5th TAS Collective Symposium 2018 *“Researching Teaching Out-of-field in Math, Science and beyond”*

*Bolzano, Italy, September 2-3, 2018*

The 5th TAS Collective symposium will take place as a pre-conference event on the Sunday and Monday before ECER 2018.

# Orienting the Symposium:

So far we have been exploring in the TAS Collective book teaching out-of-field, or Teaching Across Specialisations (TAS), from an international perspective. It is useful now to explore it from the perspective of the different subjects. And what TAS means for generating, sustaining and promoting quality teaching across different subjects.

Previously we have had a strong mathematics-science focus to our symposia, but now we would like to open up the program to different subjects. It is possible that out-of-field teaching has different effects in the different subjects in terms of student achievement, learning outcomes, attitudes and relationships.

Also, some subjects are at risk of out-of-field teaching more than others, depending on the way the curriculum is divided and the teacher preparation systems.

Also there are some effects of the experience of teaching out-of-field that are common across subjects.

Exploring these similarities and differences, and the implications for how we respond to TAS will be a focus of the symposium. Therefore, we invite researcher and practitioners interested in the phenomenon of TAS to consider presenting at this symposium.

Some guiding questions:

1. What different effects do out-of-field teaching have in different subjects?
2. What effects are common across subjects?

# Symposium format:

* Each session has two or three presentations.
* 30 minute presentations – 20 minutes presentation, 10 minute discussion.
* There will be time for a session discussion after the presentations.

# Location:

Free University of Bozen-Bolzano

Piazza Università 1

39100 Bolzano BZ, Italy

Room E2.11. The room is in the so-called "E-Trakt" of the main building on the 2nd floor.

See the ECER website for more information on the venue: <https://www.eera-ecer.de/ecer-2018-bolzano/where/bolzano-and-the-conference-venue/>

Program

# Sunday September 2nd

|  |  |  |  |
| --- | --- | --- | --- |
| Session | Time | Title | Presenters |
| Arrival  | 8.30 |  |  |
| Session 1 | 9.00-9.10 | Welcome and agenda | Günter Törner |
|  | 9.10-9.40 | Teaching English as a foreign language in primary school: Teacher education and qualification in Germany | Raphaela Porsch & Eva Wilden |
|  | 9.45-10.15 | Teacher Shortage and out-of-field teaching in Israel  | Smadar Donitsa-Schmidt Ruth Zuzovsky(Israel) |
|  | 10.15-10.45 | Session 1 discussion | Led by Anna du Plessis |
| Morning tea | 10.45-11.15 | Provided |  |
| Session 2 | 11.15-11.45 | The instructional practices of newly hired out-of-field secondary science teachers in the United States | Jessica BennettHarleen SinghJulie Luft(USA) |
|  | 11.50-12.20 | PCK of newly hired out-of-filed teachers during the first three years of their teaching | Harleen SinghJessica BennettJulie Luft(USA) |
|  | 12.20-12.50 | Session 2 discussion | Led by Steffen Lünne |
| Lunch | 12.50-1.50 | Provided |  |
| Session 3 | 1.50-2.20 | How relevant is the subject for attending a professional development course? – Motives and expectations of out-of-field teachers in mathematics | Steffen Lünne Susanne Schnell Rolf Biehler (Germany) |
|  | 2.25-2.55 | Supporting out-of-field mathematics teachers: an evaluation of a professional development programme | Catherine PaolucciMáire Ní RíordáinLaura O’Dwyer(Ireland) |
|  | 3.00-3.30 | Professional development for out-of-field post-primary teachers of mathematics: A pre and post analysis of the impact of mathematics specific pedagogical training | Fiona Faulkner, Niamh O’Meara |
|  | 3.30-4.00 | Session 3 discussion | Led by Raphaela Porsch |
| Break | 4.00-4.10 |  |  |
| Session 4 | 4.10-5.00 | TAS Collective matters:* Current projects
* Future projects
 | Linda Hobbs |
| Dinner | 6.00 | Location TBC |  |

