European and international research on teaching out-of-field

Symposium

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 effect of decision making. 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.

This symposium provides a European and an international perspective by presenting current research on the phenomenon of *Teaching Across Specializations* (TAS) or also known as *Teaching Out-Of-Field* (TOOF). The first part of the symposium presents work on teaching practices and beliefs of out-of-field teachers with regard to inclusive education (*du Plessis, Australia*), teaching mathematics (*Bosse & Törner, Germany*), and social and science education (*Porsch & Wendt, Germany*) along with an introduction into the terminology used to define TAS, and the extent, incidence and distribution of TAS using an international perspective (*Price, Australia*). The second part provides different perspectives on teacher education and training of out-of-field teachers, particularly looking at the roles universities play in preparing teachers to teach out-of-field (*Hobbs, Australia*), successful programmes of in-service training of out-of field teachers in the UK (*Crisan & Melissa Rodd*), Ireland (*Ríordáin & Faulkner*), and South Korea (*Kim & Kim*). Since out-of-field teaching is an international phenomenon, the work to be presented clearly emphasizes the need for highly qualified teachers and the integration of the topic in teacher education around the world.

<u>Part 1: Teaching out-of-field: Research on teaching practices and beliefs</u>

Chair: Raphaela Porsch

Discussant: Linda Hobbs

1. Anne Price (Murdoch University, Australia): *An international perspective on teaching across specialisations*
2. Marc Bosse & Günter Törner (University of Essen-Duisburg, Germany): *Towards out-of-field teaching mathematics teachers’ subject-related teacher identities*

3. Raphaela Porsch (University of Muenster, Germany) & Heike Wendt (TU Dortmund, Germany): *Social and science education by primary school teachers who majored in Biology versus a different subject: Are there differences in teachers' self-efficacy beliefs and effects on students' self-concept and proficiency?*

4. Anna du Plessis (The University of Queensland, Australia): *Conceptualising the meaning of out-of-field teaching practices for inclusive education: Learning from real-life experiences, reconstructing perceptions?*

Part 2: Teaching Out-Of-Field: Perspectives On Teacher Education And Training

Chair: Marc Bosse

Discussant: Günter Törner

1. Linda Hobbs (Deakin University, Australia): *Teacher Educator Perspectives On Exposing Preservice Teachers To Teaching Out-Of-Field*

2. Cosette Crisan & Melissa Rodd (University of London, UK): *In-Service Training To Become A Mathematics Specialist: Aspiration And Resistance*

3. Máire Ní Ríordáin (National University of Ireland, Galway, Ireland) & Fiona Faulkner (Dublin Institute of Technology, Ireland): *Professional Development For Out-Of-Field Post-Primary Teachers Of Mathematics: An Example From The Irish Context*

4. Ee-gyeong Kim & Hyun-jeong Kim (Chung-Ang University, South Korea): *Transforming Out-Of-Field Teachers Through In-Service Education And Teachers' Professional Identity: Realties And Problems In South Korea*

Symposium: European and international research on teaching out-of-field

Part 1. Research on teaching practices and beliefs of out-of-field teachers

Chair: Raphaela Porsch

Discussant: Linda Hobbs

The papers presented in the first part of this symposium explore various elements of the very complex issue relating to out-of-field teaching. Teaching out-of-field arises for many and varied reasons, and there are a variety of effects that are 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. At present, Governments are mostly influenced by the numbers: who is teaching what and in what numbers. While the extent of the out-of-field phenomenon differs across different nations, Paper 1 explores some of the difficulties involved when establishing the extent of out-of-field teaching nationally and internationally. But the issue is complex and not just a matter for the statisticians. All the key stakeholders should be considered when understanding the issue. Papers 2, 3 and 4 explore some of this complexity.

The teacher stands to be impacted on by out-of-field teaching, although this impact may not always be acknowledged by governments, leadership or other members of the school community. Teacher identity, self-efficacy, attitudes and motivations, well-being, knowledge and practice, are key variables that must be scrutinized in order to understand the complex and individual experience of what it means to teach out-of-field. Paper 2 argues that content knowledge and pedagogical content knowledge provide only part of the picture and that it is only when we look at teacher identity that we can understand how teachers stand in relation to mathematics and mathematics education.

