REFLECTION ARTICLE

Intrinsic Dissonance of Mathematics: The Case of Informal '*Gota-a-Gota*' ('Trickle-Down') Lending

Disonancia intrínseca de las matemáticas: el caso del crédito informal 'gota a gota'

Discordância intrínseca da matemática: o caso do empréstimo informal trickle-down

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ABSTRACT

This paper aims to describe and analyze a current risk situation, which reveals in a broad manner an example of the theoretical arguments presented by Ole Skovsmose, on the intrinsic dissonance of mathematics that reveals the relationship between mathematics and democracy. The risk situation is related to an informal credit system used by a large part of the citizens of low socioeconomic strata in the Colombian territory. In this situation, it is analyzed how mathematics, in spite of operating as a lifeline to many daily human needs, can become a tool to provoke a system of crisis, if used by people who put individual profit purposes before democratic values or social justice. Among the most relevant conclusions, we find that the dissonance in this case represents the performative relationship of the use of mathematics in society and that it finds a privileged place for its development in populations that are victims of exclusionary economic policies and consequently exacerbates the social crisis of the least favored. Therefore, it is necessary a mathematical literacy that leads to establish and glimpse the way in which mathematics structures current societies in order to act politically.

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RESUMEN

El presente documento, pretende describir y analizar una situación de riesgo actual, que devela de manera amplia un ejemplo de los argumentos teóricos presentados por Ole Skovsmose, sobre la disonancia intrínseca de las matemáticas que devela relaciones entre matemáticas y la democracia. La situación de riesgo se relaciona con un sistema informal de crédito que utiliza gran parte de los ciudadanos de estratos socioeconómicos bajos en el territorio colombiano. En dicha situación, se analiza como las matemáticas a pesar de operar como un salvavidas a muchas necesidades humanas diarias, pueden convertirse en una herramienta para provocar un sistema de crisis, si son usadas por personas que anteponen los fines de lucro individual en lugar de los valores democráticos o la justicia social. Entre las conclusiones más relevantes, encontramos que la disonancia en este caso representa en la relación performativa del uso de las matemáticas en la sociedad y que esta encuentra un lugar privilegiado para su desarrollo en poblaciones víctimas de las políticas económicas excluyentes y en consecuencia agudiza la crisis social de los menos favorecidos. Por lo anterior, es necesaria una alfabetización matemática que conduzca a establecer y vislumbrar la forma en que las matemáticas estructuran las sociedades actuales para actuar políticamente.

RESUMO

Este documento visa descrever e analisar uma situação de risco atual, que revela amplamente um exemplo dos argumentos teóricos apresentados por Ole Skovsmose, sobre a dissonância intrínseca da matemática que revela as relações entre matemática e democracia. A situação de risco está relacionada a um sistema de crédito informal utilizado por grande parte dos cidadãos de estratos socioeconômicos baixos no território colombiano. Nesta situação, analisa-se como a matemática, apesar de funcionar como uma tábua de salvação para muitas necessidades humanas cotidianas, pode se tornar uma ferramenta para provocar um sistema de crise, se for usada por pessoas que colocam o lucro individual em vez do lucro pessoal. ou justiça social. Entre as conclusões mais relevantes, encontramos que a dissonância neste caso representa a relação performativa do uso da matemática na sociedade e que encontra um lugar privilegiado para o seu desenvolvimento em populações vítimas de políticas económicas excludentes e consequentemente agrava a crise. socialmente desfavorecido. Portanto, é necessária uma alfabetização matemática que leve a estabelecer e vislumbrar a maneira como a matemática estrutura as sociedades atuais para agir politicamente.

Introduction

On December 27, 2021, in the web portal of the magazine Semana (in Colombia), an article entitled "Seized assets for more than 7. 000 million pesos to a *'gota a gota'* organization ", in which it is expressed that the assets seized by the Attorney General's Office, the Specialized Directorate of Extinction of the Right of Dominion of the Prosecutor's Office, with the support of the Sijin of the capital of Risaralda, belong to a criminal network dedicated to the illegal practice of *'gota a gota'* money lending who with high interest rates on the loans, and other conducts associated with this illicit activity such as threats and forced displacement against the debtors, managed to collect said sum (Nación, December 27, 2022). Again, on July 13, 2022, the same magazine published an article called "*el gota a gota de la muerte*" which highlights the risks of this illegal financial practice (Nación, July 13, 2021).

