Exploring professional identity as a theoretical lens for researching multilingual mathematics teachers

Exploración de la identidad profesional como lente teórica para la investigación sobre profesorado multilingüe de matemáticas

DANAI DAFNOPOULOU
Linnaeus University, Växjö, Sweden
danai.dafnopoulou@lnu.se
https://orcid.org/0000-0002-6409-2368

Abstract: *This theoretical paper explores how the notion of teachers' identities is defined and operationalised under multiple theoretical approaches, particularly in studies on language diversity. To explore this, the notion of teachers' professional identity is first discussed as dealt with in mathematics education studies and other educational fields, addressing the related concepts considered essential to identity. Next, the paper outlines how these concepts become operational in specific examples of empirical studies in education and mathematics education. Based on this overview, new directions are proposed in researching teachers' identities for addressing issues of language diversity in mathematics education.*
Keywords: Mathematics teacher's identity; identity definition; identity operationalization; multilingual mathematics teachers.

Resumen: *Este documento teórico explora cómo se define y operativiza la noción de identidad del profesorado bajo la óptica de múltiples enfoques teóricos, en particular en los estudios sobre diversidad lingüística. Para ello, en primer lugar, se examina la noción de identidad profesional del profesorado tal y como se aborda en los estudios de educación matemática y en otros ámbitos educativos, tratando los conceptos relacionados que se consideran esenciales para la identidad. A continuación, se esboza el modo en que estos conceptos se hacen operativos en ejemplos concretos de estudios empíricos sobre educación y educación matemática. Sobre la base de este panorama, se proponen nuevas orientaciones en la investigación de la identidad del profesorado para abordar cuestiones de diversidad lingüística en educación matemática.*

INTRODUCTION

The theoretical concept of identity has become more prominent in mathematics education research over the past two decades (Darragh, 2016). Historically, the concept originated in the work of Erikson and Mead and was first developed in the social sciences and philosophy (Beijaard et al., 2004). According to Darragh (2016), Erikson followed a more acquisitionist perspective, while Mead followed a view of identity as action. Researchers in mathematics education mainly adopt a Meadian approach that views identity as an action rather than something possessed by an individual (Darragh, 2016; Graven & Heyd-Metzuyanim, 2019), and identity studies in this field mostly follow a socio-cultural (Graven & Heyd-Metzuyanim, 2019) or political approach (Lutovac & Kaasila, 2018).

The notion of identity has been used to study both students and teachers (see Darragh, 2016; Graven & Heyd-Metzuyanim, 2019). When focusing on teachers, identity has been used to understand their experiences at different stages of their careers (Graven & Heyd-Metzuyanim, 2019). Specifically, studies have examined teachers' identity formation or development through their professional change and growth (Graven & Heyd-Metzuyanim, 2019); for instance, through educational programs (Lutovac & Kaasila, 2018) or through working in educational contexts for which they are not prepared, as in the case of foreign-trained teachers (Beijaard et al., 2004). Most studies therefore address the contextual factors that play a role in teachers' identity development, such as the different communities that teachers participate in and the current reform recommendations for school mathematics (Lutovac & Kaasila, 2018; Graven & Heyd-Metzuyanim, 2019). Other studies have focused on how teachers understand or give meaning to the subject of mathematics in particular, their own relation to the subject, and the related teaching practices (Graven & Heyd-Metzuyanim, 2019).

A fundamental concern in identity research in education is the lack of an agreed-upon definition of identity and, specifically, an operational definition that can be used in empirical studies (Sfard & Prusak, 2005). Literature reviews in education and mathematics education research have

pointed out that most empirical studies on identity research use different definitions, do not define the notion at all (Beijaard et al., 2004), or define it only partially (Graven & Heyd-Metzuyanim, 2019). Although there is a critique in relation to the definition of identity in research, the fundamental issue is not the lack of definition itself. As Graven and Heyd-Metzuyanim (2019) note, the issue lies in how identity is operationalised by researchers, which means what identity is considered to be for research purposes, and how it can be empirically studied.