The issue of teacher quality in many countries has emerged as an issue partly because of international testing regimes. In recent years, student achievement, teacher qualifications, and broader issues relating to the teaching and learning experience can be scrutinised can be compared across nations. 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, 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. Paper 3 presents some of the latest TIMSS findings for Germany and explores links between being out-of-field and teacher self-efficacy, as well as how being taught by an out-of-field teacher affects student self-concept.

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, Paper 4 raises serious doubts about out-of-field teachers' abilities to create inclusive learning environments and a lack of preparedness to accommodate the learning needs of all students. These difficulties arise as teaching practices are not informed by strong disciplinary and subject knowledge.

The research question explored in Part one of the symposium is: In what ways does out-of-field teaching influence the quality of teacher practice, teacher's experiences of teaching, and students' experience of learning; and how can we compare these factors across international borders?

Keywords: teaching out-of-field, incidence of out-of-field teaching, international testing, teacher professional identity, teacher self-efficacy, inclusive learning environments, student self-concept

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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

Paper 1 (Part 1)

An International Perspective on Teaching Across Specialisations

Anne Price

This paper provides an international overview of the phenomenon of *Teaching Across Specializations* (TAS) or as it is also known *Teaching-Out-Of-Field* (TOOF) with a focus on four contexts – Germany, Ireland, Australia and Korea. The paper will draw together key findings from the first TAS Collective Symposium held in Porto in 2014. For each context, the paper will report on the terminology used to define TAS; the extent, incidence and distributions of TAS; the relative status of the teaching profession and the various responses to the phenomenon either at the national or local level.

TAS is generally and most simply understood across the four contexts as 'teachers assigned by administrators to teach subjects which do not match their training or education' (Ingersoll, 2002, p. 5). In all the countries surveyed there are national or state based accreditation processes for teachers, however, despite these regulations for certification it is up to the discretion of the Principal to assign subjects and year levels to teachers.

In all cases, except Korea, the difficulty of gaining accurate statistics on the phenomenon was noted and whilst there had been some research conducted this was limited and hindered by a lack of available data. As a result, the extent of the phenomenon is difficult to gauge but it often reported at a staggering 30-50% with the greatest numbers in subjects with the most teacher shortages. Whilst the extent identified in Korea was significantly lower (around 2%) it was still considered a major concern for the Korean public. While the phenomenon is often considered a taboo subject, increasing levels of research and public awareness has lead governments in all contexts to begin to develop strategies to address the issue. These have included a range of Professional Development projects designed to assist teachers who are required to Teach Across Specializations.

Keywords: teaching across specialisations; teaching-out-field, international perspective

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Paper 2 (Part 1)

Towards out-of-field teaching mathematics teachers' subject-related teacher identities

Marc Bosse & Günter Törner

In Germany, mathematics teaching is considered as out-of-field if the corresponding teachers teach mathematics without the so-called *Lehrbefähigung*. This formal qualification is usually gained by studying mathematics at university and by attending subject-specific preparation courses. Research shows that in grade 9 up to 36.4% of the mathematics teachers teach without such a qualification (Richter, Kuhl, Haag & Pant, 2013). Richter et al. (2013) claim that out-of-field teaching has negative impact on students' achievement in mathematics. These findings are in a line with previous research results (Goldhaber & Brewer, 2000). In order to understand why a formal qualification seems to matter, the conditions of out-of-field teaching have to be scrutinized. In our opinion, analyzing teachers' shortcomings in the fields of content knowledge and pedagogical content knowledge are not enough if we want to understand the practice of out-of-field teaching (Bosse & Törner, 2014).

To get a holistic view of the phenomenon, we want to examine the character of these teachers' subject-related teacher identities. A preliminary study suggests that these teachers have a specific relationship towards mathematics and mathematics education (Bosse & Törner, 2013) as they have usually never been confronted with mathematics beyond school. We want to get a deeper understanding of this relationship by studying the implications on the degree of professionalism of these teachers' subject-related teacher identities.

Therefore, we conducted 21 semi-structured, qualitative interviews with respect to identity related aspects in terms of Beauchamp and Thomas (2009). The interview guideline contains items concerning the teachers' subject-related biography, their mathematical world views, their beliefs towards mathematics education, their affects related to mathematics, their motivations for teaching mathematics, and aspects of their teaching profession.