The news caused indignation among the most vulnerable people, the main clients of this illegal form of loans, who were quick to express through social networks such as Twitter and Facebook, that the *'gota a gota'* business is the product of a bad financial policy of the country that relegates the populations with greater risk of social vulnerability and forces them to look for different ways to meet basic needs.

With this phenomenon overflowing in today's Colombian society, the invisible panorama that is woven behind this situation reveals how this business increases the coffers of some from the economic needs of a large percentage of the Colombian population of socioeconomic strata 1 and 2.[1] Thus, while minimal

part of people who lead this economic practice with total conviction of being a help for those who do not have the opportunity to access the regular market offer, shows an unethical and irresponsible behavior and the widening of the social gap, even in this socioeconomic level. On the other hand, the restricted access to formal sources of financing for people in the lower social strata becomes a real survival test, since they must meet their financing needs with sources that are high cost, high financial risk, high social risk and high security risk.

In consideration of the above, Sanchez (2014) states that citizens must develop mathematical literacy, to identify, point out, evaluate, and criticize the way in which mathematics is used in our political and social environment. Therefore, this has been the starting point since the reality of the situation enlarges the social inequality in our territory, and convincingly mathematics organizes part of the reality (Skovsmose, 1999) which drives to unveil in the social and economic context how mathematics formats the critical situation to be considered.

To achieve the analysis of this situation, its development has been proposed under the considerations of a sociopolitical approach within Mathematics Education, such as Critical Mathematics Education (CME). It is initially established that CME has its roots since the early 1980s, marked by the emerging social aspects in Mathematics Education, proposed by Lerman (2000) as the "shift towards the social". However, as stated by Guerrero (2008), CME is also based on the perspective of three theoretical approaches: the Frankfurt School, liberation pedagogy, and the positions of Ethnomathematics.

Likewise, as stated by Skovsmose & Nielsen (1996, cited in Manzano, 2016), the EMC has condensed some concerns and interests that underlie its philosophical position. In principle, we highlight that it postulates: the importance of school processes in the preparation of people to be active in their political life; to constitute a vision of mathematics as a reading tool to identify and analyze critical facts of society; educational practice, given the interest of students, should not focus only on the construction and transformation of pure knowledge, it should on the contrary take into account that people do not act only in their minds, they act and transform in and from their immediate environment.

Thus, Valero et al. (2015) summarize the concerns that Critical Mathematics Education addresses in at least three directions of work: "the critique of mathematics in society; the relationship between Mathematics Education and democracy, social justice, equity and in(ex)clusion; and the invention of new educational possibilities" (p.290). The above is assumed in many investigations that have addressed the concerns and central aspects of MME from different positions. In Colombia, this range of researchers has emphasized the need to empower citizens to reveal the nature of the society in which they live and become actors who understand and transform their social, political and economic reality, and contribute to the creation of more democratic conditions (Alvis et al., 2019; Alvis & Olmos, 2022; Camelo, 2017; Fresneda & Sarmiento, 2018; Sarmiento, 2020; Trujillo et al., 2022).

Research within the framework of the EMC, converge and contribute to the consolidation of a sociopolitical approach to Mathematics Education (Skovsmose & Valero, 2012a; Valero et al., 2015). Thus, one of the central ideas recognizes the relationship between Mathematics Education and democracy, which requires a recognition of the political dimension of Mathematics Education, which allows contributing to the apprehension of the democratic ideals of society (Skovsmose & Valero, 2002). However, it is evident that the connection between Mathematics Education and democracy is not simple or easy to establish. Therefore, in order to study the connection between Mathematics Education and democracy, three theses are considered: that of intrinsic resonance, that of dissonance, and that of critical relationship (Skovsmose & Valero, 2012a).

In this sense, the authors of this paper share the concerns of Critical Mathematics Education on the power exercised by the use of mathematics to oppress and subject citizens to practices of social injustice, where they particularly intend, from their understandings and derivations of their research, to describe and analyze the practices of social risk generated by the situation of informal 'drop-by-drop' loans, in order to exemplify and understand from the perspective of the intrinsic dissonance of mathematics, how the use of mathematics in society, in some cases, generates negative implications for citizens.