This paper lies in the intersection of the identity and language diversity fields of study. The motivation for this intersection lies in the assumption that teachers' different educational backgrounds are important for teachers' identities (Lutovac & Kaasila, 2018). The purpose of this theoretical paper is to explore how identity is defined and operationalised in the different theoretical approaches adopted in educational research, and what aspects of identity are the main focus in the empirical studies that exist in the intersection of the identity and language diversity fields. The following questions are posed:

1. *What are the fundamental aspects of the notion of professional identity in educational research?*
2. *How is identity operationalised in empirical studies that draw on different theoretical approaches?*

1. SELECTION OF STUDIES

This theoretical article is divided into two parts. The first part focuses on searching for the main aspects that constitute the notion of identity in a meta-discussion in the research field, while the second looks at how identity is defined by authors and how the aspects are operationalised in empirical work under different theoretical approaches. For the first part, I have built primarily on five systematic literature reviews presented in the fields of education and mathematics education to address the fundamental aspects of the notion: Beijaard et al. (2004), Akkerman and Meijer (2009), Beauchamp and Thomas (2009), Darragh (2016), and Lutovac and Kaasila (2018). In choosing this set of articles, the selection criteria included an explicit focus on teachers' identity or on different theoretical approaches to identity research. I excluded articles focusing on students' identity or on methodology, as these were not the main issues for the present study. To trace relevant articles, I looked at the reference lists of articles by Darragh

(2016) and Graven & Heyd-Metzuyanim (2019) that covered research on mathematics education from the late 1990s until 2018. Searching ERIC, I found two more recent literature reviews in mathematics education. A content analysis approach (Hsieh & Shannon, 2005) was followed to find the common aspects of identity.

The second part of this paper focuses on seven empirical studies, in order to gain a deeper understanding of the operationalisation of identity: Norén (2011), Delacour (2020), Ntow and Adler (2019), Darragh and Radovic (2019), and Andersson (2011) from the mathematics education field, Bressler & Rotter (2017) from the educational field, and Varghese & Snyder (2018) from the language education field. In selecting these studies, I looked for research on language diversity. I found only a limited amount of research in mathematics education which uses the notion of identity as a theoretical lens for addressing issues of language diversity, and so studies referring to socio-cultural issues (apart from multilingualism) were also included, along with studies on teachers' identities where the participants were mathematics teachers. An exception is Norén's (2011) work, which focuses on multilingual students' identity; this article was included because it is representative of the aspects of identities and multilingualism in mathematics education.

Another selection criterion was to include studies that adopted different theoretical approaches, to see how their definitions of identity played a role in their operationalisations. I drew on examples of the participatory, discursive, narrative, and performative approaches on identity, as Darragh (2016) has highlighted. I excluded the psychoanalytical approach (Darragh, 2016) since it is no longer prominent in mathematics education research (Graven & Heyd-Metzuyanim, 2019). Moreover, Lutovac & Kaasila (2018) have pointed out the need to broaden our perspective in mathematics education by exploring the field of education for identity. Moore (2021) worked on theoretically connecting the mathematics identity with identity in gender studies, initiating a discussion about how mathematics education research on identity can search for broader sources. Since there are limited examples intersecting identity and language diversity in mathematics education, selected examples of research from fields such as education and language education were also included. I used ERIC to trace empirical articles from the primary literature reviews referred to above, and searched studies that were not on the ERIC database. Finally, I made sure that all the articles were peer-reviewed. For the analysis, I used the "frameworks framework"

(Skott, 2018), focusing on the theoretical approach used, the unit of analysis, and the questions of the study. I followed a content analysis (Hsieh & Shannon, 2005) approach to search for the common aspects of identity that I recognised from the first part.

2. PROFESSIONAL IDENTITY IN MATHEMATICS EDUCATION AND OTHER RESEARCH FIELDS

2.1 Terminology

The terminology of "professional identity" or "teacher identity" refers to identity within a teacher's professional life (Beijaard et al., 2004). In the field of mathematics education, "mathematics teacher identity" either refers more specifically to identity as a teacher who specialises in mathematics or is used to emphasise the relation that the teacher has with the subject of mathematics (Lutovac & Kaasila, 2018). The terminologies used in the empirical studies presented in this paper are "mathematical identities", "mathematics teachers' identities", "professional identity", and "subjectivity".