# Monday September 3rd

|  |  |  |  |
| --- | --- | --- | --- |
| Session | Time | Title | Author |
| Arrival  | 8:30 |  |  |
| Session 1 | 9:00 – 9.10 | Summary of key learnings from Day 1 | Linda Hobbs and Raphaela Porsch |
|  | 9.10-9.40 | Examining Primary School Mathematics Teachers’ Understanding of How Being Out-of-field Affects Their Experience in Practice: Wenger’s Social Theory of Learning.  | Esti RahayuShuki Osman(Malaysia) |
|  | 9.45-10.15 | Building a school culture that supports out-of-field teachers: School leaders, STEM, the out-of-field teaching phenomenon and teacher capacity  | Anna E. du Plessis(Australia) |
|  | 10.15 – 10.45 | Session 1 discussion | Led by Linda Hobbs |
| Morning tea | 10.45-11.15 |  |  |
| Session 2 | 11.15-11.45 | How systems generate, sustain and promote quality teaching despite the practice of assigning teachers to out-of-field teaching positions: A model for analysing system data | Linda Hobbs, Colleen Vale, Coral Campbell, Chris Speldewinde(Australia) |
|  | 11.50-12.20 | Sustaining teaching quality in the face of out-of-field teaching: The perspective of German principals in lower secondary schools | Raphaela Porsch(Germany) |
|  | 12.20-12.50 | Session 2 discussion | Led by Günter Törner |
| Lunch | 12.50-2.00 | "Unibar" (University cafeteria) |  |
| Session 3 | 2.00-4.00 | TAS Collective matters:Planning for future projects/research | Led by Linda Hobbs, Günter Törner & Raphaela Porsch |
| Farewell |  |  |  |

Abstracts

# The instructional practices of newly hired out-of-field secondary science teachers in the United States

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**Keywords:** Secondary science teaching, out-of-field, Next Generation Science Standards, Science and Engineering Practices

Educational policy makers in the United States became concerned with teachers who were under-qualified in courses they were teaching. To ameliorate this problem, policy makers created provisions about teacher qualifications in the No Child Left Behind Act of 2001 and Every Child Succeeds Act of 2015. This legislation requires teachers to meet some level of competency in order to document their ability to teach in a content area. While this legislation requires teachers to be “highly qualified” in order to be in a classroom in their specific subject area, many new teachers are frequently asked to teach in an area outside of their expertise. This study is concerned with out-of-field (OOF) teachers who are a result of these legislative acts. It used a mixed methods approach to examine beginning secondary science teachers who were teaching in-field and OOF. In order to explore the impact of OOF teaching in science, we focused on the instructional practices of 17 physical science teachers who were both in-field and OOF. The teachers in this sample were first, second and third-year teachers. The practices of interest among these teachers came from the *Next Generation of Science Standards* (*NGSS*) (NGSS Lead States, 2013), and included: generating explanations, using computational thinking, and analyzing data. In order to understand how OOF teaching impacted the instruction of these teachers, researchers conducted semi-structured interviews and classroom observations. These data were collected from the different teachers, during one year, when they were either teaching in-field or OOF. The collected data were analyzed qualitatively and quantitatively to understand how these teachers engaged in the different science education practices found in the *NGSS* (NGSS Lead States, 2013). These results revealed two important findings. First, OOF beginning teachers had a more difficult time executing reform-based instructional practices than did in-field beginning teachers. Second, over the first three years of teaching, in-field teachers tended to use more traditional practices. Yet when they did engage in the practices described in the *NGSS* (NGSS Lead States, 2013), these practices were in greater quantity and higher sophistication than OOF teachers. The analyzed data reveals that newly hired teachers struggle, but OOF teachers do so more than their in-field colleagues. The lack of reform-based instruction certainly impacts the learning of students. Policy makers need to consider requirements that limit the variation in teaching assignments, and that outline specific expectations for new teacher preparation and support.