The process of analyzing the transcriptions is ongoing and completed systematic results can be expected in the middle of the year.

Keywords: out-of-field teaching; teacher identity; mathematics

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Paper 3 (Part 1)

Social and science education by primary school teachers who majored in Science versus a different subject: Are there differences in teachers' self-efficacy beliefs and effects on students' self-concept and proficiency?

Raphaela Porsch & Heike Wendt

In recent years several research projects have measured professional knowledge required by (future) teachers (e.g., COACTIV: Kunter et al., 2013; TEDS-M: Bloemeke et al., 2014). Based on the assumption that teachers are a relevant factor affecting children's learning outcomes, models were developed to describe the competencies required by teachers in the classroom such as "motivational, metacognitive, and self-regulatory characteristics, which are considered decisive for the willingness to act" (Baumert & Kunter, 2013: 28). Teacher efficacy is defined as "the teacher's belief in her or his ability to organize and execute the courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran, Woolfolk Hoy & Hoy, 1998: 233). Several studies in the US, Australia, and Europe have shown that students who are taught by teachers with a subject-specific qualification achieve better results compared to those taught by out-of-field teachers (e.g., Dee & Cohodes, 2008). Qualitative studies having researched characteristics of out-of-field teachers (e.g., Hobbs, 2012; Du Plessis et al., 2014) show that these teachers often have little confidence in their abilities. Ross et al. (1999) found in a study with secondary teachers that teacher efficacy was in general lower for courses outside the teacher's subject.

Using national data from the "Trends in International Mathematics and Science Study" 2011, German primary teachers who majored in Science or a different subject and teach "Sachunterricht" (an integrated subject of natural and social science) are compared with regard to their subject-related self-efficacy beliefs. Results from (multilevel) regression analyses show that there are significant differences between the two groups. On average in-field teachers show higher self-efficacy beliefs with regard to teaching social and science education. Furthermore, more students taught out-of-field possess a lower self-concept than those taught in-field. Along with further results, implications and future research questions are discussed.

Keywords: out-of-field teaching; quantitative methods; primary school teachers; self-efficacy; social and science education

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Paper 4 (Part 1)

Conceptualising the meaning of out-of-field teaching practices for inclusive education: Learning from real-life experiences, reconstructing perceptions?

Anna du Plessis

Society perceives education as an investment in transforming school communities and its students into democratic inclusive citizenship (Barr & Smith, 2009). This transformation cannot happen without the essential elements of inclusive education such as teacher tactfulness, connectedness and awareness of the learning needs of individual students (Van Manen, 1991; Lingard, 2007). In agreement with Norwich (2014) the paper defines inclusion as an appreciation for a mixture of values, equal opportunity, social respect, participation and solidarity in learning and teaching environments without sacrificing students' individuality. Concerns about classrooms as inclusive learning environments and teachers' preparedness to accommodate the learning needs of all students in their classrooms turn focus to the meaning of out-of-field teaching for inclusive education. Riddell (2009) noted that teachers' acceptance and tolerance for students with specific behavioural and learning needs is declining. This paper underlines how the complexities which are already part of inclusion into mainstream schooling become influential dilemmas because of the out-of-field phenomenon. Out-of-field teaching entails teachers teaching subjects or year levels outside their field of qualification. Research (Ingersoll, 2002) noted it as a widespread concern which has implications for all stakeholders. Smith and Barr (2008) explained how communal and relational experiences for students, their parents and teachers have significant implications for progress in successful inclusive education. This transnational, qualitative study is supported by Gadamer's (1975) hermeneutic philosophy of understanding through a fusion of horizons, looking through the various 'lenses' of educational directors, school leaders, specialist and out-of-field teachers and parents the paper explores specific lived experiences. The findings unveil the life-world of teachers in out-of-field teaching positions and what it means for students with special learning needs and their parents. Improvement strategies and policies turn focus to the interrelationship between leadership decisions, policy shortcomings, inclusive education, and the out-of-field phenomenon.

Keywords: out-of-field teaching; inclusive classrooms; special learning needs; influencers of inclusion; leadership misconceptions

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Symposium: European and international research on teaching out-of-field

Part 2. Perspectives on teacher education and training of out-of-field teachers

Chair: Marc Bosse

Discussant: Günter Törner

While the first part of this symposium focuses on the experiences of out-of-field teachers in terms of their practices, beliefs and incidence, the second part of the symposium explores teacher learning. Internationally, 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 (different approaches to professional development of teachers are summarised in Hobbs & Törner, 2014). There are different expectations for continuing professional development internationally.