2.2 Aspects of professional identity

Literature review studies seek to understand how professional identity is understood in education and mathematics education research by searching for common aspects within the field that characterise the notion of identity (e.g. Akkerman & Meijer, 2009; Beijaard et al., 2004; Darragh, 2016; Lutovac & Kaasila, 2018).

The following are the most common aspects of identity found across the literature viewed. These aspects will be presented separately, but are interrelated under the broader identity construct. Moreover, they have different meanings under various theoretical lenses, which will be examined via examples in the following section.

Professional identity is viewed as a *dynamic process,* meaning that it is not fixed (Beijaard et al., 2004); it is not a characteristic that we acquire and have, but a process or an action (Darragh, 2016). It is also shifting and unstable (Rodgers & Scott, 2008), and changes through time and context (Akkerman & Meijer, 2009; Lutovac & Kaasila, 2018). *Multiplicity* in identity means having different dimensions or sub-identities; for example, concerning one's professional versus personal life, or within the

professional context (Akkerman & Meijer, 2009). The multifaceted aspects of the concept are considered to be related to the different contexts and relationships in which a person is involved (Beijaard et al., 2004). These facets can or should be harmonised (Beijaard et al., 2004), or can be contradictory (Darragh, 2016). Multiplicity is also apparent when the notion is referred to in the plural as "identities" (Darragh, 2016).

The aspects below are considered core notions of identity and are referred to as the identity triad (Skott, 2022). *Contextuality* or the social nature of identity are interrelated aspects, as Darragh (2016) notes that identity is constructed in the social context. Identity is seen not only as being constructed in the situated social interaction, but also as manifesting in broader culturally organised activities that inform teachers' action and sense-making (Skott, 2019). In this understanding, on one hand, identity is formed in relationships with others (Rodgers & Scott, 2008), as the professional context may set the expectations for the teacher (Beijaard et al., 2004; Akkerman & Meijer, 2009) or the context of the particular subject may be of importance (Lutovac & Kaasila, 2018). On the other hand, there are social, cultural, political, and historical forces that contribute to identity formation (Rodgers & Scott, 2008). Thus, within the ideas of contextuality and the social nature of identity, the local negotiation of meanings of a practice is referred to as *situatedness* in the identity triad, while the issues that stem from beyond the immediate situation are the *structure* (Skott, 2022).

Nevertheless, the interaction between the social and the individual is central, as the teacher is not shaped solely according to the influence of others (Beijaard et al., 2004). This interaction of the social and the individual indicates the notion of *agency,* the last aspect of the identity triad. Agency is understood as teachers' ability to take an active role in their professional development by using identity to make sense of themselves as teachers (Beijaard et al., 2004). The ability to realise their identity may allow teachers to reach their goals or transform the context (Beauchamp & Thomas, 2009). Finally, teachers' agency can be understood in terms of their actions being directed not only by their local and broader context but also by their own decision-making (Skott, 2019).

2.3 Identity studies in education and mathematics education

Next, I present definitions of identity included in the studies, created by the authors themselves or borrowed from other researchers. I also

include the identity approach followed by each study according to my interpretation of Darragh's identity categorisation. Then, I briefly present the studies and the main identity aspects that are apparent or described under each theoretical lens. These aspects of identity are sometimes made explicit by the author or may be inferred, while in other cases, some are entirely absent.

Table 1. Definitions of identity in empirical studies.

