	Agenda
1.1	Increase supply of high quality qualified teachers	2
1.2	School leaders aim to appoint and assign the appropriately qualified teachers to teach science and mathematics	1, 3
1.3	Raise the profile of, and level of respect accorded to, education and teaching as a career	2
2	Priority action 2. Improve the quality of out-of-field teaching	
2.1	Providers to supply quality in-service teacher learning opportunities: professional development, retraining programs	2, 5, 4, 1
2.2	At school and policy level, provide funding, time and space for out-of-field teachers to adapt to and understand new teaching approaches in order to maintain quality teaching, as well as to avoid losing teachers due to stress created from teaching out-of-field	2, 3, 1
2.3	Support school leaders to appreciate the demands of out-of-field teaching, and to foster school communities that respect and support continued learning of teachers	3, 5, 4, 1
3	Priority action 3. Increase the readiness of teacher graduates to face the challenge of out-of-field teaching	
3.1	Teacher education programs to raise an awareness of, capacity to respond to, and expand identity in the face of the out-of-field challenge, while still maintaining commitment to subject-related requirements	5, 1

Notes:

1. Impact of the out-of-field issue on the Teacher
2. Impact of Governments and policy on Schools
3. Impact of School-related factors on the out-of-field Teacher
4. Impact of the out-of-field teacher on the Student
5. Impact of those responsible for Teacher Learning on the Teacher

Conclusion

Günter Törner and Marc Bosse

At the end of our Porto symposium we (Marc and Günter) were wondering about what we had learnt: What do we have in common with the other countries who contributed to the symposium? What is similar and what is uncontroversial in those countries?

(The collection of ideas that follows comes in random order and is not complete.)

1. Out-of-field-teachers do not necessarily have to teach “worse lessons”, there might also be situations (counterexamples) in which TAS-teachers are more engaging and better accepted than qualified teachers.
2. High-achieving students are primarily found in schools providing lessons by in-field teachers.
3. The deficits of out-of-field lessons are more likely to be identified by an outside observer. The respective teachers involved are usually not aware of these deficits because they lack the ability to professionally reflect on their performance. They don’t know what they don’t know.
4. Usually, pre-service teachers are not properly prepared for the corresponding challenges of their future work by means of their university education.
5. The problems connected to TAS are only marginally examined in terms of scientific research: The availability of data is quite poor.
6. In everyday school life the problem is only on the margins of discussion, from head master to educational administration. However, every level should be quite familiar with the issue itself.
7. So far, initial attempts of specific measures for treatment in terms of professional development or retraining are not appropriately dealt with in specialist literature.
8. We have to live with the phenomenon of out-field-teaching, in Australia and elsewhere, unless the educational administration makes an attempt at reducing its occurrence (South Korea).
9. By trivializing the problem itself, we would question the system of university education on the whole.