Teaching out-of-field has been common practice for some time, although silent and tabooed in some countries (Ingersoll, 2002; Harris, Harris & Jensz, 2006). Improving the quality of out-of-field teaching requires teachers to engage with continuing professional learning; needed is serious attention to both raising pre-service teachers' awareness of and preparation for the challenges that out-of-field teaching might present as they enter the workforce (explored in Paper 1), and to supporting, retraining and professionally developing in-service teachers (explored in Papers 2, 3 and 4). 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 targeted, available and sustainable. Papers 2, 3 and 4 report on state funded retraining programs for out-of-field teachers.

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. Papers 2 and 3 indicate some of the challenges involved for teachers in taking on new identities, and taking on the big

ideas of mathematics in their retraining programs. Papers 2, 3 and 4 provide some indication of key features needed for professional development to lead to transformation in identity and practice for out-of-field teachers.

Early career and experienced teachers can be 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 adaptable and ready when they receive an out-of-field teaching load. 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. Paper 1 (Hobbs) explores teacher educator perspectives of the possibilities and challenges involved in raising the issue of out-of-field teaching in their courses in a way that seriously prepares teachers to be adaptable, confidence and competent, and resourceful in the event that they are asked to teach out-of-field.

The research question explored in this symposium is: In what ways can teacher education programs and retraining programs attend to the issues around teacher knowledge, professional identity, and transformation of the practices of out-of-field teachers?

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Keywords: out-of-field teaching, continuing professional learning, teacher learning, pre-service teacher education, teacher retraining and professional development

Paper 1 (Part 2)

Teacher educator perspectives on exposing pre-service teachers to teaching out-of-field

Linda Hobbs

While teachers are initially prepared for particular specialisations, the reality is that many early career teachers are expected to teach outside their specialisations, i.e. “out-of-field” (e.g., Harris & Jensz, 2006). Teacher education programs are not required to prepare teachers for out-of-field teaching, but the challenge is to produce adaptable, well-informed, capable teachers in line with the Australian Professional Teacher Standards (AITSL, 2014).

This project explored the structure and philosophy of seven secondary teacher education programs, and perceptions of teacher educators and PSTs through the use of case study methodology (Stake, 2005) and questionnaires. This paper will focus on the research questions: What roles do universities play in preparing teachers to teach out-of-field? How do the structure and content of these programs support the development of teacher-ready, adaptable teachers? Interviewees included seven program coordinators/tutors, 16 teacher educators, and two placement officers.

Results showed that there were differences in how the interviewees positioned initial teacher education. This positioning depended on their perceptions of what it means to be an effective teacher and their response to tensions between “a teacher first then a subject teacher”, the fundamental role of subject and pedagogical content knowledge, and what is possible within their program structure. All teacher educators recognised the reality that their students are likely to teach out-of-field, and that there is a greater need to raise awareness and possibility of future out-of-field teaching, although how this might be achieved remains an important question for initial teacher education. In the more traditional programs with defined subject specialisations, exposure to the issue of out-of-field teaching was usually indirect rather than explicit discussion of skills and attitudes needed in out-of-field contexts; however, alternative programs that integrated specialisations challenged the subject-bound identity of a teacher. A dilemma exists in teacher education that must begin with a conversation: Should initial teacher education take action on out-of-field teaching? Are alternative models needed for teacher preparation?

Keywords: out-of-field teaching; pre-service teacher education; adaptability; identity

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Paper 2 (Part 2)

In-service training to become a mathematics specialist: Aspiration and resistance

Cosette Crisan & Melissa Rodd

The shortage of mathematics teachers in the UK has led to a number of government initiatives aiming to increase the supply of teachers of mathematics (e.g., DfE 2014). One set of initiatives concerns up-skilling teachers who are already employed at a school or college and who are teaching some mathematics, but who initially trained to teach in a subject other than mathematics. These non-specialist teachers of mathematics have come for in-service training at the university where they learn more mathematics relevant to the school curriculum. The participants in such courses expect to transfer their pedagogical knowledge from their initial specialism into the context of mathematics teaching as a result of developing their mathematical subject knowledge. We have run such courses for four years and this report draws on some of the data collected over this period.