Authors	Identity definition	Identity approach
Norén (2011)	Identity is understood as discursive positioning, which is produced by intricate networks of discourses (p. 98).	Discursive approach
Delacour (2020)	Subjectivity is fabricated by teachers shaping their practice based on expectations and by adapting to or resisting expectations and discourses.	Discursive approach
Ntow and Adler (2019)	A mathematics teacher's identity is a relationship with specific practices, where the process of identification involves an interaction between the person and the set of resources made available in the learning community and context of practice (pp. 421–422).	Participative approach
Darragh and Radovic (2019)	Identity is "a socially produced way of being or of becoming that is enacted and recognised in a given context. (…) It exists in social discourse available for individuals to attach themselves to or use in a particular context and for a particular audience" (p. 518).	Performativity approach
Andersson (2011)	Teachers' identities are ways in which practitioners see themselves in response to the actions of others towards them.	Narrative approach

Bressler and Rotter (2017)	Identity is a framework for teachers to construct their own ideas of 'how to be', 'how to act', and 'how to understand' their work and their place in society. It is negotiated through experience and the sense that is made of that experience (p. 240).	Narrative approach
Varghese and Snyder (2018)	Identity construction is an evolving narrative or storyline within which social identities and relationships are constructed and in which individuals participate with their social identities.	Participative approach

Starting with studies in mathematics education, Norén (2011) focuses on multilingual students' mathematics identity formation in the Swedish educational context. She adopts a socio-political approach and views identity in relation to the notions of discourse and power from a Foucauldian perspective. The rationale of her study is to challenge deficit discourses and shed light on how the discursive practices which enter the classroom affect the development of students' identities. Addressing how all the aspects of identity are understood under the theoretical approach emphasises how students position themselves in and challenge discursive practices about multilingual learners of mathematics. This study emphasises the broader social context and agentic aspects of identity.

Delacour (2020) follows a Swedish multilingual preschool mathematics teacher's exploration of her identity, described as subjectivity. She addresses the idea of subjectivity through a socio-political approach following Foucault's and Popkewitz's theoretical constructs of discourse, power, and fabrication. The study explores how the teacher navigates expectations and discourses as she talks about and teaches mathematics in preschool education, and how she shapes her subjectivity. Identity aspects are not explicitly described, but the idea of the broader context is apparent both in the discourses and in the situatedness of the micro-actions observed. Agency is also found when the teacher navigates different discourses and expectations.

Ntow and Adler (2019) focus on two teachers in a professional development programme in South Africa and explore these teachers'

identities as they interact with the programme resources. The authors follow a socio-cultural approach and point out the material and non-material resources available in a professional development programme. The focus is on how the participants identify with the resources offered when talking about the professional development, their motivations and learning, and how they enact practices that they find important. Elements of identity are not explicitly defined, but the emphasis is on the interaction between the local context and teachers' agency.

Darragh and Radovic (2019) examine how primary school teachers in Chile enact identities as mathematics teachers after a professional development programme. They follow a discursive approach, and view identity through narratives and fictions. The study's rationale is to provide a new understanding of teachers' willingness – or lack thereof – to take up new mathematics teaching practices. The authors view identity as being produced culturally and socially outside of the individual and emphasise the social context that creates discourses as one aspect of identity. Another aspect is the multiplicity that arises from the contradiction of different discourses that teachers enact in a given context, even though professional development demands other discourses to be enacted.

Andersson (2011) studies teachers' identity change in a collaborative research project to understand teachers' potential affordances and obstacles to changing their teaching. A socio-cultural-political approach is followed, connecting teachers' learning with identity, and the narrative view of Sfard and Prusak (2005) is used to operationalise identity. The study aims to understand how success and sustainability in teacher development can be achieved. Most aspects of identity are described, but emphasis is given to the ongoing aspect of identity.

In the field of educational studies, Bressler and Rotter (2017) focus on the professional identity of teachers from immigrant backgrounds. The study follows an analytical framework called the documentary method, in order to understand teachers' professional identity through their narration. Identity is viewed as the theoretical concept of the frame of orientation. The study aims to explore whether teachers' migration background is relevant in constructing their professional identity, focusing on the expectations of different agents in the teachers' local contexts. Aspects of identity are not explicitly described, but the contextuality of identity as understood through the expectations of agents in the school context is a critical aspect. Teachers' agency lies in accepting or rejecting the

relevance of their background for teaching as it is viewed by others in the school.

