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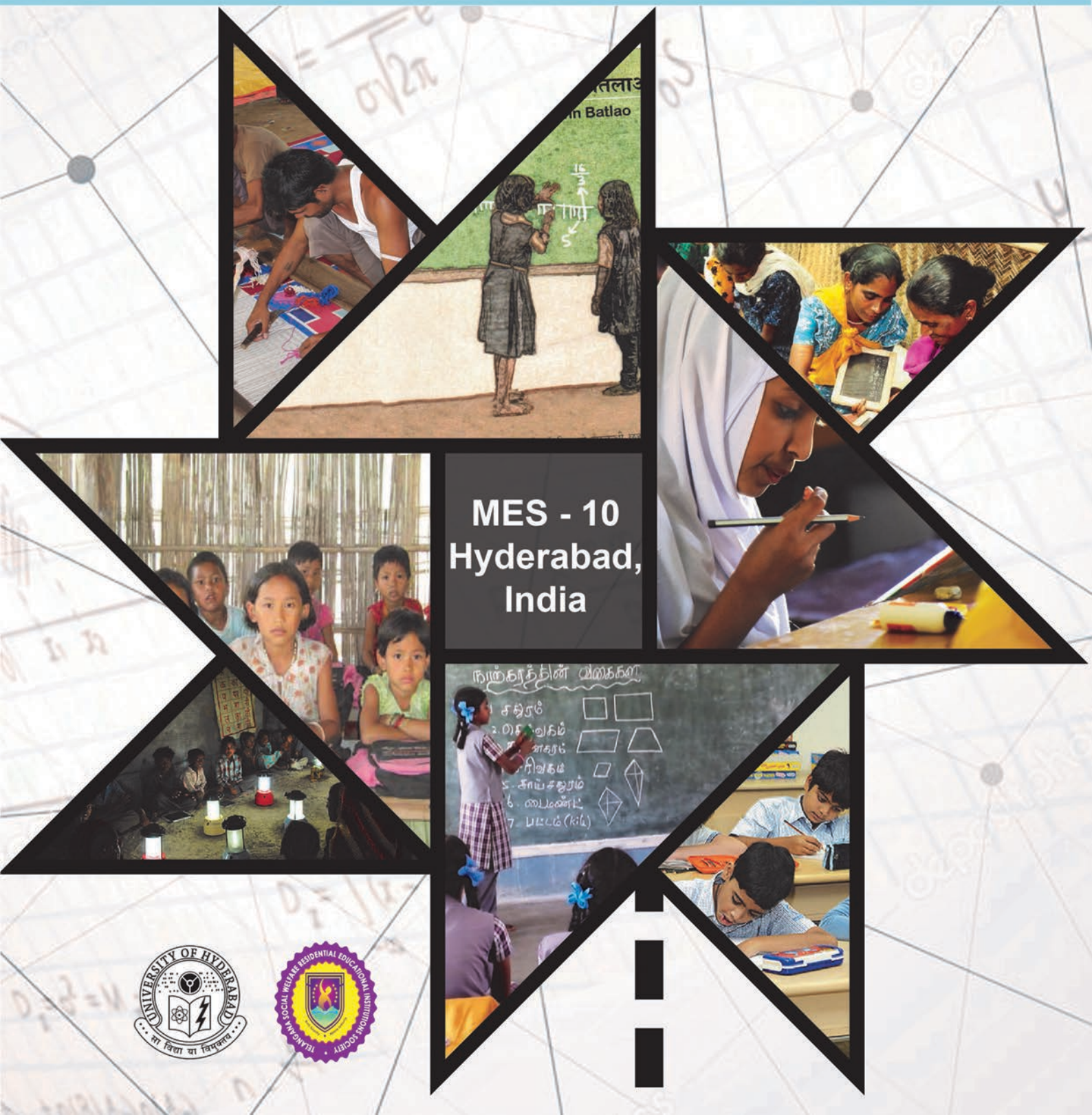


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PROCEEDINGS OF THE TENTH INTERNATIONAL MATHEMATICS EDUCATION AND SOCIETY CONFERENCE

Edited by

Jayasree Subramanian

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MES10 Conference logo was designed to show the diversity of sites and contexts in which mathematics figures and mathematics education takes place in India: artists and artisans in whose work mathematics is embedded, women learning mathematics in adult education programmes, privileged children in urban setting with access to technology at their desks, socioeconomically marginalised children attending night school, sitting on the floor with lanterns to provide light, students in rural classrooms with bamboo walls. The logo bringing out the linguistic, religious, sociocultural, economic and regional differences of learners was designed by Mohd Junaid Siddique and Murchana Roychoudury.

