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Microaggressions in the Context of Mathematics Teaching and Learning: A Theoretical-Conceptual Analysis

Microagressões no contexto de ensino e aprendizagem da matemática: uma análise teórico-conceitual

Microagresiones en el contexto de la enseñanza y el aprendizaje de las matemáticas: un análisis teórico-conceptual

Microagressions dans le contexte de l'enseignement et de l'apprentissage mathématique : une analyse théorique conceptuelle

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Abstract

In this work, we conceptualize microaggressions related to mathematics teaching and learning. We seek to elucidate its notion and highlight some manifestations in mathematics education.

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We highlight recent studies that we have also been conducting, indicating a critical relationship between the experiences of pre-service teachers and in-service teachers who teach mathematics with this phenomenon and the lack of mastery of mathematical content development during classes, which is also related to aversive reactions towards mathematics, which often favors the manifestation of episodes of mathematics anxiety or procrastination. We argue that microaggressions related to mathematics teaching and learning have similar characteristics to racial microaggressions. However, questions about teaching and learning focus specifically on classroom contexts, the established relationships between teacher, student, and knowledge. Those who present difficulties with mathematics, in academic and school environments, often end up being labeled as incapable of learning and go through uncomfortable situations throughout their lives. Because of this, mathematics has an important social prestige. This prestige favors the development of a very intimate relationship between mathematics and power, which is reflected in the school context. Educational considerations are discussed about the impacts of microaggressions on teacher education in relationships with established students under various aspects.

***Keywords*:** Microaggressions, Teacher education, Aversion to mathematics, Mathematics Education.

Resumo

Neste artigo, conceituamos microagressões relacionadas ao ensino e à aprendizagem de matemática, na perspectiva de elucidar sua noção e destacar algumas de suas possíveis manifestações na educação matemática. Nessa direção, discutimos estudos recentes, e que também temos conduzido, que vêm indicando uma relação importante entre as vivências de futuros professores e professoras que ensinam matemática com esse fenômeno e a falta de domínio de conteúdos matemáticos durante as aulas, bem como o desenvolvimento de reações aversivas em relação à matemática, que muitas vezes favorecem a manifestação de episódios de ansiedade matemática ou procrastinação. Argumentamos que as microagressões relacionadas ao ensino e à aprendizagem de matemática possuem características similares em relação às microagressões raciais. Entretanto, as questões sobre o ensino e a aprendizagem focam especificamente nos contextos de sala de aula e nas relações estabelecidas entre o professor, o/a estudante e o saber. Aqueles que têm dificuldades com o saber matemático, em ambientes acadêmicos e escolares, muitas vezes acabam sendo rotulados como incapazes de aprender e passam, ao longo de suas vidas, por situações desconfortantes. Por conta disso, a

matemática possui um importante prestígio social, favorecendo o desenvolvimento de uma relação muito íntima entre matemática e poder que se reflete no contexto escolar. Considerações educacionais são discutidas acerca dos impactos das microagressões na formação docente nas relações que se estabelecem com os estudantes sob vários aspectos.

***Palavras-Chave**:* Microagressões, Formação de Professores, Aversão à Matemática, Educação Matemática.

Resumen

En este artículo, conceptualizamos las microagresiones relacionadas con la enseñanza y el aprendizaje de las matemáticas, en la perspectiva de dilucidar su noción y destacar algunas de sus posibles manifestaciones en la educación matemática. En esta dirección, destacamos estudios recientes y también los que hemos realizado, que han venido indicando una relación crítica entre las experiencias de los futuros docentes que enseñan matemáticas con este fenómeno y la falta de dominio de los contenidos matemáticos durante las clases, así como el desarrollo de reacciones aversivas hacia las matemáticas, que a menudo favorecen la manifestación de episodios de ansiedad matemática o procrastinación. Argumentamos que las microagresiones relacionadas con la enseñanza y el aprendizaje de las matemáticas tienen características similares en relación a las microagresiones raciales. Sin embargo, las preguntas sobre la enseñanza y el aprendizaje se centran específicamente en los contextos del aula, las relaciones que se establecen entre el profesor, el alumno y el conocimiento. Quienes tienen dificultades con el conocimiento matemático, en ambientes académicos y escolares, muchas veces terminan siendo etiquetados como incapaces de aprender y pasan por situaciones incómodas a lo largo de su vida. Por ello, las matemáticas tienen un importante prestigio social. Ello favorece el desarrollo de una relación muy íntima entre matemáticas y poder, que se refleja en el contexto escolar. Se discuten consideraciones educativas sobre los impactos de las microagresiones en la formación docente en las relaciones que se establecen con los alumnos bajo diversos aspectos.