The particular finding that we report on here concerns participant aspiration and resistance. For instance, gaining certification at the end of the course that indicated their new specialism in mathematics teaching was a goal to which many of the teacher participants aspired, also reported in Crisan and Rodd (2011, 2014). However, some teacher participants resisted changing their conceptions about the teaching of mathematics; for instance, 'understanding a topic' was construed by some as an instrumental facility with a mathematical procedure sufficient to answer standard questions.

We used many forms of data from the course participants: mathematical work, interviews, teaching observations, written narratives, and used a 'communities of practice' framework (Wenger 1998) for analysis of data. The issues of aspiration and resistance are considered in terms of the participants' developing mathematics teacher identity in terms of 'engagement, imagination and alignment' or lack of it.

Keywords: out of field teaching; communities of practice; identity; engagement

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Paper 3 (Part 2)

Professional development for out-of-field post-primary teachers of mathematics: An example from the Irish context

Máire Ní Ríordáin & Fiona Faulkner

Out-of-field 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 students (Ní Ríordáin & Hannigan, 2011). Accordingly, a two-year part-time Professional Diploma in Mathematics for Teaching (PDMT) has been established (2012) nationally to up skill these teachers. The programme is delivered in a blended learning format and is closely aligned with the needs of out-of-field mathematics teachers, the syllabus and the requirements of the Teaching Council for registration. As part of a comprehensive project evaluating the implementation of the PDMT, teachers' beliefs about teaching and learning mathematics and their content and pedagogical knowledge of mathematics are evaluated on commencement and completion of the programme. Teachers' perceptions of the programme are evaluated on a continuous basis to inform programme development. All data is collected quantitatively through online questionnaires and paper and pencil tests. This presentation will provide an overview of the PDMT and its key underpinnings and teachers' perceptions of the programme, while also reporting on the content and pedagogical knowledge of out-of-field teachers on commencing the PDMT. Findings indicate wide variations and significant areas of weakness in out-of-field teachers' conceptual understanding of mathematical topics and underdeveloped pedagogical knowledge on commencement of the programme. A general evaluation of participants' perceptions of the programme highlights their satisfaction with the programme website and levels of support provided, while raising concerns surrounding the teachers' lack of awareness of the commitment level required and teachers' misconceptions regarding what the programme is preparing them for. 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 programmes to ensure quality mathematics teaching (Darling-Hammond & Youngs, 2002).

Keywords: out-of-field teaching; mathematics; pedagogical knowledge; subject knowledge; programme development

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Paper 4 (Part 2)

Transforming out-of-field teachers through in-service education and teachers' professional identity: Realties and problems in South Korea

Ee-gyeong Kim & Hyun-jeong Kim

In South Korea, over 2% of the certified secondary school teachers teach subjects for which they have no official qualification, leading to out-of-field teachers. The mismatch between the supply of teachers by education authorities and the demand of teachers by schools often causes the certified teachers to become out-of-field (Kim, 2014).

Recognizing the harmful effect of out-of-field teaching on students and teachers, the Korean government has implemented in-service education so called "Minor Qualification Education (MQE)" to help out-of-field in-service teachers obtain additional qualifications to teach subjects on demand. The current state of MQE, however, does not gain enough attention of the education authorities. Critics also argue that the quantity and quality of the MQE are far from being satisfactory. Teachers who acquire a new qualification through MQE are reported to experience identity crisis, as they belong to neither of the two teacher groups.

The situation requires us to investigate the current state of MQE along with the perception of secondary school teachers. The purpose of this research is to analyze the trends of MQE during the last 10 years (2005~2014) in order to further reveal the professional practice and identity of teachers who are transformed into in-field teachers through the MQE.

Utilizing the national database on teachers, we identify the number and percentage of teachers who have acquired new qualification through MQE. We also conduct semi-structured interviews of 7 secondary school teachers and personnel administrators to reveal the transformation process and results of teachers' professional knowledge and identity.

We discuss the distinctive features of teacher professional knowledge acquisition and identity transformation process. We recommend policy alternatives for supporting out-of-field teachers to become in-field teachers.

Keywords: out-of-field teachers; in-service education, teacher identity; South Korea

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