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INCLUSIVE MATHEMATICS EDUCATION IN THE GERMAN-SPEAKING COMMUNITY: THE POLITICS OF THE EMERGENCE OF A RESEARCH FIELD

David Kollosche

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Abstract: In the German-speaking countries, the number of publications on inclusive mathematics education has increased severely since the ratification of the UN Convention on the Rights of Persons with Disabilities in 2009. This study is based on a literature survey and reports that inclusive mathematics education is focussing one-sidedly on open learning environments, while special needs of students are seldom taken into consideration. It also addresses the uncritical dogmatisation of inclusion and tolerance of stigmatisation through mathematics education. Eventually, the emergence of inclusive mathematics education as a research field is discussed from a systemic perspective.

Kurzzusammenfassung: Die Anzahl der Veröffentlichungen zu inklusiven Mathematikunterricht in den deutschsprachigen Ländern hat seit der Ratifikation der UN-Behindertenrechtskonvention im Jahre 2009 deutlich zugenommen. Diese Studie basiert auf einem Literaturbericht und legt dar, dass die Mathematikdidaktik einseitig offene Lernumgebungen fokussiert, während besondere Bedürfnisse der Schüler selten in den Blick geraten. Sie diskutiert außerdem die unkritische Dogmatisierung von Inklusion und die Toleranz von Stigmatisierung durch den Mathematikunterricht. Schließlich wird die Entstehung des Inklusionsdiskurses innerhalb der Mathematikdidaktik als Forschungsfeld aus einer systemischen Perspektive diskutiert.

INTRODUCTION

Traditionally, Germany, Austria and Switzerland do not only have highly segregating school systems, usually allocating students to three different tracks of normal schools after the fourth year of schooling, they also operate professionalised networks of special-needs schools for the exclusive education of students with special needs. These schools are usually organised around one or several special needs foci. Germany distinguishes between the foci learning impairment, mental development, emotional and social development, language development, physical and motoric development, hearing impairment, visual impairment, and illnesses. With the ratification of the United Nations Convention on the Rights of Persons with Disabilities in 2009, Germany, and in similar processes also Austria and Switzerland, committed themselves to the provision of an inclusive school system. Thereby, research and educational policy tend to use a wide understanding of inclusion:

> [I]t is imperative to consider the different dimensions of diversity. That includes disability in the sense of the Convention on the Rights of Persons with Disabilities as well as special starting conditions such as language, social background, cultural and religious orientation, gender and special giftedness and talents. (KMK, 2015, p. 1, my translation)

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In the course of the development which started in 2009, mathematics education has seen the establishment of inclusive mathematics education as a field of scholarly inquiry in the German-speaking community. This development will be the object of this study.

This study can first of all be understood as an attempt in 'researching research' (Pais & Valero, 2012). Just as mathematics education originated from an integration of mathematical, pedagogical and psychological theories and was limited to such theoretical perspectives until connections for further disciplines were established (Kilpatrick, 1992), every emerging field runs the risk that the theories originally underlying it 'comprise particular choices in terms of analytic filters that we apply, governed by underlying ideological motivations and trends of which we are not always aware' (Brown, 2008, p. 249). Consequently, research should always be considered a political act which can and should be questioned critically, not only in the micro-cosmos of specific studies or theories, but as a whole. In this vein, this study can be understood as an opportunity to pause and look back on the work that has been done, on its conditions, assumptions, emphases and results, in order to gain orientation for the future. At the same time, the development of inclusive mathematics education in the German-speaking community can be studied as an example of an emerging field within mathematics education. Thereby, I am fully aware that most readers will not be familiar with German traditions in mathematics education. That is why the following analysis will not engage in intra-German discussions but present very general observations which might – to some extend – also apply to other countries and other developments of fields of academic study.

The core of this study is a literature survey with a multi-dimensional categorisation to represent the publications in the field of inclusive mathematics education in German-speaking countries in an assessable form. On that basis, the strengths and weaknesses of the contemporary field will be discussed, especially its over-emphasis of open learning environments and its uncritical stance towards inclusion and stigmatisation. In the end, the discussion returns to the politics of the emergence of the field.

