





Supporting mathematics public school teachers' professional development and the teaching of statistics in elementary and middle school: An imperative for teacher education in Brazil

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ABSTRACT

This research sought to understand the perspectives of 28 elementary school mathematics teachers, on equity, social justice, cultural, socioeconomic, and racial issues and their relationship with the teaching and learning of mathematics (statistical concepts) in an online collaborative mathematics course focused on teaching statistics in an equity view. Federal policy requires teaching statistics since elementary school in Brazil. The course was conducted in the context of a university-school partnership through an online professional learning community-PLC, involving teachers from eight public schools and researchers from eight public universities in three different states in the Northeast and one in the Southeast of Brazil. Teachers' perspectives on equity, social justice, cultural, socioeconomic, and racial issues were analyzed under the lens of the National Council of Teachers of Mathematics (NCTM) equity principles and Gorski's (2019b) heritage literacy. Data was generated through responses to an online questionnaire. Data analysis involved the qualitative method of textual discursive analysis. Results focused on teachers' understandings and interpretations regarding: how they define equity, equality, and social justice; opportunities in mathematics teaching to support student learning; school support in relation to racial, cultural, and socioeconomic issues of families. The findings point to the need to support the implementation of a professional development model that attends, at the same time, the learning of teachers and students, with a focus on equity in Brazilian public schools.

Keywords: professional development, equity, teacher education

INTRODUCTION

This study sought to understand the perspectives of elementary and middle school mathematics teachers in relation to equity, social justice, cultural, economic, and racial issues and their relationship with the teaching and learning of mathematics, especially regarding statistical concepts, during an online collaborative mathematics course.

Initially planned as face to face meetings, the course changed due to the COVID-19 pandemic which led Brazilian schools to adopt emergency remote education (Hodges et al., 2020). This condition showed even more the inequalities already present in Brazilian education, mainly due to the lack of access by students and, in some cases, by teachers, to the Internet and other technological resources in a minimally satisfactory way. Therefore, the formative process discussed in this work took place remotely with the support of digital information and communication technologies (DICT) such as Google Classroom, Google Meet, and Telegram.

In general, teachers' professional development programs are based on pre-formatted courses or workshops outside of school sites and focused primarily on math content (Ponte, 2012). In these programs, issues such as school context, teachers' beliefs about students' learning and strategies for students learning with an equity focus are rarely addressed (Day, 2001; Marcelo, 2009).

The formative process conducted in this research sought to mobilize knowledge and professional experiences, integrating statistical concepts explored in Brazilian basic education from a critical reflection of the problems experienced in the context of schools with an equity focus. This proposal is based on the perspective of critical mathematics education (Skovsmose, 2008, 2014). This choice was made due to the importance of developing knowledge that will allow teachers and students to use statistics as a tool to analyze society with a critical stance, using data to reflect on issues such as equity and social justice.

The process was based on a collaborative perspective, distributed in four modules: statistical concepts, equity at school, investigative cycle, and reflections on the investigative cycle. Those included contextualized activities on the teaching of statistics during the COVID-19 pandemic. For this article, data consisted of responses to an online questionnaire applied before the second module—equity at school—as a way to verify teachers’ previous knowledge about equity, social justice, cultural, socioeconomic, and racial issues and their relationship with teaching and learning mathematics.

The paper is organized in four sections. The first presents reflections on the teaching of mathematics with an equity focus and its relationship with statistics. The second comprises the methods used including description of the formative process and the data generation process. The third presents the results and the fourth the final considerations.

MATHEMATICS TEACHING AS WAY TO CRITICAL THINKING AND EQUITY

Teaching mathematics in line with social issues which permeate teachers and students’ life context, means to allow development, socialization, and citizenship, creating better conditions for students’ active participation in society, questioning political and social economical decisions. To think of mathematics in the context of socialization and citizenship, Skovsmose (2008, 2014) defends a critical mathematics education, a set of minimal knowledge needed for citizens to be able to critically act on society. Such a perspective aims to empower students with knowledge and skill, promoting equity in students’ learning (Farias & Santos, 2018). The use of real-world situations could help students understand issues of inequities and discrimination in society and use statistical data to create better arguments for a more equal society (Chao et al., 2014).

Teaching based on the use of real situations to be solved by students, contemplating the context of inter-disciplinarity, reveals and refers to a complex web of knowledge, each with its own peculiarity (Fonte, 2011; Silva et al., 2018). Therefore, Skovsmose (2000) suggests research scenarios as possibilities for the elaboration of questions, the search for explanations and, consequently, reflections. Real life scenarios seem to be necessary to provoke a detailed reflection on how mathematical situations can be happening in the daily lives of people and society. The teaching of mathematics through inquiry can help a student to be critical and reflective.