***Palabras Clave*:** Microagresiones, Formación Docente, Aversión a las Matemáticas, Educación Matemática.

Résumé

Dans cet article, nous conceptualisons les microagressions liées à l'enseignement et à l'apprentissage des mathématiques, en vue d'élucider sa notion et de mettre en évidence

certaines de ses manifestations possibles dans l'enseignement des mathématiques. Dans cette direction, nous soulignons les études récentes et aussi celles que nous avons menées, qui ont indiqué une relation importante entre les expériences des futurs enseignants et des enseignants qui enseignent les mathématiques avec ce phénomène et le manque de maîtrise des contenus mathématiques pendant les cours, ainsi que comme le développement de réactions aversives envers les mathématiques, qui favorisent souvent la manifestation d'épisodes d'anxiété mathématique ou de procrastination. Nous soutenons que les microagressions liées à l'enseignement et à l'apprentissage des mathématiques ont des caractéristiques similaires par rapport aux microagressions raciales. Cependant, les questions sur l'enseignement et l'apprentissage sont spécifiquement axées sur les contextes de classe et sur les relations établies entre l'enseignant, l'élève et les connaissances. Ceux qui ont des difficultés avec les connaissances mathématiques, dans les milieux académiques et scolaires, finissent souvent par être étiquetés comme incapables d'apprendre et vivent des situations inconfortables tout au long de leur vie. De ce fait, les mathématiques ont un prestige social important, favorisant le développement d'une relation très intime entre les mathématiques et le pouvoir, qui se reflète dans le contexte scolaire. Des considérations pédagogiques sont discutées sur les impacts des micro-agressions dans la formation des enseignants dans les relations établies avec les étudiants sous divers aspects.

Mots-clés : Microagressions, Formation des Enseignants, Aversion pour les Mathématiques, Enseignement des Mathématiques.

Microaggressions in Mathematics Teaching and Learning: A Theoretical-Conceptual Analysis

In the 1970s, Chester Pierce, a psychiatry and education African-American professor at Harvard University, was one of the pioneers in problematizing and discussing in the academic field covert and subtle forms of everyday racism directed at Black people. In his work, Pierce (1970) called such practices *racial microaggressions*, defining them as subtle, often attitudinal, preconscious, or unconscious[6] humiliations and degradations, which can also take verbal forms. According to Pierce (1970, p. 266)

> Most [racist] offensive actions are not gross and crippling. They are subtle and stunning. The enormity of the complications they cause can be appreciated only when one considers that these subtle blows are delivered incessantly… the cumulative effect to the victim and to the victimizer is of an unimaginable magnitude.

The *micro* prefix contained in the word microaggression often causes the false impression that this racist practice can be light, interfering little in the lives of those who experience it. However, *micro* refers to the context in which the aggression occurs. While racial macroaggressions may be considered racist practices at a macro level (via structural racism[7], for example), microaggressions occur in local contexts, usually places where the victims regularly go, such as classrooms of different levels of education, gyms, bars, restaurants, stores and, sometimes, their own home. Authors such as Berk (2017) highlight that microaggressions are "micro" in the size of the offense compared to a "macro" hate crime, which is explicit, illegal, and the perpetrator's perception that it is trivial, innocuous, banal, and invisible. It also highlights that microaggressions are not "micro" regarding the harmful impact they can have on people who experience them. Microaggressions are similar to direct aggressions, as they produce fear, stress, and emotional damage, and may embarrass or intimidate the victim, undermine their credibility, and expose vulnerabilities (Berk, 2017). Racial microaggressions represent the manifestation of covert racism, which is more covert, subtle, and insidious as it reinforces direct racism and is a bedrock of white supremacy.

In countries like Brazil and the United States, covert racism has been used to build barriers that oppress Black people while maintaining privileges that benefit White people (Levchak, 2018). As the literature has shown, covert racism is difficult to define and, therefore,

[6] Pierce (1970) uses the expressions "preconscious" and "unconscious" to refer how some racial microaggressions are uttered. In this article we will adopt the term "unintentional actions".
7 For further information, see: Almeida, S. (2019). *Racismo estrutural*. Editora Pólen Livros.

difficult to challenge (Almeida, 2019). These practices have been changing over the years, taking on new guises and acquiring new forms of manifestation, such as discussions about the existence of "reverse racism", for example, which is currently one of the most recurrent forms of perpetuating racism, an attempt to delegitimize or take over the place of the victims. Those new manifestation formats also occur now in contemporary societies, when openly racist speeches and actions are not only morally condemned but can also lead to negative consequences from a legal, social, academic, and professional point of view (Almeida, 2019; Levchak, 2018; Sue et al., 2007).