Varghese and Snyder (2018) focus on bilingual prospective elementary teachers' professional identity in dual language education. The study explores the influence of the teacher education programme, the internship placement, the broader societal context, and how teachers invest in and understand being dual language teachers through their individual histories and their language views. The theoretical viewpoint focuses mainly on the notion of agency and figured worlds developed by Holland and her colleagues. The rationale of the study is to address the teacher's construction of what it means to be a dual language teacher in the interaction between all the different local contexts and teachers' personal histories and views. Contextuality and agency are key aspects.

3. DISCUSSION

The fundamental aspects of the notion of identity, as seen in education and mathematics education research, are as follows: identity is a dynamic process, it is multiple and constructed in a social context, and there is more or less agency in identity creation and negotiation. These ideas provide different methodological directions for the operationalisation of identity. Notably, the aspects of multiplicity and dynamicity do not indicate where or how to search for professional identity, but hint at its non-static nature and show us not to expect the same person in every situation, place, story, or period of time. *Contextuality* and *agency* provide a view of where and how to look at identity. The contextual aspect of identity is divided into *situatedness*, which can be seen as the local context of the classroom, school, or professional development programme, and *structure*, which is understood as the macro context that may play a role in teachers' identity construction, pointing at the broader societal issues. Finally, *agency* comes from teachers' decision-making and their reaction to and view of the contextual reality.

Definitions of identity include notions stemming from the chosen theoretical viewpoint, which can be connected to some of the aspects of identity introduced above. There are two broader types of definition, one focusing on self-reflective matters and the other on external affairs. The former type of definition comes from a narrative approach, emphasising the processes the person goes through to comprehend themselves in the local context. The latter type of definition comes from a participatory,

discursive, or performative approach where the emphasis is on the local or broader social context and how the person reacts to it. Within this type of definition, the discursive approach pays attention to the person's actions that are influenced by the social context and that influence it themselves. In contrast to the discursive approach, the participative approach connotes changing broader societal issues. The performative approach focuses more on choosing one's identity according to what is available in society.

The studies focusing on multilingual issues in mathematics education follow a discursive approach, while the definitions do not include any element of language diversity. Thus, I suggest that a definition and operationalisation of identity for looking at multilingual teachers in the multilingual mathematics classroom and school context must combine the broader societal aspects that structure the educational context and a teacher's local everyday school life. Identity, in that sense, does not need to be seen as either an action of positioning or a self-reflection process, but rather as a process of experiencing within the instant situations of the school context.

When operationalising identity, it is apparent from the studies presented above that agency and the contextual nature of identity are the most recognised aspects. The focus is either on the local context or on the broader social context that relates to the experiences of the individual, and hence to their identity formation. Depending on the theoretical view adopted, participants are somewhat constrained in all cases, but have more or less control over their identity formation. In particular, the studies that focus explicitly on structural issues claim that agency is constrained by social structures. Identity as a dynamic process is rarely acknowledged as the focus.

As presented above, research in mathematics education focusing on multilingual issues follows a discursive perspective; the broader context is usually the key aspect of the notion of identity, while the local context is mainly in the background. The interpretations of identity come from what is available in the social structures, while the agency is understood as what identity is created according to those structures. Other perspectives in mathematics education that do not directly work on language diversity focus more on the local social context and how it forms identity. Similarly, in different educational disciplines, some examples emphasise the local social context in teachers' identity formation while the broader social structures are in the background. Thus, I suggest that what is still missing in the field of mathematics education is a greater focus on what stems from

the local context (e.g. the school) in the formation of multilingual teachers' identities.

Overall, there is a need for more systematic work on how identity is defined in different theories in order to better ground the definition and operationalisation of identity in cases of multilingual issues. The next step should be a more systematic look at how professional identity is viewed in education and language education, especially concerning language diversity issues.