This perspective is in line with recommendations from the National Common Curricular Base (BNCC), a normative document for the curriculum of Brazilian schools, which indicates the valorization of scientific, critical and creative thinking as one of the ten general competences (Brasil, 2018). The BNCC also recommends intra-disciplinary work—numbers, algebra, geometry, quantities and measures, and probability and statistics—and interdisciplinary work—between areas of knowledge, with Portuguese language, arts, history, geography, and sciences. Pontes and Castro (2021) explain that statistics stands out for favoring these relationships by carrying out investigative processes, which favors reflections and the development of literacy and statistical thinking.

Practices that focus on teaching and learning mathematical concepts, especially statistics, with a view to equity, can be included in this recommendation. Furthermore, Santana and Cazorla (2020) argue that to develop statistical literacy in basic education, students should not be limited to simply reading about content, but should engage in activities that are contextualized in real-life situations where they are required to use statistical thinking. However, it is necessary for teachers to know possibilities, which demands research and professional development on the subject.

Thinking about teaching and learning statistical concepts helps to use the principles of justice theory as equity. Gutstein (2003) reports his two-year experience with teaching mathematics for social justice. He used real-world projects coupled with standards-based curriculum in order to develop students’ mathematical power and change their orientation toward mathematics. His study relates to this research as it links mathematics education with equity through the lens of social justice. His findings led to a question on: how to form teachers to teach mathematics (or statistics) with a focus on equity and addressing social justice issues?

In this sense, teaching and learning should have a political nature, creating opportunities to develop specific skills in teachers and students, defending the promotion of equal opportunities based on the idea that primary social goods such as freedom, opportunities, wealth, income, and the social bases of self-esteem (Vaz, 2006) must be socialized according to needs. A condition which indicates the inequalities of freedom as an opportunity or income to create conditions for the least favored to be benefited.

In this educational context, the teaching of mathematical concepts should provide opportunities that offer possibilities for everyone to learn, build and develop similar skills, since inequalities and non-learning require redress and must be compensated. However, in schools the prevailing idea that teaching mathematics is only to develop logical reasoning by solving calculations still remains. It is common for mathematics to be explored through procedures, models and rules that often do not make sense to some students (Castro, 2016; Soares & Rêgo, 2015). This situation ends up contributing “as instruments for maintaining school and, consequently, social inequalities” (Carrizo, 2014, p. 260).

Although mathematics is a discipline that can help to develop values, social justice, identity, autonomy, solidarity, respect for individual differences, and human dignity, it is also an instrument of inequality when it promotes school failure (Carrizo, 2014; Roseira, 2010). In this perspective, students “should always be encouraged to develop their skills” (Silva, 2016, p. 400).

In this sense, a formative intervention based on equity helps to understand, create and sustain learning processes at school, for teachers and students, with principles that are individual and institutional in the context of the school and society. These principles contribute to reducing injustice actions and fostering social justice actions (Gorski, 2019a), which requires “the redistribution of material, cultural, and social access and opportunity. We do this by changing inequitable policies, eliminating oppressive aspects of institutional culture, and examining how practices and programs might advantage some students over others” (Gorski, 2020, p. 1).

Thus, equity in mathematics requires pedagogical practices that enable all students to build mathematical concepts. For this, it is necessary to consider the evaluations carried out, whether large-scale or school based, the organization of the curriculum and teaching content, the skills to use real contexts and offer students time to learn (NCTM, 2014). Also, according to the NCTM (2014, p. 63), understanding the context and thinking of students contributes to the mathematical learning of teachers and students, to arrive at the construction of identity and equity, considering that:

1. Mathematics ability is a function of opportunity, experience and effort—not of innate intelligence. Mathematics teaching and learning cultivate mathematics abilities. All students are capable of participating and achieving in mathematics, and all deserve support to achieve at the highest levels.
2. Equity is attained when students receive the differentiated supports (e.g., time, instruction, curricular materials, and programs) necessary to ensure that all students are mathematically successful.
3. Equity—ensuring that all students have access to high-quality curriculum, instruction, and the support that they need to be successful—applies to all settings.
4. Effective mathematics instruction leverages students' culture, conditions, and language to support and enhance mathematics learning.
5. Effective teaching practices (e.g., engaging students with challenging tasks, discourse, and open-ended problem solving) have the potential to open up greater opportunities for higher-order thinking and for raising the mathematics achievement of all students, including poor and low-income students.
6. All students are capable of making sense of and persevering in solving challenging mathematics problems and should be expected to do so. Many more students, regardless of gender, ethnicity, and socioeconomic status, need to be given the support, confidence, and opportunities to reach much higher levels of mathematical success and interest.