Pierce (1970) was also the first academic to argue that the accumulation of experiences with microaggressions can shorten life, increase morbidity, and weaken self-confidence. Studies have confirmed Pierce's hypotheses and highlighted the negative implications for the physical and mental health of people who experience microaggressions daily (McKenna et al., 2021). In addition, in the educational field, studies have also highlighted that racial microaggressions can have permanent consequences for students who experience them. In basic education, they can generate feelings of exclusion and discouragement to continue their studies. In higher education, they can contribute to students abandoning their courses or even dropping out of university (Lee et al., 2020; Silva, 2016; Silva & Powell, 2016; Solórzano et al., 2000; Sue et al., 2009); and in postgraduate school, they may trigger feelings of isolation and dissatisfaction with research (Burt et al., 2019; Miles et al., 2020; Solórzano, 1998).

Silva (2016) sought to understand the role of Mathematics Education in affirmative action policies in higher education, among other issues. To this end, the researcher interviewed managers, professors, and students that benefited from affirmative actions [White and Black men and women] in three different places. Some respondents either worked or studied in Science, Technology, Engineering, and Mathematics (STEM) programs at two federal public universities in the state of São Paulo, and some at a North American university consisted of White students mostly. During the interviews, professors and students underscored several episodes of racial and gender microaggressions experienced during their trajectory at the university, corroborating literature about the negative influence of those experiences on academic permanence and progress in the course (Yang & Carroll, 2018).

During interviews conducted by Silva (2016), Black and White students reported episodes of discrimination and prejudice with characteristics similar to racial microaggressions, mainly due to the subtle and covert nature of the offenses. However, such practices were not attached to race, skin color, gender, sexual orientation, or even the type of admission to the university. Instead, they were connected to the students' mathematical content knowledge level.

These practices had characteristics similar to racial microaggressions: they were covert, subtle, and often unintentionally carried out by the aggressors, and seemed to leave extremely negative emotional marks on the lives of the students who experienced them. Silva (2016) defined them as microaggressions related to mathematical content because the lack of mastery of mathematical content during classes triggered microaggressions.

Silva's work (2016) allowed the construction of a new category related to microaggressions. Although the author focused on microaggressions related to mathematical content, we believe that broader manifestations of such practice may occur. In other words, such manifestations are not directly related to a person's mathematical knowledge but can refer to some context that involves mathematics education at all levels. For example, comments such as "Mathematics is very difficult and requires a lot of effort and dedication" refer to a supposed intrinsic characteristic of mathematics (being very difficult) and specific forms of preparation and study (requires effort and dedication), not necessarily to an individual's mathematical knowledge in different contexts. Similarly, comments such as "Men do better than women in mathematics" refer to the issue of gender[8]. Other comments, such as "Mathematics is an exact science. You were not born to follow this science; you should go for humanities!" refer to a supposed individual's innate ability. Therefore, we consider that microaggressions are related not only to the content but also to mathematics teaching and learning practices in school or out-of-school contexts. In this work, we chose to use the expression: *microaggressions related to mathematics teaching and learning*.

In the aftermath of Silva's (2016) research, other studies in higher education indicated that during the school trajectory, the experiences of microaggressions such as those discussed above might negatively impact the relationship of future professionals with mathematics (Julio & Silva, 2018; Santos, 2021; Silva & Powell, 2016; Silva & Silva, 2021). In this article, we conceptualize microaggressions related to mathematics teaching and learning and highlight some manifestations in mathematics education. In this research, we address recent studies, ours and of others, that have been indicating an important relationship between the experiences of pre-service and in-service teachers who teach mathematics with this phenomenon and the lack of mastery of mathematical content during classes. Those works also suggest that people suffering microaggressions may develop mathematical anxiety or procrastination.

[8]Further discussions on the myth "gender is a worthless variable to explain performance differences in mathematics" can be obtained at Rocha, J. T. F. d., & Hazin, I. (2007). Dez mitos acerca do ensino e da aprendizagem de Matemática. *Pesquisas e práticas em educação matemática, 1*(1), 27-48.