NGSS Lead States (2013). Next Generation Science Standards: For States, By States. Washington DC; Achieve.

# Teacher Shortage and out-of-field teaching in Israel

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**Key Words:** supply and demand, teacher shortage, out-of-field teaching

Israel, like many other western countries, suffered in the past few years from quantitative teacher shortage. Previous studies conducted in Israel in 2010-2013 revealed that the quantitative teacher shortage led to an extensive out-of-field phenomenon as a major strategy used by school principals to overcome this shortage. This strategy of hiring out-of-field teachers effected directly the quality of teaching and created a qualitative teacher shortage. The quantitative and qualitative shortage were found to be more acute in certain school subjects.

 The current research to be presented in this symposium which was conducted in 2017-2018, five years after the previous study, examined again whether teacher shortage still exists in the Israeli education system. The study focuses on several core school subjects in the elementary and secondary schools including Math, Science, Hebrew, English as a second language, Humanities, Computer Science and Special Education. Based on the previous studies the assumption is that the existence of quantitative teacher shortage in these school subjects influences the spread of the out-of-field teaching phenomena.

Data on teacher shortage was obtained by focusing on the gap between supply and demand of teachers through an examination of job advertisements that appear regularly on the teachers’ union internet site. The supply ads are placed by schools seeking to hire teachers; the demand ads are posted by individuals seeking a teaching position. The examination was carried out over a period of a year in 2017-2018. This enabled us to identify recurring patterns and fluctuations of supply and demand over the school year. These data will be complemented and compared to administrative national data on the number of student teachers who majored in these school subjects and started teaching in schools in the school year 2017. These data will shed light on the supply of qualified teachers in these school subjects who entered the school system in the years preceding the study.

The findings will show whether teacher education colleges manage to supply the demand for teachers and whether the education system overcame the acute teacher shortage that was found to exist in the past few years. The presentation will shed light on the dynamics of teacher shortage throughout the year and on the reasons for the out-of-field phenomena in certain school subjects in the Israeli context.

# Building a school culture that supports out-of-field teachers: School leaders, STEM, the out-of-field teaching phenomenon and teacher capacity

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**Proposal information/Research Questions and theoretical approach**

The purpose of this paper is to offer an insight into the implications the out-of-field phenomenon has for the development of quality teaching and learning environments, school leaders, STEM improvement strategies and a supportive school culture. The out-of-field teaching phenomenon entails teachers teaching outside their field of qualification, expertise or specialisation. ‘Field’ is defined as a specific subject area or year level. Academic outcomes and results obtained by students relate to high-quality teachers (Goldhaber & Walch, 2014). Results stimulate a deeper understanding of teachers’ challenges and school leaders’ role linked to the out-of-field teaching phenomenon. I argue the need for global scholarship on the meaning of out-of-field teaching practices to improve and inform diverse democracies and educational leadership fully engaged in improving quality teaching for the next generation.

The investigation includes two very different education environments, Australia and South Africa ranked respectively 2nd and 119th on the human development index (United Nations Development Programme, UNDP, 2017). The rationale to provide a global lens, Germany (Bosse, 2014), Phillipines, Australia and South Africa (Du Plessis, 2014), US (Ingersoll, 2002), Ireland (Cosgrove, Shiel, Oldham, & Sofroniou, 2004), is to enhance the applicability of the information to different education systems while it develops an in-depth understanding of transnational trends and issues (Goodnow, 2006).