LITERATURE SURVEY

Providing an objective overview of the literature in the field proved to be demanding as it required intensive decision-making as to which publications to consider and which not to consider. As I wanted to make sure that all contributions were published under the influence of the UN convention, I started my literature survey in the year 2011, and had it end in 2017, the last completed year before the preparation of this study. In order to delimit the field, I restricted the study to German publications only, even though a few Germanophone authors also or predominantly published in English. I searched library and research databases as well as Google Scholar for monographs (including doctoral disserations), book chapters and journal articles including the keywords 'inclusion' and 'inclusive' in relation to 'mathematics' in the titles (using the German expressions), and went through all results for references to further publications on inclusive mathematics education. All publications found were analysed for the school

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type in focus (primary or secondary), for the style of publication (research, overviews, best practice, and case reports), and for the focus of the contribution. Every sixth contribution focusses on ‘mathematical giftedness’. However, as this focus has a more than 30-year-old tradition in Germany which initially had little to do with inclusive education, and as it is nearly impossible to determine where inclusive mathematics education begins in this branch, I decided to exclude this focus from the following analysis. Another nearly 7% of all the publications found focus on diagnostics. As these contributions do not present specific diagnostic tools for students with special needs but discuss the application of general tools in inclusive settings, it was likewise hard to demarcate that line of research from general diagnostics, leading me to exclude this focus as well. Finally, I excluded another 5% of all findings as they focus on dyscalculia, a field also much older than the idea of inclusive mathematics education and difficult to distinguish from it. The remaining foci are listed in Table 1 below.

Focus	Re	Ov	BP	CR	abs.	rel.
Open learning environments	10	7	38	-	55	49%
Teacher education for inclusion	5	2	7	1	15	13%
Migration	8	2	-	-	10	9%
Language diversity (w/o migration)	5	5	1		11	10%
Emotional and social development	-	-	-	1	1	1%
Visual impairment	2	1	-	1	4	4%
Hearing impairment	-	-	1	-	1	1%
Learning impairment	1	-	1	1	3	3%
Mental development	2	-	-	-	2	2%
Physical and motoric development	-	-	-	1	1	1%
Other or several foci	-	5	2	1	8	7%
In total	33	22	50	6	111	100%

Table 1: Numbers of occurrences of German publications on inclusive mathematics education in 2011–2017, classified by inclusive focus and by style of publication. (Re – research, Ov – overviews, BP – best practice, CR – case reports)

ONE-SIDED RESEARCH FOCUS

It is striking that 49% of the publications focus on open learning environments. These are collections of problems that touch a common mathematical content and allow for multiple solutions paths and problem-solving. Open learning environments

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> include different levels of difficulties in a natural way, so that it is possible to work on different levels. Learners have options to choose, for example, the ways of solution, the materials, the tasks and the representations. (Scherer & Hähn, 2017, p. 25, my translation)

Indeed, there is an evidence-based consensus that heterogeneous learning groups profit from the possibility of in-class differentiation (e.g., Scherer, 1995). However, an interview study with teachers on the possibility of inclusion of mathematics education revealed that many teachers consider it impossible to teach mathematics inclusively or feel badly prepared for that task (Korff, 2015). Teacher students have been shown to express similar concerns, although their confidence in managing inclusive mathematics education can be raised significantly by appropriate coursework (Korff, 2016). Thereby, teachers and researchers alike are well aware that the inclusion of students with special needs might have them end up with special tasks which are fundamentally different from the task of the regular group, leading to a 'microexclusion' in spite of an achieved 'macroinclusion' (Faustino, Queiroz Moura, Gomes da Silva, Muzinatti, & Skovsmose, 2017). Therefore, the provision of a variety of open learning environments for the use in inclusive mathematics education is an important product of the research community.

Nonetheless, the documented focus on open learning environment also constitutes a fundamental problem. It runs danger of becoming the dominant form in which inclusive mathematics education is thought. Why else would an author refer to open learning environments and then claim that 'inclusion in mathematics education can be made possible with easy means' (Grohmann, 2014, p. 51, my translation)? Inclusion through open learning environments uncritically assumes that inclusion is more or less achieved by allowing various speeds of learning. For example, Andrea Peter-Koop's (2016) proposal that open learning environments should not only allow work on a 'basis level' but should include two degrees of 'support levels' and two degrees of 'expansion levels', each with appropriate tasks and material, documents a tendency to think inclusion one-dimensionally along the ease and speed of learning processes. Admittedly, 70% of the students with diagnosed special needs have been labelled the foci learning impairment, mental development, or emotional and social development (numbers from 2014, Klemm, 2015), and in those cases, it is usually assumed that the intellectual development in mathematics equals that of regular students, albeit delayed (cf. Moser Opitz, 2016). Yet, such a perspective on inclusion does not ask for the specific conditions of learners with special needs, who indeed might experience and approach mathematics very differently. Focussed research on the special needs of students with special needs foci in mathematics education add up to only 11% of the publications on inclusive mathematics education and provide hardly any answers for students with specific special needs. As a consequence, the contents of inclusive mathematics education and the order in which those contents are discussed stay those

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which were chosen for the idealised regular students, eventually merely adapted for the in-coming diversity. To my knowledge, only Klaus Rödler's (2016) approach constitutes an exception in proposing to begin elementary instruction with the introduction of multiplication as a concept that is new and challenging for nearly every student.