Racial microaggressions in the educational field: historical and conceptual aspects

In the late 1990s, Daniel Solórzano (1998) conducted some of the first empirical research in the educational context aimed at understanding the experiences of Latino postgraduate students related to microaggressions. The study included six male and six female doctoral and postdoctoral students who were scholarship holders of the Ford Fellows[9] program at a predominantly White US university. Using focus group interviews, the author identified three patterns of racial and gender microaggressions based on the daily experiences of those students: (i) feeling of not belonging to the academic space due to race and gender-related issues; (ii) feeling that teachers expected less from them, and; (iii) manifestations of subtle and non-subtle incidents of racism. Even at higher levels, in which the educational conditions of students are better leveled, Solórzano (1998) points out that forms of inequality and discrimination can be even more subtle and difficult to notice. According to Solórzano (1998, p. 132), it is very likely that:

> the cumulative impact of racial and gender microaggressions at each point in the educational system is further evidence of the very different road that scholars of color must travel and the strength they must have to overcome both macro- and micro-barriers along that road.

In the early 2000s, Solórzano et al. (2000) deepened the understanding of how race could connect to other social issues from African-American college students' experiences with microaggressions. Using focus group interviews with 18 female and 16 Black male students from three US predominantly white public universities, the authors identified that racial microaggressions could occur in the academic and social spaces of the campus. For example, students highlighted feelings of invisibility and segregation in the classroom. Because they were numerically racial minorities in their classes, those students felt ignored during class interactions. When they expressed their ideas, they felt that their professors paid more attention to other colleagues' comments, especially during debates about academic content. In addition, they stated that when they engaged in didactic activities in workgroups with other students, their contributions seemed irrelevant in the group, as they were generally never considered by the team. Students interviewed also claimed that whenever issues related to race and racism arose, professors and classmates expected them to take a stand, assuming that they represented

9 Ford *Fellows* is one of the most prestigious and competitive scholarship programs in the United States, funded by the Ford Foundation. The program offers doctoral scholarships to students belonging to underrepresented groups, aiming at their insertion as professors and researchers in higher education.

the viewpoint of others of the same race. In this study, the authors concluded that the cumulative effects of racial microaggressions could be devastating for students who experience them, negatively affecting, among other factors, the racial climate on the campus.

Sue et al. (2007) used Chester Pierce's and Daniel Solórzano's works to develop a typology of racial microaggressions, classifying them into three forms: *microinsults, microinvalidations, and microassaults*. According to Sue et al. (2007), *racial microinsults* represent subtle, usually unintentional, affronts that clearly convey a hidden message of insult to the person attacked. Assuming that a black student is a cleaning worker at a university, not considering their opinions during classroom discussions, and assuming a superiority of European mathematical knowledge over the mathematical knowledge of African peoples can be considered examples of microinsults in the university context. According to the authors, *racial microinvalidations* are usually defined as unconscious communications or behaviors that tend to exclude, deny, or cancel individuals' racial realities. Taking a black student's opinion as representative of the entire black population when racial issues arise in some context, telling black people not to be "overly sensitive" when racially offended, advocating racial neutrality, or upholding the "myth of democracy" are examples of racial microinvalidations.

Sue et al. (2007) state that *racial microassaults* are direct and explicit forms of racism perpetrated in a careful and well-planned way. Microattacks are perpetrated verbally or attitudinally, usually when the aggressor feels safe to attack (for example, on social networks or in a group of like-minded people) or when the situation allows for anonymity. Using nicknames based on race or heredity, discouraging racial interactions, assuming an individual is a criminal or abnormal, or treating someone as inferior based on their racial identity are all examples of microassaults. Although Sue et al. (2007) have typified microassaults as a type of microaggression, Minikel-Lacocque (2013, p. 455) says that:

> micro to certain racist aggressions has the ability to maintain power dynamics with attaching respect to racism. In other words, the use of this term may invalidate the anger and hurt caused by such acts as well as empower the perpetrators to believe their actions and words are somehow less egregious than those racist acts not classified as micro.

Minikel-Lacocque (2013) proposes the use of the expression *racial aggressions* for what Sue et al. (2007) call microassaults. However, we want to emphasize that there is a fine line between implicit/covert racist practices and more direct ones. In this way, although microassaults may not be "as explicit" as *old-fashioned* racism (OFR), we agree with Minikel-

Lacocque (2013) that classifying microassaults as microaggressions can make the aggressor hide behind an unintentional action.