The main research questions, *“How fundamental, for out-of-field teachers in their everyday concerns and practices, are their lived experiences linked to the out-of-field phenomenon* and school leaders’ support?”, and *“What are the implications of out-of-field teaching practices for quality STEM teaching and learning environments?”* guide this investigation. The multi-layered characteristics of the phenomenon call for an innovative research design. Gadamer’s (1975; 1976) hermeneutics philosophy provides a theoretical frame to support examining the perceptions and life-worlds of participants. The paper’s argument is embedded in Vygotsky’s (1978) social constructivist theory that the careful guidance of a more knowledgeable other develops positive learning strategies. It, however, has implications and expectations for teacher’s awareness, alertness, and engagement in the teaching and learning space. An innovative theoretical framing, the Context-Conscious Understanding Development (C-CUD) theory provides a strong conceptual positioning for the investigation.

**Methods**

The qualitative paradigm allows an in-depth investigation of lived experiences through Gadamer’s (1975; 1976) philosophy of ontological awareness while Heidegger’s (1962) theories of “being in the world” (p. 174), encourages understanding the need for ‘belongingness’ and ‘at homeness’ within subjects and year levels.

Seven schools, independent (3 Australian) and public schools (2 Australian and 2 South African) involved 33 Australian and 15 South African participants. These participants represented different levels of experience and positions; education sectors, educational directors, principals, specialist and out-of-field teachers as well as parents.

Semi-structured interviews and informal discussions were based on Gadamer’s (1975, 1976) hermeneutic philosophy of interpretation and understanding through listening, testing, reflecting and observing from different angles to formulate meaning. Classroom and staffroom observations view the life-world of the participants while “maintaining a hermeneutic alertness” (Van Manen’s, 1990, p. 69). The interpretive analysis unveils themes and sub-themes of lived experiences beyond what seems obvious.

**Conclusion and Findings, Scientific Significance**

The findings highlight out-of-field teachers’ uncertainty about pedagogical content knowledge and content knowledge and its impact on teacher effectiveness and competencies. Perceptions that an education crisis is looming, concerning Science and related fields such as Technology, Engineering and Mathematics, stimulated questions regarding the capacity of out-of-field teachers to teach these subjects. Against the background of research that claims that 75% of people entering the 21st-century job market will require Science, Technology, Engineering or Mathematics (STEM) skills, this investigation provides information to better understand the impact of out-of-field teaching for STEM subjects. The findings inform strategies to improve the quality of STEM teaching. Focus turns to awareness of how the out-of-field phenomenon could be manage to maintain quality teaching practices. This notion embraces Gillies and Boyle’s (2008) view of a classroom as a comprehensive space in which effective meaning-making happens freely.

The transnational investigation exposes specific factors that intensify the complexities surrounding out-of-field teaching practices. Out-of-field teachers in developing countries (South Africa) teaching out-of-field subjects to class sizes with 40 or more or international teachers in out-of-field positions in a developed country (Australia) that teaching in a second language in which they are not fully fluent, or have to manage multiculturalism in classes without support or understanding from educational leaders greatly impact the quality of teaching and learning. Findings reveal that assessment frameworks do not acknowledge the differences between specialist teachers and teachers in out-of-field positions. The paper concludes with recommendations linked the CANNAS-School leadership model and the C-CUD theoretical framing.

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# Professional development for out-of-field post-primary teachers of mathematics: A pre and post analysis of the impact of mathematics specific pedagogical training

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**Keywords:** Maths specific pedagogy; out of field teaching; upskilling.