However, many Brazilian schools still fail to understand the principles of equity in math classes. In this sense, Franco et al. (2007) carried out a research with mathematics students from the 5th year of elementary school and data from the basic education assessment system in Brazil. Their results showed progress in research on intra-school factors and the inequalities in the social distribution of knowledge. They also point out that schools can make a difference as they plan actions to offer teachers and students an academic environment, access to library and resources—material and financial—and emphasis on passing and correcting homework. In the same direction, Madalozzo and Faria (2014) presented four goals to ensure student learning, which can be common in schools, regardless of the area of knowledge.

The first goal is related to clarity in relation to what someone wants to achieve. For this, it is necessary a structured plan for the recovery of teaching, with strategies and actions for students to learn the content, that is, to develop the skills expected for their school year, at the right age. The authors also emphasize that the search for students' learning goes through the valorization and recognition of teachers who manage to guarantee this learning; and encourage continuing teacher education, tutoring for students with difficulties and extracurricular activities (Madalozzo & Faria, 2014).

The second goal refers to long-term monitoring, which can be accomplished by monitoring student learning with the support of teachers, coordinators and principals by making a detailed analysis of official and school-based assessments; creating a culture of school day-to-day accompaniment to identify the contents that each student masters and those that need to advance; building solutions to ensure learning, observing classrooms and analyzing activity books, as a possibility to identify learning problems to plan pedagogical actions that guarantee students' learning (Madalozzo & Faria, 2014). Follow-up must be daily and not just during the periodic exams that take place at the end of certain periods of the school year. In establishing this second goal, the school can also organize a favorable climate to guarantee learning and continued professional development, such as support, exchange of knowledge, and collaboration among teachers, valuing issues of race and the construction of identity.

The third goal is to create an open and transparent flow of information communication between the different professionals who will implement the actions and changes (Madalozzo & Faria, 2014). This interaction between school professionals aims to develop practices that promote mutual support within the team, respecting the knowledge and experiences that they have already built regarding students, teaching content and the school. In this way, it is possible to carry out planning of pedagogical actions, with effective participation of teachers, to think about the curriculum, its goals and actions, as well as to face resistance and inequalities, considering that even with the socioeconomic and cultural conditions of students' vulnerability, they are able to learn what is needed in each school year.

Finally, the fourth goal seeks to create actions to guarantee the support and mobilization of groups outside the school in favor of student learning (Madalozzo & Faria, 2014). Among these external groups are the governors, since they are responsible for teachers' professional development, the learning of students and the implementation of reforms in schools, considering the elaboration of a plan with actions related to the construction of cultural identity and the characteristics of that group with respect to race and social inequality.

These goals listed by Madalozzo and Faria (2014) can help achieve equity. From them, teachers may be able to develop a work focusing on students' learning and citizenship formation, reducing race stereotypes, without masking racial inequality (Gorski, 2019). It is necessary to understand the 'place' of these students, in school policy, prioritizing the interests of students of color, to plan teaching and learning situations as paths to equity, and not as detours around it (Gorski, 2019). In this context, a question arises: How can a teaching situation help in learning and in building student's identity?

Goals and actions for professional development in schools where social inequality is a study point for planning, should not be based on situations where the feelings and fears of 'white' educators mask "conversations about race rather than to advance equity for students of color" (Swanson & Welton, apud Gorski, 2019, p. 58). It is necessary to build a way of speaking and studying

“cultural differences”, the “race” without having to name, mask or face racism (Gorski, 2019), since “all knowledge is [...] a dynamic and never finished process” (D’Ambrósio, 2001, p. 18).

According to Gorski (2019a), racism is a structural confusion with marks of power, oppression, unfair distributions of access and opportunities that are sometimes used to randomly explain school failure. These marks can only be resolved with a culture of collective conscience, a construction as a process for analyzing educational policies (about the textbook, technologies in the school, school meals, the school library, etc.), the curriculum and the subjects that are being proposed, among them mathematics, as a way to fight against racism and socioeconomic inequality, providing teaching situations as an opportunity for significant practices. A job that needs to be done with stakeholders, principals, teachers and students.