According to Sue et al. (2009), university students who experience racial microaggressions tend to be quieter, fear public speaking, become more isolated, and sometimes drop out of school subjects or courses. The authors point out that this negatively affects their academic productivity, leading them to have difficulties developing problem-solving skills, for example. To Sue et al. (2009), racial microaggressions are not limited to the individual/local (micro) level but can also be manifested at systemic and environmental levels, i.e., at the macro level. Yosso et al. (2009), for example, have used the term macroaggressions to illustrate the institutional actions that contribute to racial marginalization and inertia towards racial issues, evidenced in structures, practices, and discourses that endorse a racially hostile climate in a given context for racially or ethnically minorities. At university, Yosso et al. (2009) address a "passivity" of institutions for not recruiting, for example, professors and coordinators of underrepresented groups (such as blacks and Latinos in the United States) or not promoting cultural events aimed at these groups.

As the search for understanding the different ways microaggressions can manifest themselves progresses, researchers have identified not only due to race-related issues but also gender, social class, language, ethnicity, and sexual orientation, among others (Yang & Carroll, 2018). For example, Huber and Solórzano (2015, p. 302) classified microaggressions as follows:

> (1) verbal and non-verbal assaults directed toward People of Color[10], often carried out in subtle, automatic or unconscious forms; (2) layered assaults, based on a Person of Color's race, gender, class, sexuality, language, immigration status, phenotype, accent, or surname; and (3) cumulative assaults that take a psychological, physiological, and academic toll on People of Color.

Based on the scores, we can see that the main characteristic of microaggressions lies in the subtle and hidden way the insults are manifested, not allowing victims to denounce or confront them, for example. It is important to say that "subtle" does not mean "light" in this context. Instead, it means that microaggressions are carried out sophisticatedly, making it difficult to identify or describe. In other words, microaggressions are manifestations of

10 In the United States, "people of color" is intended for a broad category that includes self-declared black, brown, indigenous, and dark-skinned minorities without black, Latino, or Asian traits.

structural violence rooted in the structures of society that are reflected in the most different contexts, whether educational or not (Silva & Skovsmose, 2019).

The reflections and discussions on experiences with microaggressions and social and racial marginalization underlie our understanding of how these actions contribute particularly to mathematics teaching and learning, as presented in the section below.

Microaggressions related to mathematics teaching and learning: an underestimated problem

With the technological development on an exponential scale, the performance of multidisciplinary teams in various scientific fields, and the advancement in various areas of knowledge –such as health sciences, human sciences, applied social sciences, and biological sciences, among others– our society is greatly dependent on mathematical knowledge. Because of this, mathematics has high social prestige. It is not new that such prestige favors the development of a very intimate relationship between mathematics and power, which is reflected in the school context. Being "good" at mathematics guarantees students a differentiated status class and may many doors throughout their lives. Stinson (2004), for example, points out that mathematics works as a social gatekeeper, filtering and selecting people for positions of power, courses, and prestigious academic programs that may open relevant doors for those who master the subject. Among other factors, the above makes mathematics teaching critical for students' personal and professional development from the beginning of their school trajectory.

The official documents and programs that govern education regarding "mathematical literacy" has given relevance to teaching, mainly focusing on those who teach in the first years of schooling (for example, in the *Base Nacional Comum Curricular*, in Brazil, or the *Common Core State Standards*, in the United States). Teachers are then pressured to improve their students' mathematical performance, primarily due to the rates generated by large-scale assessments, which influence the distribution of financial resources to schools, among other aspects. On the other hand, implicitly and explicitly, students are socially pressured to obtain good grades in mathematics because mastering scientifically constructed mathematical knowledge differentiates them socially due to the status conferred by the subject, among other factors, as presented in this article. Those with difficulties with this curriculum organizer often end up being labeled as incapable of learning and, throughout their lives, experience uncomfortable situations when dealing with this knowledge.

This whole scenario eventually creates environments and situations conducive to the manifestation of microaggressions in environments where mathematics plays a central role. As

explained earlier, we call those specific microaggressions of *microaggressions related to mathematics teaching and learning*. These microaggressions are understood as verbal, non-verbal, or attitudinal practices of subtle, intentional, or unintentional insults directed at people in educational (at all levels) and or extracurricular contexts involving mathematics.