The Professional Diploma in Mathematics for Teaching is a 2 year part time programme dedicated to out of field teachers of mathematics in second level education in Ireland. The programme was introduced in Ireland after a report was published highlighting that 48% of second level teachers of mathematics in Ireland were not qualified specifically to teach mathematics (Ní Ríordáin & Hannigan 2011). The Irish Government, in turn, provided funding to upskill these teachers. The programme has been running since 2012 and is currently upskilling its 6th cohort of out of field teachers. A total of 825 teachers have graduated from the professional diploma with a further 152 expected to graduate this year. As part of the programme, teachers are required to undertake mathematics content modules as well as mathematics specific pedagogy modules. As part of one such maths specific pedagogy module students must undertake five 3-hour workshops which examine mathematics content contained on the second level curriculum and offers suggestions on how to teach it for conceptual understanding. Teachers in Cohort 5 of the programme completed a questionnaire prior to completing the 5 workshops to outline their opinion on whether they felt such training was necessary and also to reveal how confident they currently felt teaching particular aspects of the second level mathematics curriculum. Upon completion of the 5 workshops this same cohort of teachers completed a similar questionnaire investigating their level of confidence in teaching the curriculum and their views on the necessity of the workshops. This research examines the findings of such questionnaire data and reveals that the teachers’ confidence levels in different content areas of the curriculum changed significantly before and after undertaking the workshops. The second level maths curriculum in Ireland consists of 5 main strands and teachers confidence improved across the board in all 5 strand areas with the greatest improvements being noted in ‘Number’ and ‘Algebra’ strand and the smallest improvement evident in the ‘Geometry and Trigonometry’ strand. More details of such findings, as well as qualitative feedback and associated themes, will be presented in this talk. It is hoped that such findings will inform future mathematics specific pedagogy modules/programmes designed for out of field teachers of mathematics and beyond.

How systems generate, sustain and promote quality teaching despite the practice of assigning teachers to out-of-field teaching positions: A model for analysing system data

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**Keywords:** teaching out-of-field, systems, policy, school system, university system, critique, quality teaching

Teaching out-of-field, that is teaching a subject without a specialisation, has become an international phenomenon. Research exploring this issue is emerging, however cultural variation as to what defines a person’s ‘field’ makes international comparison difficult. This transnational project with Germany adopts an innovative approach to exploring this issue by examining the systems that generate, sustain and promote teaching quality in response to the reality of out-of-field teaching: universities (such as initial teacher education), schools (and the practices and policies that govern teacher recruitment, allotment and support), and government (including the policy settings that influence availability of support and funding). These systems create the conditions for, and capacity to respond to, out-of-field teaching. The responsibilities for and responses (as initiatives and practices) to out-of-field teaching differ between jurisdictions within countries and between countries.

Given the focus on policy critique, this project is informed by critical theory (Giroux, 1983). Giroux argues that dramatic social change can be achieved through “critique”. Critique focuses on systemic responses, and attends to the relationships between policy and what is happening on the ground in schools and at universities when preparing teachers for the realities of the teaching profession. Through interviews with key informants of each system—governments, universities and schools—this research provides insight into how quality teaching can be generated, sustained and promoted at these three system levels in the face of the persisting practice of assigning teachers to teach out-of-field. This presentation proposes a model that will be used in the analysis of these data, focusing on the perceived responsibility of each, the innovations or actions that each system can undertake, and how interaction between the three systems generate, sustain and promote quality teaching despite out-of-field teaching. Through critique this research sheds light on how out-of-field teaching has been produced, contested, and legitimated in the Australian education arena.

Giroux, H. (*1983*) Theories of Reproduction and Resistance in the New Sociology of Education: A Critical Analysis. Harvard Educational Review: September 1983, Vol. 53, No. 3, pp. 257-293.

# How relevant is the subject for attending a professional development course? – Motives and expectations of out-of-field teachers in mathematics

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**Keywords:** out-of-field teachers, subject-specifity, professional development course, motives