Theoretical Framework

Since the developments towards the positioning of CME as a sociopolitical practice, the connection between democracy and Mathematics Education has been a central theme in the field of research in Mathematics Education. At this point, it is necessary to rescue the vision of the concept of democracy and as expressed by Skovsmose and Valero (2012a) "to mention different aspects of this concept, so that we can place it in a space and in a context where we can give it meaning, in its relationship with Mathematics Education" (p.12).

The concept can be assumed of an open nature (Skovsmose & Valero, 2012a) by considering that there is no intention to provide a sharp definition about democracy and that, on the contrary, it is necessary to question the idea that democracy is only connected with formal organizations and in expressions such as "the government is democratic", "the school is democratic" or "the classroom is democratic", as this portrays the belief that democracy is external to the people in the sense that it resides only in formal organizations and not in the daily relationships between the people who constitute it.

Sánchez and Molina (2012), based on an exhaustive theoretical review, characterize democracy in different dimensions, among which they highlight: political, legal, economic and sociocultural. They show that the concept of democracy is multidimensional, i.e., it is a concept that refers to freedoms, rights, obligations, distribution of material and cultural goods and respect for the diversity of ideas and ways of thinking. Similarly, Skovsmose (1997) points out that democracy can be associated with "formal conditions related to algorithms for choice, material conditions associated with distribution, ethical conditions linked to equality, and finally conditions related to the possibility of participation and reaction" (p. 195).

This last aspect allows us to emphasize the meaning of the word democracy with respect to Mathematics Education in the field of social and political relations (interactions), in which citizens relate to each other to produce their material and cultural conditions for a dignified life. There, democracy configures a way of life in community, more explicitly related to an open political action carried out by citizens in order to contribute to the understanding and discussion of social, political, economic, historical, environmental, medical and cultural phenomena that take place in our society, as opposed to a vision related to forms of government, administration of justice, and distribution of resources (Silva & Kato, 2012; Valero, 2017).

Considering the implications of democracy in the formation of political subjects allows, to assume Mathematics Education as a set of practices associated with the teaching and learning of mathematics, which are not limited to the physical classroom, quite the contrary, which include external educational practices that affect the learning and teaching of mathematics and the formation of democratic values (Valero, 1999). Furthermore, these practices allow establishing links between Mathematics Education and training for the exercise of democracy, related to providing students with mathematical and non-mathematical skills to critically analyze their context, and also to identify and evaluate the positive and negative uses of mathematics in society; that is, to establish that its use allows promoting or inhibiting values and attitudes that are essential to build and sustain democratic societies; and finally to recognize, by teachers and students, that Mathematics Education can function as a kind of social filter that restricts the opportunities for development and civic participation of some students.

To arrive at this analysis, it is substantial to recognize the challenge that the mathematical education of a citizen implies to contribute to the development of democratic forces in society, opening spaces to rethink the teaching and learning of mathematics from perspectives that highlight its intricate connection with many other social and political phenomena in the classroom and beyond (Skovsmose & Valero, 2012b).

Thus, broadening the horizon, understandings and developments exposed in the connection between Mathematics Education and democracy is considered on the basis of three theses: intrinsic resonance, dissonance and critical relationship (Skovsmose & Valero, 2012a). Generally speaking, the thesis of intrinsic resonance of mathematics postulates that "it is based on the assumption that, due to the nature of mathematics, Mathematics Education can safeguard democratic interests and values" (Skovsmose & Valero, 2012a, p. 5). In this context, mathematics plays a central role in social development, as its teaching and learning per se are consistent with the achievement of democratic ends since they are powerful and empower those who learn them. Thus, the panorama has been addressed in great depth in mathematics education research.

On the other hand, the thesis of the intrinsic dissonance of mathematics alludes to the power of mathematics and Mathematics Education to generate social injustice. Furthermore, it is established that at certain times mathematics can end up oppressing and/or negatively influencing society and can create risk structures that threaten humanity, due to its role in the construction of models that support decision making, mainly in social, political and economic matters. However, "the destructive power of mathematics has escaped the suspicions of citizens, scientists and social scientists" (Skovsmose & Valero, 2012a, p.7), which makes evident an imperative need to identify and describe risk situations that make evident the negative power of mathematics in societies.