For the analysis of the emergence of the field of inclusive mathematics education, it is essential to ask for the reasons of the one-sided dominance of open learning environments in the field. In the Germanophone mathematics education community, open learning environments have a more than 40-year-old research tradition (Häsel-Weide, 2015). The concept is well known among teachers, although not widely established in school. Traditionally, this branch of research advocated the use of open learning environments for all students and had no special focus on inclusion. Still today, some authors legitimise the use of open learning environments 'for all students' in inclusive settings by positive effects of learning outcomes rather than by the wish for inclusive education (e.g., Scherer & Hähn, 2017, p. 25). The mechanisms behind that branch of research can be understood as part of what Sverker Lundin (2012) calls the 'standard critique of mathematics education' (p. 74) in the sense that school practice is constantly criticised, provoking more research, in our case on open learning environments, but eventually remains more or less the same. Formulated polemically, inclusive mathematics education provided an opportunity for scholars to cast their old ideas on open learning environments into new publications, to attract external funds, and to impose their ideas on school with renewed authority. Tellingly, this focus of inclusive mathematics education has the lowest rate of research output with less than a fifth of all publications presenting new insights. The vast majority of contributions on learning environments are best practice reports, proposing that academia already knows enough and only needs to communicate its insights. Even though open learning environments have a lot to offer, they require further research, and still they cannot be the only answer to inclusion.

INCLUSION AS A DOGMA

In the German publications, political directives in favour of inclusion and romantic ideals of all children learning together happily are regularly held as warrant enough to justify inclusive mathematics education and discard any critical considerations or alternative forms of dealing with heterogeneity. Under the 111 publications that lay the basis for this analysis, not one sets out to critically discuss the idea of inclusive mathematics education. Thereby, already the idea of inclusion through open learning environment provokes a wide range of critical questions: *In how far is it generally possible to design a logically-structured course in mathematics in the form of open learning environments? In how far is it even possible to address similar contents at highly differentiated levels without essentially altering the contents?*

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In contrast to the dogmatism with which inclusion is met in mathematics education research, German inclusive pedagogy has witnessed intensives debates concerning the chances and dangers of inclusion. For example, Bernd Ahrbeck (2014) argues that the discussion on inclusion in school is too emotional and normative and not sufficiently based on empirical evidence. Regarding the teaching of students with various special needs by unspecialised teachers in inclusive settings instead of the teaching of students with one special need focus by specialised teachers, Ahrbeck warns: “Special needs education is in danger of lowering its standards, for which a high price will have to be paid, first and foremost by the affected children themselves” (p. 9, my translation). And concerning open learning environments, Jürgen Budde (2015) explains that meeting every learner’s individual needs will eventually stand in conflict to mutual work on the same topic. In mathematics education, the central question would not only be in how far inclusion is possible and desirable, but, above all, on the basis of which normative orientation such a question could find an answer in the first place. Eventually, the question of inclusion in mathematics is a (not yet) well-informed political decision, which mathematics educators should not leave to politicians and follow all too willingly but co-organise more actively and critically.

STIGMATISIATION THROUGH INCLUSIVE MATHEMATICS EDUCATION

School, and mathematics education in particular, has the social function of assessing students for later selection and allocation (Kollosche, 2018). If students with special needs do not get marked, they will have to be labelled as ‘different’ in order to be comparable to other applicants to the job market. Thereby, the definition of the labels and the rights connected to each of them are necessarily arbitrary. For example, the special needs focus in Germany is granted if a learner’s IQ scores below 70; with only 1 more point on the IQ score, the same child might be labelled as ‘normal’. As different diagnostic methods are applied in the 16 federal states of Germany, the proportion of students with diagnosed special needs varies from as low as 5.4% in one state up to 10.8% in another (Klemm, 2015). To some extent, it is coincidental whether a struggling student is diagnosed a learning impairment or labelled as intellectually impaired. Equally fluent differences are established when deciding where other special needs foci such as hearing impairment begin. However, the consequences for affected students can be severe. They are henceforth branded as handicapped, a stigma that has been shown to have negative effects on self-efficacy, achievement and self-confidence. Admittedly, they may also receive individualised support to ease their learning of mathematics. But if these benefits outweigh the effects of stigmatisation is hard to say and subject to intensive discussions on inclusive education research (e.g., Arishi, Boyle, & Lauchlan, 2017). In any case, voices from inclusive pedagogy are already demanding a decategorisation and positioning themselves against an industry that relies on a market of students who require special care (Frances, 2013).