Thus, to organize actions with a view to minimizing issues of inequality, injustice, racism and cultural identity, it is necessary, initially, to “impose limits and adjustments to the results accumulated during the social process, so that the institutions that make up the society basic structure to organize themselves in a way that favors and encourages constructive efforts” (Möller, 2006, p. 73), as well as considering the principles of equal opportunities and difference. One is closely related to the other. These principles help to reflect on a situation that does not favor social justice, such as non-learning and school failure, which results in the mark of social inequality, not favoring the offer of equal perspectives, of formation and construction of cultural identity, with similar opportunities for all students to be able to learn, but in different situations. “Undeserved inequalities demand redress, and they must be compensated in some way” (Rawls, apud Möller, 2006, p. 75) and further, “the use of opportunities will depend on desires, willpower, and other specific capacities of individuals” (Möller, 2006, p. 75), such as the ability to learn to read, write, interpret, mathematize, etc., which depends on the student (the one who learns), the teachers (the one who plans and teaches), the family (support), managers (principals, secretaries etc., who plan, manage, and develop public policies to reduce educational inequalities).

Thus, a reasoned teaching proposal “equity involves redistributing access and opportunity at the most basic institutional level. This includes material access to things like learning materials, technology, healthy food, and even healthcare” (Gorski, 2019a, p. 60). Such a condition is our challenge in mathematics education, in an attempt to raise the self-esteem of all students including those from low socio-cultural classes, foreigners, with special educational needs and of different ethnicities (NCTM, 2014). “The development of opportunities to use their own cultural and linguistic resources when they are working with mathematics, [to] find a balance between what is culturally valued and what is usually required by society” (Silva, 2016, p. 409). In this sense, “the principle of difference indicates the importance of equity in social arrangements so that attention is paid especially to the difficulties of people in the worst situation” (Sen, 2011, p. 95).

For Skovsmose (2008), the relationship between teaching mathematics, critical education for citizenship and the school’s commitment to society requires planning learning environments based on research scenarios as a condition for coping with situations such as: traditional math teaching, with resolution of list of exercises and the student as a passive subject in the construction of mathematical knowledge; starting to build environments of contextualization of mathematical concepts beyond the relations of power, exclusion and inequality—racial and socioeconomic—, making interventions and taking decisions in a critical and autonomous way (Skovsmose, 2008). Such ideas also corroborate the principles of equity and social justice, helping to overcome inequalities.

Then, principles of critical mathematical education can be the basis for the planning of a formative process that will help teachers to develop teaching sequences involving statistics content in elementary and middle education, to achieve equity in public schools. Next, the methods used in the research are presented.

METHODS

The research was carried out by the Mathematics Education Northeast Network (REM-NE), comprised of researchers from four northeastern states of Brazil—Bahia, Ceará, Pernambuco, and Rio Grande do Norte—and one from southeastern—São Paulo¹. The REM-NE has been conducting research in mathematics and statistics education since 2018 (Santana et al., 2021).

The formative intervention research was conducted in the context of a university-school partnership, through an online professional learning community—PLC (DuFour, 2004) teachers from eight public schools, called participant teachers, and researchers from eight Brazilian public universities of five states. In 2020, due to the pandemic caused by COVID-19, it took place virtually. In the next section, the course held in 2020 is described.

Collaborative Mathematics Course

The formative intervention was planned, considering the support of DICT, due to the pandemic situation in Brazil. The formative activities were carried out using tools available from G suite for education. A class was created in Google Classroom to post study material and handouts. Google Meet was used for synchronous meetings. In addition, an instant messaging app (Telegram) was used to provide constant contact between researchers and participant teachers. The course was organized in four modules, namely:

1. Statistical concepts as prescribed by Brazilian curricular documents (Brasil, 2018) and approached through interdisciplinary and transversal themes,
2. Theoretical studies of equity at school,

¹ https://www.instagram.com/rem_nordeste/

3. Investigative cycle, and
4. Reflections on the investigative cycle.

The last two modules were based on the work of Santana and Cazorla (2020) and Wild and Pfannkuch (1999). Together, all modules totaled 80 hours, distributed in synchronous and asynchronous activities. Fifty-five teachers started but only twenty-eight completed all course modules. Each module used as strategy:

1. Synchronous meeting between researchers and course participants to present the module and
2. Asynchronous group and individual activities for study, discussion, and exchange of experiences.

All modules were planned considering three actions:

1. Research–asynchronous activity in which the participant teachers studied and carried out activities on the content of the module,
2. Connecting concepts–asynchronous activities in which participant teachers were organized into groups by school grade to study the concepts covered in each module, with support from researchers, and
3. Presentation–synchronous moment for presentation, discussion, and institutionalization of studied concepts.