Thus, in terms of D'Ambrosio (1994) in its contact with technology and science, mathematics has supported warmongering, insecurity, diseases and environmental deterioration. In this sense, assuming that mathematics today is very different from what it was only fifty years ago and that it is constantly developing without modifying pedagogical practices helps to hide the adverse impact of its use, as well as its social functions. On the other hand, assuming a critical and political stance allows Mathematics Education to identify the different roles and possible negative social functions of mathematics as society advances and becomes more complex in order to activate a process of political participation of the subjects (Valero et al., 2015).

The practices that shape dissonance are generally protected by the intrinsic empowerment of mathematics and school mathematics. The above constitutes a language for economic, technological and social societies, through the adaptation of powerful and universal mathematical rules in the form of mathematical models, which create formal systems, hierarchies, social organizations, institutions and regulations that go against the nature of a fair democratic state, in economic, technological and social matters.

In the same way, mathematics can be associated as a way of legitimizing economic and political arguments and in this way, it not only describes reality, but also configures risk situations in part of society. Thus, the analysis of the way in which mathematics is actually used and applied to understand social dynamics, opens the way to a critical juncture that deeply opposes the development of democratic values in society and that can be understood from the relationship that exists between mathematics and crisis.

Finally, the perspective of resonance and the intrinsic dissonance of mathematics represent opposite poles that entail assuming a flexible and dynamic position when considering that the relationship between Mathematics Education and Democracy is critical. Thus, the critical relationship conditions seeing mathematics as a social process in which the social frameworks in which it was created must be considered and not simply adorn it with the status of "queen of sciences", because it would be acknowledging that it is not neutral or apolitical (Skovsmose & Valero, 2012a).

To specify and understand the intrinsic dissonance of mathematics, Skovsmose (2019), assumes as equivalent the concepts of risk situation and critical situation, based on the notion and close reciprocity between crisis and criticism. Thus, a risk situation can be seen as a situation that has a critical potential. Then, these elements configure three relationships between mathematics and crisis, in which, mathematics can represent a crisis, mathematics can constitute a crisis and mathematics can format a crisis (Skovsmose, 2019, 2021).

The first relationship in which mathematics can represent a crisis is associated with views that highlight mathematical modeling (Borromeo, 2006; Kaiser & Sriraman, 2006) as a particular type of language in which a mathematical model provides a representation of a piece of reality. Thus, in general terms the mathematical model has its functionality in trying to serve as a "piece of that reality" to understand the risk situations of society, which in any case may not be accurate and condition or postulate direct and indirect socio-political repercussions, given that such reality will inevitably have more factors and variables that the model in trying to photocopy the situation, may provide a distorted image of it. Examples of this type are more visible in educational contexts where learning environments displace the political participation of subjects to focus on conceptualization (Valero, 2002; Orey & Rosa, 2007; Silva & Kato, 2012; Sarmiento, 2020).

On the other hand, mathematics may constitute a crisis, in the sense that mathematics itself could become an intrinsic part of a risky situation (Skovsmose, 2021). Thus, our society characterized by high technological

development provides that the different devices one has are highly configured through mathematical algorithms. Algorithms based on mathematics can provide underlying dynamics that cause crises. In such a case, mathematics is not representing a crisis, but becomes an essential ingredient of a crisis. The crisis might not exist without the mathematics. Such is the case with bank interest models and tax rates.

Finally, the third relationship states that mathematics can format a crisis. From this perspective, it is understood that mathematics can be part of the very formation of a crisis, so that mathematics is not only a descriptive tool, but also has a performative power. In other words, a mathematical reading of a crisis on the part of citizens, the media, or other organizations, provokes actions in a critical situation that can work or, on the contrary, be counterproductive; in both cases, mathematics shapes the dynamics of the crisis itself. As an example, we can cite the practices of cost overruns in the family basket in the context of the pandemic, without respecting the limits set by regulatory agencies or the needs of people in vulnerable conditions, due to the scarcity of certain products. The crisis, in this case, becomes a good business.

Given these relationships between mathematics and crisis, the concept of dissonance of mathematics represents only one side of the coin in which the relationship with democracy can be approached from the integration of social and political perspectives, where the role played by mathematics education in identifying the different possible social roles and functions of mathematics as society advances and becomes more complex becomes important.

Critical Situation: 'Trickle Down' as a Source of Social Injustice

A deeper understanding of the critical 'trickle-down' situation

Within the world economy and, in particular, the Colombian economy, the financial system plays a very important role, since it exchanges goods and services between savers and borrowers of funds, thanks to the mediation carried out by financial entities. For Cárdenas and Martínez (2015) in Colombia, projects have been developed that aim to strengthen the country's financial system, since its growth and development depend on good financing policies.