Due to the shortage of mathematics teachers in German secondary schools (Klemm, 2015), an increasing number of mathematics lessons is taught by teachers who are not formally qualified for teaching this subject (Richter, Kuhl, Haag, & Pant, 2013; Törner & Törner, 2012). To promote the quality of teaching, some German federal states offer professional development courses [PDC] for out-of-field teachers in mathematics. On completion participants gain a certificate, which allows them officially to teach mathematics in secondary schools (grade 5 to 10) (Lünne & Biehler, 2018). Contrary to expectations these courses are mostly attended by teachers, who have never taught mathematics before their application. It seems to be a variety of different motives (extrinsic such as the prospect of career advances, intrinsic such as the striving for improvement of one’s mathematical teaching skills) and expectations (regarding content, methods and goals of the PDC) which influences their decision for participation (cf. Bosse, 2017). So, they have reasons, which are not related to the subject itself. As motives are persistent preferences for achieving a specific goal (Rheinberg & Vollmeyer, 2012), they can be seen as the preconditions of a present motivation (Schiefele & Schaffner, 2015). So, lower interest in the subject itself might lead to a lower willingness for professionalization in mathematics. In order to make PDCs efficient, the orientation towards participants is an important design principle (Barzel & Selter, 2015; Rösken-Winter, Schüler, Stahnke, & Blömeke, 2015). Thus, the exploration of motives and expectations is a crucial prerequisite for sustainable learning processes (cf. Bosse, 2014, 2017).

Extending our contribution to TAS 2018, this article elaborates on the role of motives and motivations in professionalization processes with a specific focus on out-of-field teachers. On the backdrop of these considerations, we present data collected in a survey among the 61 participants of the three certification courses for out-of-field teachers in Detmold province, North Rhine-Westphalia, Germany (Lünne & Biehler, 2018). By qualitative content analysis (Kuckartz, 2014), we refined the categories of motives and expectations - highlighting how they are subject-related - and present relations between them.

On the backdrop of these findings, we discuss implications for the design of future professional development courses for out-of-field teachers.

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# Supporting out-of-field mathematics teachers: an evaluation of a professional development programme

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**Key Words:** Professional development; Mathematical knowledge; Self-efficacy

As international concerns have grown regarding the prevalence of out-of-field mathematics teachers, so have discussions about how to support these teachers. In the Irish context, Ní Ríordáin and Hannigan (2011) found that 48% of teachers who were teaching post-primary mathematics were not qualified to do so, as determined by the Irish Teaching Council. As a result, the Irish Government funded the establishment of the Professional Diploma in Mathematics for Teaching (PDMT), a national professional development programme specifically designed to address the needs of out-of-field mathematics teachers.

Research conducted in conjunction with the PDMT has two main aims. The first is to better understand the areas of greatest concern regarding the mathematical knowledge of Ireland’s out- of-field-teachers. The second is to evaluate the impact of the PDMT on participating teachers’ mathematical knowledge, self-efficacy, and commitment to incorporating research and innovative practices in their mathematics classrooms. This is particularly critical given that research has established teachers’ knowledge as an influential factor in classroom practice and self-efficacy as a potential indicator of both effectiveness and willingness to incorporate innovative teaching strategies (Bitto & Butler, 2010; Lampert, 2001).

This presentation will discuss the results from research examining the mathematical knowledge and self-efficacy of out-of-field mathematics teachers, both prior to enrolling in the PDMT and upon programme completion. Data was collected from a combination of two instruments – a mathematical knowledge test and an online survey. The PDMT’s cohort model enabled comparison of data collected prior to enrolment with data collected from the same group upon programme completion. The results from the pre-test and initial survey highlight critical areas of concern in the mathematical knowledge of participating out-of-field teachers (Ní Ríordáin, Paolucci & O’Dwyer, 2017). The results of the post-test and final survey offer evidence of development in participating teachers’ mathematical knowledge and self-efficacy over their two years in the programme. In addition, over 60% of participating teachers reported having already incorporated at least one, if not several strategies learned from the PDMT into their classrooms.

At the same time, the findings also raise some important concerns about persistent weaknesses in participating teachers’ mathematical knowledge related to key areas of the Irish curriculum.

The presentation will outline both the positive impacts of the PDMT and persistent challenges regarding the mathematical knowledge and self-efficacy of out-of-field mathematics teachers. These findings can help to direct continued conversations, research, and programme development aimed at supporting out-of-field teachers.