BIBLIOGRAPHY

Akkerman, S. F., & Meijer, P. C. (2011). A dialogical approach to conceptualizing teacher identity. *Teaching and Teacher Education*, *27*(2), 308–319. https://doi.org/10.1016/j.tate.2010.08.013

Andersson, A. (2011). A "Curling teacher" in mathematics education: teacher identities and pedagogy development. *Mathematics Education Research Journal*, *23*(4), 437–454. https://doi.org/10.1007/s13394-011-0025-0

Beauchamp, C., & Thomas, L. (2009). Understanding teacher identity: An overview of issues in the literature and implications for teacher education. *Cambridge Journal of Education*, *39*(2), 175–189. https://doi.org/10.1080/03057640902902252

Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, *20*(2), 107–128. https://doi.org/10.1016/j.tate.2003.07.001

Bressler, C., & Rotter, C. (2017). The relevance of a migration background to the professional identity of teachers. *International Journal of Higher Education*, *6*(1), 239–250. https://doi.org/10.5430/ijhe.v6n1p239

Darragh, L. (2016). Identity research in mathematics education. *Educational Studies in Mathematics*, *93*(1), 19–33. https://doi.org/10.1007/s10649-016-9696-5

Darragh, L., & Radovic, D. (2019). "To Tia with love": Chilean mathematics teacher identities after professional development. *ZDM*, *51*(3), 517–527. https://doi.org/10.1007/s11858-018-01023-7

Delacour, L. (2020). Expectations and discourses in multilingual preschool mathematics: Case study of a teacher of immigrant background. *Philosophy of Mathematics Education Journal*, *36*.

Graven, M., & Heyd-Metzuyanim, E. (2019). Mathematics identity research: The state of the art and future directions. *ZDM*, *51*(3), 361–377. https://doi.org/10.1007/s11858-019-01050-y

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Lutovac, S., & Kaasila, R. (2018). Future directions in research on mathematics-related teacher identity. *International Journal of Science and Mathematics Education*, *16*(4), 759–776. https://doi.org/10.1007/s10763-017-9796-4

Moore, A. S. (2021). Queer identity and theory intersections in mathematics education: A theoretical literature review. *Mathematics Education Research Journal*, *33*(4), 651–687. https://doi.org/10.1007/s13394-020-00354-7

Norén, E. (2011). Students' mathematical identity formations in a Swedish multilingual mathematics classroom. *Nordic Studies in Mathematics Education*, *16*(1–2), 95–113.

Ntow, F. D., & Adler, J. (2019). Identity resources and mathematics teaching identity: An exploratory study. *ZDM*, *51*(3), 419–432. https://doi.org/10.1007/s11858-019-01025-z

Rodgers, C. R., & Scott, K. H. (2008). The development of the personal self and professional identity in learning to teach. In M. Cochran-Smith, S. Feiman-Nemser, D. J. McIntyre, & K. E. Demers (Eds.), *Handbook of research on teacher education: Enduring questions in*

changing contexts (3rd ed., pp. 732–755). Routledge. https://doi.org/10.4324/9780203938690

Sfard, A., & Prusak, A. (2005). Telling identities: In search of an analytic tool for investigating learning as a culturally shaped activity. *Educational Researcher*, *34*(4), 14–22. https://doi.org/10.3102/0013189x034004014

Skott, J. (2018). Re-centring the individual in participatory accounts of professional identity. In H. F. G. Kaiser, M. Graven, A. Kuzniak, E. Simmt & B. Xu (Eds.), *Invited lectures from the 13th International Congress on Mathematical Education* (pp. 601–618). Springer. https://doi.org/10.1007/978-3-319-72170-5_33

Skott, J. (2019). Changing experiences of being, becoming, and belonging: Teachers' professional identity revisited. *ZDM*, *51*(3), 469–480. https://doi.org/10.1007/s11858-018-1008-3

Skott, J. (2022). Conceptualizing individual-context relationships in teaching: Developments in research on teachers' knowledge, beliefs and identity. In E. Hodgen, G. Geraniou, & F. Ferretti (Eds.), *Proceedings of the Twelfth Congress of the European Society for Research in Mathematics Education (CERME12)* (pp. 34-60). Free University of Bozen-Bolzano.

Varghese, M. M., & Snyder, R. (2018). Critically examining the agency and professional identity development of novice dual language teachers through figured worlds. *International Multilingual Research Journal*, *12*(3), 145–159. https://doi.org/10.1080/19313152.2018.1474060