However, since a large part of the country's economy is made up of micro-economies, national policies aimed at them generate a negative impact, causing an imbalance in the national economy. Thus, in Colombia the banking system strengthens banking penetration, coverage and credit penetration policies, granting credit a relevant and leading role in the country's economy. However, in spite of the different recommendations made by international organizations, the interest and policies that have been implemented for the inclusion of new agents to the financial system is a situation that has not been able to change, since for example, the interest rates according to the amount, the size of the micro or small enterprise, the financial backing, the experience in the financial sector or what would be called the credit life of individuals and other elements, constitute obstacles for the rapid access to the system by the population that ends up excluded from it.

As a consequence of the above, it is recognized that in Colombia there is a significant percentage of the population considered to be in a state of poverty without the minimum conditions to access the financial system. Therefore, it is feasible to affirm that financial inclusion policies for the common people do not aim at channeling microcredit to poor sectors, nor at making the use of the formal banking system more flexible, nor at making financial services more affordable in general terms. On the contrary, it configures a set of practices that put users at economic risk and excludes a large part of the population.

This situation is exacerbated by the fact that extreme poverty in the territory is concentrated in strata 1 and 2, where citizens work in the informal sector, which is the result of the limited capacity of the legal productive sector to absorb a constantly growing labor supply (Peres, 2010). Thus, it is clear that the informal sector today constitutes the main source of employment and income for millions of people, who are forced to subsist in Colombian society from different areas of daily work. For us, this condition stems from policies that strengthen a series of social injustice and affect the population in terms of quality of life and opportunities for social growth.

Therefore, in this perspective in Colombia, as in other countries in the region, there is a population: "whose access to traditional banking systems is limited or nonexistent by virtue of their socioeconomic status; that is, actors with low income levels, considered as unreliable customers by banks" (Mballa, 2017, p. 111). This situation preponderates a financial exclusion to people of greater social vulnerability, since it is evident that within the policy of some banks, it is indispensable that the citizen who wishes to acquire a credit has a credit life, has no reports in the irrigation centers, has supports that guarantee his indebtedness capacity, as well as certificates that accredit his source of income, among other aspects requirements that make the process take a considerable time and that is not a guarantee that the credit will be approved (Madera et al., 2019).

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These conditions exposed by the banks to people who do not have the minimum conditions or requirements to access a credit in a formal entity, lead them to make use of extra-banking credits such as the so-called *'gota a gota'* or 'pay per day' credits. Thus, informal credits predominate in the country's economy, because people resort more and more frequently to this modality, given that these informal credits are an intermediation activity carried out by non-specialized lenders, owners of the offered capital, who do not have the supervision or support of the State.

These arguments presented up to this point show that the 'drop by drop' loans or credits are an easy, fast option, without intermediary, that provides the necessary resources to satisfy immediate, basic or unforeseen needs, but at a high cost for the service provided.

Finally, it can be established that the need for immediate money without requirements has generated the rapid proliferation of informal 'drop-by-drop' credit providers, to the point that they go out to offer their services directly in areas where they know they can easily find their clients (areas of greater social vulnerability). In a situational tracking, it has become evident that the "loan sharks" are people who generally have cash assets ranging on average from $ 10,000,000 and upwards and engage in this modality as an easy way to profit without having to have resources that in a formal system are obligatory to declare and pay. Likewise, some of these people usually have a safe conduit to carry a firearm as a means of defense at any time, to the point of being used as a means of harassment for non-compliance with the agreed payments.

Operationality of a 'trickle-down' informal loan

In practice, it can be recognized that there is not a single procedure to make a *'gota a gota'* credit effective between the lender and the user. For the latter, the user is the natural person who requires the money to satisfy some need, but merchants who are owners of a formally established business and who are engaged in some commercial activity are also identified.

In all cases, the user establishes contact with the lender, and in this contact the user requests the amount required, which varies according to the user's activity. For individuals, some lenders provide up to three

million pesos, and in other cases for users of some commercial activity, they lend up to fifty million pesos. In all cases, the interest rate of the loan is agreed upon, as well as the time of the loan, which may be daily, weekly or monthly, and the methods of collection and the guarantees to be provided in case of default of payment by the user (in many cases this corresponds to a bill of exchange to support the debt, signed in blank).