Data Generation and Analysis

The data in this study were generated from an online questionnaire sent to participant teachers one week before the start of module 2. The questionnaire contained six questions regarding equity, social justice, cultural, economic, and racial issues and relations with teaching and learning mathematics. The goal was to understand teachers' previous knowledge and perspectives in relation to those issues. This study was approved by the ethics committee, Comitê de Ética em Pesquisa da Uesc–Uesc Research Ethics Committee (<http://www.uesc.br/cep/>) with approval code: 3.813.638 on January, 20th, 2020.

Data analysis used the textual discursive analysis (ATD) (Moraes & Galiuzzi, 2011), a technique which does not aim to generalize, but to verify the different perspectives presented in the discourse, by dismantling the original discourse into units of meaning, categorization and meta-text construction (Moraes & Galiuzzi, 2011). In this sense, the results focus on qualitative and non-quantitative aspects.

The answers were disassembled, a new organization was made, the units of meaning and categories were identified, and a new text called meta-text was constituted (Moraes & Galiuzzi, 2011). The meta-text was subjected to interpretation to seek, in the light of the theoretical principles of equity, the perspectives of teachers before discussions to be carried out in the module about equity.

The meta-text aims to present a synthesis of the teachers' perspective, relating it to the elements that emerged after the methodological process. In the meta-text, teachers' perspectives are presented with pseudonyms to preserve their confidentiality. Results will comprise teachers' previous knowledge about equity and the perspectives of their teaching practices and students' learning through the lens of equity literacy (Gorski, 2019b). In the next section, results are presented.

RESULTS

Participant teachers' responses made it possible to know what they think about: equity, equality, and social justice, differences in students' learning in mathematics, strategies to reduce these differences; to value the participation and achievements of students, and how the school considers or not the socioeconomic reality, race, and cultural identity for the student's mathematical learning.

When participant teachers were asked to describe what they understood about equity, equality, and social justice in mathematical learning, in their view, equity circumscribed offering different opportunities for learning, different teaching strategies, being able to judge, and make fair judgments about students and their own understandings. For them, equality levels students, offers a single teaching strategy and the same opportunity for all, regardless of individual differences. Social justice was perceived as a possibility to offer conditions of access to health, housing, transportation, and educational material. Part of the participant teachers considered these three points: equity, equality, and social justice, in a unique description as equal learning, access, and opportunity to teaching and learning for all and, as being difficult to offer in the teaching of mathematics as depicted in **Table 1**.

The systematized analysis in **Table 1** reveals that there were understandings about equity in mathematical learning. These understandings permeate the idea of respecting differences, of offering opportunities, of supporting students with teaching strategies, perspectives that are in line with what the NCTM (2014) indicates. Participant teachers also declared fairness as being fair or having the ability to judge, understandings that diverge from what is assumed for equity in mathematical learning.

When referring to equality in mathematical learning, participant teachers assumed equal opportunities and conditions for everyone to learn, without considering differences or skills inherent to each individual. These understandings are pertinent to what Vaz (2006) defines as equality in learning.

Social justice in mathematical learning had different interpretations. Participant teachers considered that it involves access to education, conditions of equity and equality, as well as respect for students' rights, duties, origins, and beliefs. There were those who did not understand what social justice refers to in mathematical learning. These are concepts that, according to the theory of justice as equity (Rawls, apud Möller, 2006, p. 40), refer to eliminating social injustices, and do not contemplate specificities of mathematical learning. It is necessary to realize social justice for the development of students' specific skills.

Table 1. Description made by participant teachers about equity, equality and social justice in mathematical learning

Description	Category
<ul style="list-style-type: none"> - Offer different opportunities; - Offer different teaching strategies; - Give more attention to those who need it most; - Understanding of the person with or without the influence of society; - Fair judgement; and - Ability to judge. 	Equity
<ul style="list-style-type: none"> - Offer access conditions considering health, housing, transportation, and teaching material; - Break with inequalities; - Add equality and equity in class; - Collective equality; - Equal rights and duties; - Respect origins and beliefs; and - Promoted from equality. 	Social justice
<ul style="list-style-type: none"> - Equality of learning in the same conditions; - Teaching for all, right to learn; - Access to teaching and learning; - Constructed from contextualization; - Difficult to offer in the teaching of mathematics; - Determine didactics so that everyone has equality; and - Learning opportunity. 	Equity, equality, and social justice

Table 2. Learning differences identified by participant teachers

Description (unitarizations)	Category
<ul style="list-style-type: none"> - You need help from the teacher or colleagues; - It is accompanied by the family; - Social differences; - Need concrete material; and - He has other occupations with work. 	External to students
<ul style="list-style-type: none"> - Personal stimulus; - Own capacity; - Like the discipline; - Lack previous knowledge; - Learning time; and - Attention deficit. 	Internal to students

Part of the participant teachers declared that equity, equality and social justice in mathematical learning constitute a single conception. They referred to equality of learning considering the same conditions, access and teaching for all, considering them complex or difficult elements to be implemented in the teaching of mathematics.