As mentioned earlier, the prefix *micro*, in this context, is not synonymous with small. Rather, it indicates that the insult occurs at the local level. Some studies have discussed examples of these microaggressions, such as McKenna et al. (2021), who conducted research in the US context. The authors were based on social psychology studies that relate people's beliefs and personalities as a resource for racial microaggression practices to be uttered by them and designed a conceptual framework to predict behaviors of racial discrimination existing in interactions between mathematics and their students. McKenna et al. (2021) argue that black, Latino, and Asian high school and college students are more likely to experience microaggressions related to mathematics teaching and learning than their white peers. According to the authors, this discrimination favors the maintenance of a gap in mathematical performance between white and non-white students in the context of the United States, which is very evident in the specialized literature on the subject. The point to be highlighted here is that the study by Mckenna and collaborators indicates a very close relationship between racism and microaggression practices in mathematics teaching and learning contexts. McKenna et al. (2021) underscore some examples of microaggressions related to mathematical content, presented in Figure 1:

- Teachers that maintain the conventionally conservative and traditional belief that Mathematics was purely developed in Europe may, quite implicitly, reinforce stereotypes that other peoples do not know how to do mathematics, ignoring or minimizing the contributions of mathematicians from other cultures;
- Teachers that believe that there is only right and wrong in mathematics may be correcting the solution methods of mathematical activities just by imitating the textbook, even when the student's solution is valid (or even more effective than the one registered in the book);
- Teachers who rank students based on their mathematics performances may invalidate, during class, the ideas of those students who do not have high Mathematics performances, either by ignoring them or disregarding their questions.
- Teachers that judge their students' lifestyles or even personalities based on their mathematical performance (e.g., labeling them lazy or stupid).

Figure 1.

- *Examples of microaggressions related to mathematics teaching and learning*

(McKenna et al., 2021)

Chart 1 reveals that the examples focus on verbal attitudes uttered by mathematics teachers. However, we add other examples that show microaggressions related to mathematics teaching and learning, such as:

- Derisory comments from teachers or classmates about students' mathematical remarks or questions during a class;
- Teachers' or peers' different treatment during pedagogical activities involving mathematical knowledge, especially for those considered to have poor performance in Mathematics;
- Jokes that teachers or students utter about their mathematical abilities;
- Teachers who punish their students for bad behavior by giving them lists of mathematics exercises or multiplication tables when other students are having fun or making them solve exercises in front of the class, knowing that they cannot do them;
- Teachers or classmates who exclude or ignore comments from students with low performance in Mathematics while carrying out pedagogical activities involving mathematical knowledge;
- Discussing a mathematical demonstration or the correction of a mathematical activity with scornful speeches like: "either you know, or you don't"; "it is easy to verify that..."; "it is trivial to show that..."; "the rest is just basic algebra...", and "this exercise can be solved by a student in the early years of elementary school...", among others.

We argue that microaggressions related to mathematics teaching and learning have similar characteristics to racial microaggressions. Such similarities lie in (i) the subtle and covert characteristic that makes them difficult to identify by the victims and the fact that they are often unintentionally practiced by the aggressors; (ii) the violent content that these practices carry; (iii) and the negative consequences for the academic path of those who experience them. Furthermore, just as there is a very close connection between racial and gendered microaggressions (McKenna et al., 2021; Yang & Carroll, 2018), the same seems to happen with microaggressions related to mathematics teaching and learning: in higher education courses in areas of exact sciences, for example, we often hear reports from women who constantly needed to show that they were "good" at mathematics and that their assessments were marked more rigorously than their male counterparts (Silva & Powell, 2016).

However, microaggressions related to mathematics teaching and learning and racial microaggressions present crucial differences. The first concerns the context in which they occur. Although racial microaggressions can be evidenced in the school context, they are also significant in other contexts, for example, at work and during leisure time. Microaggressions

related to mathematics teaching and learning happen mainly in school or academic environments. Mathematics classrooms appear to be their natural environment in elementary and high school. In higher education, they also occur during classes that require mathematical knowledge and in teachers-students' and students-students' relationships, mainly in workgroups, research projects, teaching, extension, and guidance activities.

Another difference concerns their complexity. Because they are part of a broad and complex framework of structural racism, racial microaggressions tend to occur more constantly in the victims' lives. In this case, the individual is not only constantly bombarded with verbal, non-verbal, and attitudinal practices (avoidance actions and pre-judgments, for example), but they also experience institutionalized racial microaggressions, such as, for example, non-representation in collegiate political bodies, media advertisements, and management positions.