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# Sustaining teaching quality in the face of out-of-field teaching: The perspective of German principals in lower secondary schools

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Legally principals in Germany are responsible for ensuring that the sufficient number of lessons is provided at their schools but they also play an important role in maintaining teaching quality. However, if there is a lack of qualified teachers, they may be forced to assign positions to teachers who do not have the subject-specific qualifications also known as out-of-field teaching. “Leadership is a process whereby an individual influences a group of individuals to achieve a common goal“ (Northouse, 2007, p. 3). This definition implies that leadership is regarded as a process rather than a trait or characteristic but it is also notable that in the school context the principles’ attitudes towards the phenomenon of out-of-field teaching may strongly influence how teachers view the situation and how much support they receive from their school leaders. In addition, different leadership styles exist (Bush, 2008) and contextual factors play an important role in decision-making (Hobbs, 2013). Thus, principals may deal differently with the situation of out-of-field teaching at schools.

The project researches the perspective of principals at lower secondary schools by identifying their individual understanding and perceptions of out-of-field teaching practices, their responses to the phenomenon at their schools against the background of different leadership styles and contextual factors. This research was carried out in the state of North Rhine-Westphalia, Germany, in 2017. In lower secondary schools up to 90 per cent of all school lessons are taught out-of-field depending on the subject and year level. Data from three schools was generated by conducting individual semi-structured interviews with headmasters or deputy headmasters. The transcribed texts were analysed by using qualitative content analysis (Kuckartz, 2016). Results from this small case study show, among other, that two different views on the phenomenon exist among the principals: Teaching out-of-field teaching is regarded as a “normal” part of the teaching profession or underline that this situation is a great challenge for teachers and schools. The latter understanding was also identified by du Plessis (2016) in an Australian and South African sample. Opposite views also relate the assignment of teachers to their positions. Two leaders emphasize in particular the teachers’ interest in the subject as the main prerequisite to teach a subject effectively. In contrast, another principal stresses the necessity of teachers to attend post-qualification courses if they teach subjects regularly and which were not part of their initial teacher training.

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# Teaching English as a foreign language in primary school: Teacher education and qualification in Germany

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In Germany education is mainly the task of the federal states. As a consequence, each of the 16 German states has its own school system and system of teacher education. In most states, children transfer to secondary education after year 4, in two states after year 6. Most federal states in Germany begin with English as a foreign language (EFL) education at primary level in year 3, in five states children already start learning EFL in year 1. In general, teacher education is organized in two distinct ways: teachers are either trained as generalists or as specialists for a subject. In Germany foreign language teachers in secondary education are typically trained as subject specialists majoring in a foreign language as well as a second subject. In primary education, however, the number of subjects that are part of teacher education differs and depends on the regulations in each state (see Porsch, 2017). In addition, in primary school teachers work mainly in one class and thus they teach almost all lessons and subjects. Depending on the number of subjects that were part of an individual teacher’s training, out-of-field teaching is very likely to happen in EFL primary education. Although no official statistics are available and only a few studies from individual states report on the status of EFL teacher qualification, one can assume that a large amount of primary EFL teachers currently working in Germany did not study EFL at university.

Based on the previous considerations, this talk reports on the TEPS study (Teaching English in Primary Schools) which is addressing this research gap by having surveyed 844 primary school teachers in two German states regarding their EFL qualifications. Those primary schools teachers, who on a regular basis are teaching in year 4, have the following subject qualifications: 40.2 % studied English as a major, 47.9 % participated in a post-qualification course in EFL, and 12 % had not participated in professional training for EFL education. In the talk further information about differences between the groups (individual characteristics, teaching methodology) will be presented. Based on these findings, possible changes in teacher education will be discussed.

# Examining Primary School Mathematics Teachers’ Understanding of How Being Out-of-field Affects Their Experience in Practice: Wenger’s Social Theory of Learning

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**Keywords:** Social Theory of Learning, identity, practice, meaning, community, teacher learning.