All participant teachers claimed to identify differences in learning among students and, in their perspective, such differences are due to factors external and internal to students (Table 2).

When participant teachers' perspectives for learning differences refer to factors external to students, they report whether students have family support or not, help from colleagues to carry out activities, or whether or not they have concrete material or manipulatives for the development of activities. Participant teachers also indicate that taking on labor activities to help the family financially, interferes with students' learning performance.

The internal factors were declared to be cognitive and perceived as their own ability to learn in a short time or need more time to develop learning, have greater or lesser ease with calculations, show interest in studies, be motivated, have a deficit in attention, not having prior knowledge of the contents of previous school years. In their view, the fondness for mathematics may be another factor that explains the differences in learning among students.

In order to have access to equity, it is necessary for a teacher to plan different teaching strategies that make it possible to assist students in their learning (Gutstein, 2003; NCTM, 2014). When asked what strategies they use to reduce learning differences between students, participant teachers stated that they are guided by activities with the students themselves and activities with resources (Table 3).

According to the analysis, in the perception of participant teachers, teaching strategies supported by the development of group activities, with the monitoring of students who have better performance or individual service to students, reduce learning differences. In addition, the encouragement of reading and interpretation collaborates so that students expand their own learning.

Participant teachers understand that resources such as: concrete material, fun activities, educational games and plays; as well as the proximity of family and student's reality to the classroom, as well as the review of mathematical content from previous school years, are teaching strategies that reduce the differences in learning among students.

The promotion of equity in the classroom can be favored when students feel the support for their learning. This support can occur in different ways, such as, for example, by valuing their participation in the proposed activities and their achievements (NCTM, 2014). When participant teachers were asked if they used strategies to value the participation and the achievements of the students, they all responded yes. In their perspective, these strategies are linked to emotions or pedagogical actions (Table 4).

Table 3. Strategies reported by participant teachers to reduce learning differences between students

Description (unitarizations)	Category
<ul style="list-style-type: none"> - Group activities; - Individual assistance to students; - Encouragement for reading and interpretation; and - Students as tutors. 	Strategies with students themselves
<ul style="list-style-type: none"> - Personal stimulus; - Own capacity; - Like the discipline; - Lack previous knowledge; - Learning time; and - Attention deficit. 	Strategy with resources

Table 4. Strategies used by participant teachers to value student participation and achievements

Description (unitarizations)	Category
<ul style="list-style-type: none"> - Congratulate student and family; - Valuing student's self-esteem; and - Give awards in recreational activities. 	Strategies with emotions
<ul style="list-style-type: none"> - Personal stimulus; - Own capacity; - Like the discipline; - Lack previous knowledge; - Learning time; and - Attention deficit. 	Internal to students

Table 5. Participant teachers' perspective regarding the school considering or not the socioeconomic reality to improve students' learning

Description (unitarizations)	Category
<ul style="list-style-type: none"> - It does not elaborate projects and - It does not use strategies. 	Does not consider
<ul style="list-style-type: none"> - Brings families reality to the classroom; - Involves the community and the family; - Support with didactic and digital material; - Support with tutoring; - Serves underprivileged students with social programs available at school; - Develops teacher formative process; and - Offer events and projects. 	Consider

From the perspective of participant teachers, congratulating the student or family, working on the student's self-esteem and giving awards as recognition for what they do, are strategies that value student participation and achievements. These strategies are related to the search for overcoming individual potential, with the evolution of their learning, and with the achievements in small stages. These strategies can be classified as emotional, as they involve the movement of feelings with a view to a positive reaction to the given stimulus.

However, participant teachers also understand that valorization occurs when they use strategies such as: games and plays, apps, mathematical curiosities, dynamic, and group activities with students' active participation and socialization of students' responses. These strategies can be seen as pedagogical actions, as they directly involve working with the content, that is, with the development of skills and competences. They seek to motivate students to participate and integrate in the proposed activities aiming the content learning, in this case, mathematical contents.

A learning proposal based on equity needs to contain institutional culture and ideologies that meet students and families' interests in the community in which school is inserted (Gorski, 2019a, 2020). Thus, participant teachers responded about what their perspectives were regarding teachers and school management members considering the socioeconomic reality of students, in order to improve students' mathematical learning. Only two teachers stated that schools do not take into account socio economic reality while the remaining 26 stated that they did. These perceptions led to the analysis in two categories: it considers and does not consider socioeconomic reality (Table 5).