Furthermore, unlike racial microaggressions, microaggressions related to mathematics teaching and learning may generate feelings of avoidance of mathematical subjects during the students' formative period. In higher education, this can negatively impact both the academic trajectory of those who have experienced them and those who depend on those professionals. For example, early years of elementary school pre-service teachers who shy away from mathematics due to their experiences with microaggressions may find it challenging to work with mathematics during their teaching practice, which may breach students' learning rights (Julio & Silva, 2018).

Microaggressions related to mathematics teaching and learning can also be typified according to Sue et al.'s (2007) classification highlighted earlier. However, as also mentioned, we consider that, due to their explicit and conscious content, Sue et al.'s (2007) microassaults could not be seen as microaggressions. In this case, explicit practices of offenses in the context of mathematics teaching and learning (microassaults) could fit, in our view, as practices of school bullying, for example.

Despite being considered difficult to conceptualize, bullying presents characteristics that delimit it for understanding, identification, and study. Unlike microaggressions, moral harassment is intentional, non-subtle, and is established through a higher-hierarchy figure than the victims to exclude, tire, and humiliate their targets. This phenomenon has been more frequently studied in the workplace, among workers, their peers and or higher-position people, but in the school context, it can occur in two ways, by the student-teacher route and the other way around. Although less studied, it is plausible to infer that such experiences can occur throughout the educational scope, which may cause damage to the performance of students and lead to exclusion, failure, and school dropout (Paixão et al., 2014).

The fact is that microaggressions related to mathematics teaching and learning are present in school (or even non-school) contexts, and is practiced mostly unintentionally by teachers and students. A relevant question in this context could be the following: What implications can those practices bring to mathematics education? In the next section, we highlight some of those implications related to the education of teachers who teach mathematics in the early years of elementary school.

Educational implications in the education of degree students who teach mathematics

Weaving considerations about the impacts of microaggressions on teacher training requires a reflection on recent studies that address this topic (Julio & Silva, 2018; Santos, 2021; Santos et al., in press; Silva & Silva, 2021) or that touch on this topic by discussing mathematical anxiety (França & Dorneles, 2021). When conducting research involving pre-service teachers (students attending different semesters of the pedagogy course), Santos (2021) found that microaggressions (that the author called negative experiences) are present since the early years of schooling and affect the way those pre-service teachers interact in academic contexts focused on mathematical content. Such experiences are related to how the teacher deals with mathematical knowledge in their classroom, not exploring criticism and using comments that expose students' weaknesses and tending to use mathematics punitively, especially in the early years. As microaggressions are mistaken for "harmless jokes", they are rooted in classroom routines, and teachers are rarely aware of their use. However, students "see and feel" the microaggressions, which can generate an unproductive climate for mathematics teaching.

The difficulties of identifying or characterizing a performed or experienced microaggression related to mathematics teaching and learning are due to the subtlety of the disguised aggression or the culture already established around mathematics. Micro-aggressive communication can take verbal, non-verbal, and/or visual forms, such as understated offenses, contempt for the student's knowledge, mean comments, disdainful looks, gestures, and tones of voice. Those attitudes from male and female teachers result in students' feelings of non-belonging and insufficiency in mathematics. They cannot understand the addressed content, and that causes behaviors that lead them to give up, run away, and avoid the curricular component. It is worth mentioning that the people using this communication type do not usually mean to harm the ones they address. Instead, they ignore its effect and deny any intentionality in the offense, claiming exaggerated sensitivity on the victim's part (Berk, 2017a; Su, 2015). However, those "unintentional messages" discourage the targeted students.

Microaggressions arise through factors beyond the classroom that involve family, social, didactics, education, infrastructure, language, and the teacher. They all act as construction and development agents of the student's mathematical knowledge (or lack thereof). Regarding the male or female teachers, elements contributing to disseminating those negative experiences may involve their own experiences with mathematics in their school years (Bekdemir, 2010). Elementary and early childhood education teachers' lack of competence and or knowledge of the mathematical concepts constructed may also contribute to this aspect (Kaskens et al., 2020), as they may favor those professionals' development or maintenance of math anxiety, lack of confidence, and negative beliefs. Although we are always trying to change the beliefs and prejudices rooted in the attitudes of male and female teachers, we cannot fail to mention that they are rooted in their personalities. In general, individuals defend what they want to believe and act accordingly in their personal lives (McKenna et al., 2021).