In most *'gota a gota'* loans, interest rates range from 5% to 20% per day, and the faster you pay, the lower the interest rate. These values are proposed by the lenders who are the owners of the capital, and in most cases exceed the interest rates formally established for banks. Finally, when the user receives the requested money, the lender delivers an invoice as proof and a copy of a kind of checkbook, which is divided into the number of boxes, corresponding to the number of days that the credit will last. Each time the daily payment is made, the corresponding box is filled in and the original is kept by the lender.

In a first analysis, one of the most common values that users request from a lender will be considered. The value corresponds to $100,000, with the intention of paying it in 10 days. Here, the experience acquired and based on the user's need to acquire the credit, the lender traditionally offers a daily interest rate of 10% on the value of the credit, since it is necessary to obtain a high profit for such a small loan value. With the knowledge and well elaborated mathematical processes product of previous experience, the lender communicates in all cases the value of the daily installment to be paid, which in this case corresponds to $20,000 per day. With the information given by the lender and the conditions of the loan, we can establish some additional considerations that are expressed in table 1 below.

Table 1. *Description of credit values*

Day	Balance due	Interest balance due	Daily payment
1	$ 90.000	$ 90.000	$ 20.000
2	$ 80.000	$ 80.000	$ 20.000
3	$ 70.000	$ 70.000	$ 20.000
4	$ 60.000	$ 60.000	$ 20.000
5	$ 50.000	$ 50.000	$ 20.000
6	$ 40.000	$ 40.000	$ 20.000
7	$ 30.000	$ 30.000	$ 20.000
8	$ 20.000	$ 20.000	$ 20.000
9	$ 10.000	$ 10.000	$ 20.000
10	0	0	$ 20.000

Source: own elaboration

The payment of the daily installment corresponds to the payment of the principal and one tenth of the value of the interest. However, in some cases, when the user wishes to pay the agreed credit value before the stipulated time, he/she must do so by covering the remaining interest and principal, without any benefit for early payment. By considering the same value, where time and interest vary, we can establish some characteristics of such loans, as shown in Table 2 below.

Table 2. *Comparison of credit values*

Modality	Requested value	Daily interest	Term	Daily payment	Total interest payment	Total credit payment
Caso 1	$ 100.000	5%	10 días	$ 15.000	$ 50.000	$ 150.000
Caso 2	$ 100.000	5%	15 días	$ 11.666	$ 75.000	$ 175.000
Caso 3	$ 100.000	5%	30 días	$ 8.333	$ 150.000	$ 250.000
Caso 4	$ 100.000	10%	10 días	$ 20.000	$ 100.000	$ 200.000
Caso 5	$ 100.000	10%	15 días	$ 16.666	$ 150.000	$ 250.000
Caso 6	$ 100.000	10%	30 días	$ 13.333	$ 300.000	$ 400.000
Caso 7	$ 100.000	15%	10 días	$ 25.000	$ 150.000	$ 250.000
Caso 8	$ 100.000	15%	15 días	$ 21.666	$ 225.000	$ 325.000
Caso 9	$ 100.000	15%	30 días	$ 18.333	$ 450.000	$ 550.000

Source: own elaboration

It should be noted that this form of credit is well managed by the lenders, since in the end they are the ones who impose the value of the daily interest on the needs of the people (different cases). Thus, if the same payment term is maintained, but the interest rate is modified, it is evident that the total interest payment is higher on the higher daily interest rate. However, users, when considering taking a 'trickle-down' loan, in the first place, the factor that determines their choice corresponds to the value of the daily installment expressed in the maximum time. Thus, when choosing the time between 10, 15 and 30 days, the tendency will always be for the maximum term because the daily installment will be lower in these cases, but it is there where it is not considered that it will be the highest value in interest payments that will exceed 100% of the value of the credit, which causes a negative deepening in the financial situations of people, because they must pay a high value in the total interest.

What about the risk situation and mathematics?

Our societies are permeated by an accumulation of material and social conditions that condition various problems. Thus, the social and economic needs of citizens represent daily situations that deserve particular attention by democratic states. In our case, according to figures from the National Administrative Department of Statistics (DANE), in the year 2021, 39.3% of the population in Colombia was living in poverty, that is, although there was a decrease of 3.2 percentage points (pp) compared to the figure for 2020 (42.5%), the data show a critical outlook in the development of the country, generating greater social inequality among citizens.