Participant teachers who understand that the school does not consider socio-economic reality, in order to improve student learning, claim that the school does not develop projects to work with socio-economic reality of students or does not use strategies to remedy the difficulties of students who are needier.

Among the participant teachers who understand that the school considers the socioeconomic reality, it is understood that the school carries out activities in the classroom, approaching the community: uses the reality of families and involves them in activities, carries out projects and events with community participation, offers tutoring classes, serves underprivileged students with social programs, distributes didactic and digital material to underprivileged students and develops formative processes with teachers. The realization of integrative activities between school and community, support to students with materials and reinforcement classes pointed out in the participant teachers' perceptions, bring signs of promoting equity in schools, but not specifically for the learning of mathematical concepts.

Table 6. Participant teachers' perspective on how school considers race and cultural identity to improve mathematical learning

Description (unitarizations)	Category
<ul style="list-style-type: none"> - They are not elements that influence the learning process and - Students are welcomed regardless of race or cultural identity. 	Does not consider
<ul style="list-style-type: none"> - Cultural identity; - In the classroom; - With school community; - For learning performance; - Community research; - On racial ethics; - With teaching materials; and - Equity. 	Consider developing activities

When asked whether school considers race and cultural identity to improve mathematical learning, 16 participant teachers said yes and 12 said no (**Table 6**).

From participant teachers' perspective, schools that do not consider race and cultural identity for mathematical learning are supported in two directions: they are not parameters that influence the learning process and students are welcomed regardless of race and cultural identity. These directions are understood as a departure from the principles of equity, since these are parameters that can influence the learning process, as indicated by Gorski (2019a) when referring that racism is sometimes used to explain school failure. Each individual needs to be integrated into school actions according to his needs.

Participant teachers who understand that the school considers race and cultural identity for mathematical learning have in their conceptions that ethics, race and culture are approached in the classroom and with the community, through projects, events or classroom activities. Skovsmose (2008) considers that school's commitment to build environments to contextualization of mathematical concepts of racial and socioeconomic inequality favors critical formation for citizenship, thus helping to overcome inequalities. Participant teachers consider that the principle of equality contributes to the constitution of student learning. However, if equality is assumed in this proposition, it is not possible that issues of race and cultural identity can provide a foundation and support for student's mathematical learning.

Meta-Text

The analysis directed by the questions asked to the participant teachers were constituted by unitarizations that identified their perspective regarding equity, social justice, cultural, socioeconomic, and racial issues and their relationship with the teaching and learning of mathematics (statistical concepts). With the unitarizations, the occurrence of actions that make it possible to boost aspects of equity and social justice in the classroom and in schools were identified, but these aspects are not considered by all participant teachers and by all schools surveyed. Evidence can be seen in the answers given:

"Having equity, equality and social justice in learning mathematics is a little complex [...]. Mathematics, unfortunately, is not viewed favorably by the majority of students, perhaps because its base has not been done the way it should have been, considering internal and external factors that are beyond full responsibility of the teacher who teaches the discipline" (Gil).

"Social justice, something abstract, because in order for social justice to occur in the learning of mathematics, the first step would be a radical change in teaching, the realization of work that considers individuality and collectivity" (Rode).

Other participant teachers understand that equity, equality and social justice are aspects that can be worked on in a math class. This was ratified in:

"[...] Social justice in learning mathematics: it is you being able to bring the first two topics together in a class in mathematics, equity and equality" (Gean).

That confirms the statements of Skovsmose (2008). However, there are participant teachers who did not know the meaning of the terms such as:

"[...] equality is only obtained from equity. I do not know the term social justice" (Tina).

Learning differences between students are understood to exist and the categories external to the student and internal to the student have emerged. Evidencing the understanding of elements that influence students' learning with regard to their own stimulus, their learning time and cognitive conditions.

"Some are more interested and easier to learn; others are neither interested nor easy to learn. Others still find themselves unable to learn mathematics" (Sira).

The external differences are allusive to the monitoring of students by family and teachers, but include the use of concrete material in activities, the occupations that the student assumes outside school and social inequalities and their consequences such as the use of drugs, triggering reflections about the need to support students in their learning difficulties and provide opportunities for learning to occur.

“There are students who learn using the concrete material, others do not need it. There are those who, with the help of the teacher, can understand the activity, others need help from a colleague or from group activities, interaction among them and use of the same language makes the content more understandable” (Adria).

“It is social inequality that takes the interest of young students out of the classroom for a futile and unsuccessful life (drugs)” (Nete).