Through interviews and the application of scales with undergraduates in pedagogy[11] program, Santos (2021) observed significant correlations between the degree of mathematical anxiety with negative experiences throughout the entire schooling, from elementary to higher education, indicating that students with a higher level of anxiety also reported more negative experiences in that school/academic context. In that regard, Suárez-Orozco et al. (2015) present a metaphor in which microaggressions are like drops of toxic rain that cause cumulative and adverse effects on students' well-being over time as a result of the "corrosion" it causes. Berk (2017b) compares microaggressions with difficulties, discomfort, and fear of mathematics. That elephant in the room that teachers and students must confront but ignore in the learning space may have disastrous consequences for society.

From a bibliographical review, França and Dornelles (2021, p. 144) highlighted that mathematical anxiety in pre-service teachers' education is associated with a lower performance in mathematics education subjects. In addition, they state that pre-service teachers are "less confident in their pedagogical practices.". The authors say that, in Brazil, "teachers and pre-service teachers develop mathematical anxiety due to a combination of structural problems in their school and university education.". In this sense, a better understanding of the impacts of microaggressions related to mathematics teaching and learning, together with other phenomena, such as *math anxiety* and *procrastination* in executing activities involving mathematical content could provide relevant information about the relationship between affectivity and mathematics teaching in Brazilian educational contexts.

[11] Pre-service program teachers to work at primary education and coordination aspects on the school.

Santos et al. (in press) have taken a step in this direction by simultaneously investigating mathematical anxiety, procrastination, and microaggressions related to mathematics teaching and learning and their relationship with the education of teachers who teach mathematics in the Brazilian educational context. The investigation under development hopes to provide psychometrically validated instruments in the future that will make it possible to evaluate students and teachers concerning mathematical anxiety, microaggressions, and procrastination, to propose/elaborate actions that can be implemented in the school context to favor students' mathematical understanding at different levels of education.

Final remarks

It is not an easy task to deconstruct microaggressions in any context, as it takes time and effort to change beliefs. From this perspective, it is important to point out, initially, that the implementation of reflective mathematics teaching may not be enough to eliminate all prejudices, inequalities, or discrimination in a classroom, bearing in mind that this may not be enough to change fundamentally teachers' and students' behaviors. The microaggressions generated by those behaviors can define the classroom environment. After all, every educator, regardless of their work area, brings their beliefs, prejudices, and assumptions to the classroom. For example, it is difficult to change the beliefs of male and female teachers from the dominant society who carry deeply rooted traditional practices. Furthermore, changes made in the school context do not necessarily imply changes in the teacher's personal life. People can still continue to believe and defend whatever they want and act accordingly.

The reflections woven in this article are of close interest to us because, as educators, we must know the Brazilian reality regarding microaggressions. Silva and Skovsmose (2019) emphasize that those manifestations are rooted in our society and emerge in the most varied contexts. Although the studies above have dealt with this topic in the international and national scenario, we lacked a concept that encompassed the different perspectives that explore the phenomenon of microaggressions and mathematics in the educational context (Julio & Silva, 2018; McKenna et al., 2021; Santos, 2021; Silva & Powell, 2016; Silva & Silva, 2021; Yang & Carroll, 2018).

In this sense, in this article, we seek to explain the definition of *microaggressions related to mathematics teaching and learning* that we defend and bring examples to illustrate the impacts those manifestations have on the formation of students at different levels, in particular, pre-service teachers who will teach mathematics. Such manifestations can lead

students to develop aversive reactions towards mathematics, often favoring episodes of mathematical anxiety or procrastination.

It is also worth considering that we must bring those discussions to teacher education courses in all areas of knowledge, at all initial or continuing education levels, to minimize the impact that microaggressions may have on future professionals' actions. Only then will we be breaking with propositions that have survived the clashes in mathematics education, such as that "affectivity is a worthless variable in explaining difficulties in mathematical learning" (Rocha & Hazin, 2007, p. 38).

Considering the discussion in this article, we consider the urgency of developing formative proposals focused on dialogue and reflections that help educators and degree students who work or will work in basic school mathematics education build a culturally inclusive classroom. The recognition and integration of racial or cultural knowledge and values are critical issues for developing pedagogical practices focused not only on reducing discriminatory treatment but also on promoting students' academic progress equitably.

The contributions proposed by the different consulted authors helped us to systematize data from the national and international literature to outline reflections on diverse forms of manifestations of microaggressions and advance in the problematization of the challenges that involve educating pre-service teachers to teach mathematics at different levels of education.

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