The present study uses social theory of learning (Wenger, 1998) to examine the professional learning journey of primary school mathematics teachers in Indonesia who entered teaching job as out-of-field teachers. The purpose of this study is to take an exploratory look at how three Mathematics primary school teachers in Indonesia come to understand their experience in educational practice and their professional role as teachers who transform from being out-of-field teachers to accomplished teachers using the framework provided by Wenger’s Social Theory of Learning. Crucial to this theory, it is important to understand that teachers’ participation shapes who they are (identity), what they do (practice), how they interpret what they do (meaning), and how they belong (community). The social theory of learning combines these specific components to describe social participation as a process of learning and knowing. Supporting research questions include: (1) How are teachers’ reflections of their changed role? (2) How are teachers’ processes and experiences of participation and engagement in their current teaching practice? (3) How do the teachers interpret and understand their transformation from being out-of-field to accomplished teachers? (4) How are the teachers’ processes and experiences of belonging to their current teaching practice?

Qualitative research methods are used to gather data that is collected from 1) three out-of-field mathematics teachers’ engagement in their professional learning in their school and 2) out-of-field teachers’ supervisor’s support in teachers’ professional learning. Data collected from the out-of-field teachers’ engagement in a professional development activity includes interviews and documents that chronologically described the history of the professional development activity. Data collected from the supervisor to inform case studies includes interviews. The data from the out-of-field teachers’ engagement in the professional development activity and the supervisor is analyzed and coded by the framework provided by Wenger’s Social Theory of Learning to identify emergent themes and patterns that informed the teachers’ understanding and experience of transformation from being out-of-field to accomplished teachers.

Findings of this research revealed the importance for teachers to collectively discuss their experiences teaching Mathematics, the importance for teachers to engage in reflection throughout their professional learning, the importance for teachers to observe and view other colleagues’, and the opportunity for teachers to become more familiar with Mathematics teaching materials and methods to enable for more authentic teaching experiences with their students.

# PCK of newly hired out-of-filed teachers during the first three years of their teaching

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**Keywords:** Pedagogical Content Knowledge, Out-of-field teaching, Beginning secondary school teachers, Physics

Pedagogical content knowledge (PCK) is unique to teachers. In science, this knowledge entails making decisions about instruction and monitoring the learning of students. It is generally accepted that PCK develops as teachers engage in instruction with students, and in the presence of adequate subject matter knowledge, builds progressively. Unfortunately, there are teachers who are assigned to teach courses that they are not adequately prepared to teach, which makes them out-of-field (OOF) teachers. This study examines how being In-field (IF) or OOF impacts the development of the PCK among newly hired physics teachers, and how PCK develops over the first three years of their teaching. The mixed methods study followed 17 newly hired teachers who held majors in physics, chemistry or biology and taught physics or physical sciences as a part or whole of their teaching assignment. The data collected included semi structured interviews and classroom observation of the teachers over the first three years of their teaching experience. Interviews probed into the instructional decision-making process of the teachers and the classroom observations described the teacher actions and student experiences. The two main categories of PCK that we documented were (i)*knowledge of students* which included students’ prior knowledge, different levels of understanding and existing misconceptions. (ii) *Knowledge of instructional strategies* including science specific strategies and topic specific strategies. Results of the study indicated that beginning OOF physics teachers struggled with teaching physics, especially in their first year of teaching, which could be attributed to their lack of subject matter knowledge. There was a large gap between the PCK of IF and OOF teachers in the first year, but this gap reduced after the first year. During the second year of teaching, the PCK among OOF teachers shifted towards more basic levels. It was also observed at this time that when OOF physics teachers returned to teaching classes in their degrees (biology, chemistry), they showed a higher level of PCK than when they taught physics as OOF teachers. In year three, the PCK of both IF and OOF teachers showed a decline, indicating as previous research suggests that PCK is context specific. From this study, it is evident that science teacher educators need to consider how to help teachers cultivate their PCK if they are IF or OOF. This may result in science teacher educators assisting new teachers in learning about core instructional practices, or ways to be metacognitive while teaching.