Perspectives that are in the direction of the principles of equity (NCTM, 2014).

To work on learning differences, participant teachers declare to rely on teaching strategies that use the students themselves to solve activities or with didactic resources.

“Sometimes, I propose that students carry out activities in groups or in pairs. I tend to correct the activities collectively and sometimes I ask the students to write their answers on the blackboard and we analyze the resolution of the exercises together” (Juá).

“I use a lot of educational games that involve math” (Nete).

These are strategies that seek to value the participation and socialization of the resolutions of the activities. Activities that elucidate effective action with equity are not described, but participant teachers mention the use of situations that approach students' daily lives.

“I try to work in a clear and objective way, in order to contextualize with situations that fit in students' daily lives” (Ine).

As for the way that administration and other school teachers consider the socioeconomic reality of students in order to improve student learning, the categories emerging from the analysis reveal that activities are carried out in the classroom that involve the reality of families and the community. Which brings evidence that the actions do not necessarily address students' reality.

“We seek to problematize these issues in such a way that this knowledge is useful when the children are helping their parents at work” (Adria).

Participant teachers present a perspective of the future for the interaction with socioeconomic reality and do not address it in the present time. With regard to considering race and cultural identity for students' mathematical learning, two categories are evident. The schools which consider it and the schools which do not consider it.

“Race/color is not a parameter to identify whether the student has learning difficulties or not” (Gil).

“I never used race and cultural identity to improve math learning” (Joe).

These statements are in line with Gorski's (2019a) statements when he points out that racism is used to explain school failure, that is, non-learning.

The analyzes bring evidence that these themes are not yet seen as influencing learning, on the other hand, the schools that consider it carry out projects, events and activities in the classroom,

“In black awareness month, math students create questions together with teachers and go to do field research on their street, to find out about a certain subject and, in relation to cultural issues, we do cultural week” (Joas).

These are specific actions, but they can initiate a process of belonging to those involved, so that students' learning is favored, as the elements to be addressed support them in their real conditions, constituting scenarios for learning (Skovsmose, 2008). With this analysis, from participant teachers' perspective, equity and its aspects are elements that tangent the classrooms and the school, but they still need to be articulated with effective actions of teaching and learning in mathematics.

FINAL CONSIDERATIONS

Results indicate that, in the formative process, before conducting a discussion about equity, social justice, cultural, socioeconomic, racial issues and their relationship with the teaching and learning of mathematics (statistical concepts), participant teachers' perspectives are close to equity principles. However, few perceptions for support and opportunities that can be offered to students have been identified considering socioeconomic, cultural, racial, and social justice issues.

From the perspective of the participant teachers, equity in learning means offering different opportunities and teaching strategies, supporting those who need the most attention, having the ability to judge and respect the learning pace of each student and, these are elements that are part of the principles of equity (NCTM, 2014). However, among participant teachers, the prospect of being fair and having the ability to judge was revealed, and these principles do not refer to equity, but to equality. Which brings evidence of the need to expand discussions on equity among teachers at school.

When describing social justice, participant teachers even declare that they do not know the term or have no perspective on it, with a tendency to consider it as equality or even as equity. Results that need to be reflected in the perspective of Gorski (2019a, 2020) in which individual knowledge and skills contribute to reducing injustices, being a prerogative to enhance social justice.

The points regarding cultural, socioeconomic and racial issues are understood with little emphasis on classroom work and mathematical learning (statistical concepts). There is a tendency for these points to be considered in problem situations, events or special dates, but there are few perspectives that consider them in continuous work in the classroom and at school.

With these indications, it is necessary that, in the Brazilian context, formative processes are implemented emphasizing how to develop actions in the classroom and at school in order to guarantee students' learning, supporting and giving opportunities, which points to Madalozzo and Faria (2014) study when presenting the four goals to ensure students' learning: clarity in relation to what they want to achieve, long-term follow-up, open and transparent flow of information between different professionals and creating actions to guarantee support and mobilization of groups outside the school.

The results presented in the paper are the first on a series of studies which will address contributions of the formative intervention to the improvement of teachers' professional development of teachers. Future papers will cover teachers learning about equity and statistical concepts and how it affected their practices in the context of emergency remote teaching.

Even though these are initial finds, they support the proposition for the need to implement, in Brazilian public schools, formative processes that support a professional development model with a focus on equity that reach practice in the classroom and at school, with goals to be achieved in short and long term, considering access and opportunity, in the construction of knowledge, materials and cultural activities, providing conditions for students to be able to lead their lives outside the classroom, in a constant learning and as a process.

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