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Statistical data from Germany reveals that the proportion of students in exclusive education at special needs schools has remained almost constant from 2010 to 2014, while the proportion of students in inclusive education has increased from 1.2% of the student population in 2010 to 2.1% in 2014 (Klemm, 2015). While some scholars celebrate this increase of inclusively educated students from 19% of all students with special needs in 2010 to 31% in 2014, others are astonished by the sudden increase of the proportion of students with special needs. Often, the policy of inclusive education does not mean that less students are education in exclusion at special needs schools, but that more students are diagnosed with special needs. In fact, it may be argued that inclusive education in Germany has yet failed to considerably improve the situation of learners who are still educated in an exclusive system; instead, it has produced additional thousands of learners who will be stigmatised as problems for the education system, receive specialised assessment and equate to more funding or personal support for their teachers.

While mathematics education obviously does play a role in that stigmatisation business, and possibly a central one, given the close neighbourhood to general intelligence which is often attributed to mathematics, German publications on inclusive mathematics education do not address the problem at all. With their one-sided focus on open learning environments and the concomitant ignorance of the challenges of specific special needs in inclusive mathematics education, researchers in mathematics education have played their part in keeping the traditionally excluded students out of inclusive school. At the same time, they have profited from an increased demand for inclusion in regular schools which was produced by the intensified labelling of students. Without a critical position concerning the increase of the number of students who are diagnosed to have special needs, mathematics education is willingly taken part in a development that might not lie in the interest of students and teachers. For example, the literature survey showed that diagnostic tools, which were designed for regular students, are uncritically applied to students with special needs. If such tools are able to inform teachers about the special condition of a learner or rather document the student's deviation from the norm and legitimise stigmatisation, is a delicate question. To take another example, it is established that managing open learning environments requires socio-linguistic and meta-cognitive abilities that are unequally distributed among learners (Kirschner, Sweller, & Clark, 2006; Theule Lubienski, 2000). So, while open learning environments might be a pragmatic solution allowing a large variety of students to learn on a shared topic, it might simultaneously establish new and less visible forms of exclusion along other axes of differences.

In socio-political studies, mathematics education has generally been shown to disadvantage students along ethnicity, gender, migration background, and social class (Jurdak, Vithal, Freitas, Gates, & Kollosche, 2016), thus establishing new lines of

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exclusion. What is more, processes of stigmatisation as 'unfit for understanding mathematics', which create forms of exclusion which are predominantly based in the mathematics classroom, have been identified in empirical studies (Kollosche, 2017; Lange, 2009). All in all, it is fair to say that mathematics education leads to discrimination and exclusion, and it is at least surprising that such processes are not discussed in publications on inclusive mathematics education. An exception to the general phenomenon of stigmatisation through mathematics education is the research on dyscalculia which has recently expressed awareness for the fact that problems with basic arithmetic is not a medical issue but a case of failed teaching (Gaidoschik, 2010; Meyerhöfer, 2011).

CONCLUSION

In terms of inclusive mathematics education in the German-speaking countries, it has been shown that the discourse relies heavily on open learning environments, whose potentials are not yet fully understood, but without any doubt limited. This reliance threatens to mask more substantial questions, especially how mathematics and mathematics education can interact with students with specific special needs. Also, the German field will have to face critical questions concerning the potentials and limitations of inclusion in general as well as concerning the role that mathematics education plays in stigmatisation processes.

Returning to the political analysis of the emergence of the field of inclusive mathematics education in the German-speaking countries, it can be argued that the increased political focus on inclusion, which is also expressed by a considerable funding, has not yet led the academic basis to provide insights that allow for a wide inclusion. Instead, it has supported a specific group of colleagues, particularly those from primary school education who had already worked with open learning environments and could quickly – presumably more quickly than colleagues embarking on less prepared tracks – present first ideas and intervention programs. While the contributions on inclusive learning environments are an important piece in the puzzle, this development might have led to a situation in which many scholars are resting on their success rather than promoting critical questions and developing new lines of research. This situation might change drastically if policy makers, alarmed by the stagnation of inclusion rates, decide to take a more critical stance themselves and fund research on inclusive mathematics education more purposefully.

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