With the above, it is clear that these conditions of social inequality widen the unemployment gap and in many cases exacerbate insecurity in society. Thus, the solution of some emerging needs of this population requires immediate attention from the financial system that allows them, under flexible conditions, to have access to credit at low interest rates, in order to meet these needs. However, as has been discussed, the demands and requirements of the legally constituted banks do not contribute to the solution of the critical situation exposed, which on the contrary creates and deepens a greater crisis among citizens who acquire monetary commitments in an illegal system such as the 'drop by drop' credits.

Now, the critical situation is aggravated to the extent that the so-called lenders are meticulous connoisseurs of the needs of others and know the great dividends generated by state prohibitions. They profit from that scarcity, and inopportunity and configure a springboard towards personal economic enrichment, since in this case, as Skovsmose (2021) expresses it, mathematics is assumed as a performative device because, on the one hand, it accelerates the illegal growth of this type of informal credit system, by providing high dividends for the excessive use of interest rates of the agreed credits.

For this purpose, lenders establish in an articulated manner and in their favor, the different options they can offer users in terms of interest rates, times and amounts that can configure a 'drop by drop' credit. Their expertise in the management of daily and in other cases monthly interest rates (supported by the concepts of percentage) give them the possibility to enter into a game of sensitivities resulting from the urgent needs of people, leading them to be victims of deception produced through mathematically based proposals or speeches (Sanchez, 2014) used by them. Thus, we could mention in terms of (Stephan et al., 2021) that the socio-political awareness developed by lenders, leads them to understand the negative impact that mathematical decisions (proposed interests) have on groups of people who acquire the credits 'drop by drop', regardless of the fact that their economy is deepened.

Similarly, mathematics has become a strong support for arguments in decision making in society (Skovsmose, 1999). However, these arguments do not always lead to ethical practices, this is evidenced in the opportunity that lenders claim to offer to citizens through *'gota a gota'* credits, in the absence of a flexible financial system by the Colombian state for this type of population. It is clear then, that the mathematics that serve as a tool disguised as a solution to this critical situation, that is, is used in a negative way by the lenders reflecting in their dishonest, intransigent and insensitive practices in front of a social situation that a great part of the Colombian society lives.

On the other hand, in terms of the users, seeing the *'gota a gota'* credit as an important tool that households have to protect themselves from economic cycles and being one of the ways to channel resources towards investment projects or satisfaction of needs, makes them end up paying a usury rate equivalent to 15% per day for the value acquired, thus paying up to 5 times the value of the debt, which does not solve a financial problem, on the contrary increases it, generating indebtedness over indebtedness.

The reality of low-income citizens, their characteristics, their level of education, their material conditions, alienates them to enter into a macabre informal system, where many times the urgency of money does not allow them to have a clear picture of the debt they are acquiring, because in principle they are necessarily fixed in that the daily installment is modest to their income to be able to pay it, leaving aside the high values in the interest of the credit. This leads us to think about the need to retake Freire's (2000) ideas when he invites us to develop a critical conscience in terms of "learning to perceive the social, political and economic contradictions and to act against the oppressive elements of reality" (p. 35).

Finally, 'trickle-down' credits, their characteristics, implications and actors are the product of a vulnerable human condition that configures a critical situation, for in Ernest's (2010) terms it is that situation with a tipping point where conditions tend to deteriorate. Thus, without thoughtful and constant attention by the Colombian state, such conditions of social and economic vulnerability on the part of the population will increase the excessive use of informal credit systems such as 'gota a gota'. At the same time, the mathematics used by the actors in this crisis situation negatively shape the conditions in the informal system, provoking injustices, threats and other conditions that deteriorate the human condition.

What do mathematics educators do about this?

Rethinking the teaching of mathematics, this expression is used by researchers and teachers who are located in sociocultural and sociopolitical perspectives of Mathematics Education when they assume that students are political subjects and that mathematics is not neutral (Valero, 2012). In practice, this rethinking of teaching has its focus on the design of learning environments and classroom management considering the interests and social needs of political subjects; this includes the possibility of thinking about the transformation of the living conditions of marginalized populations or in a state of social vulnerability from the classroom, but not limited to them.

There are some references in the literature on the situation presented in this paper. Valero (2012) as a result of the housing crisis suffered by a student and his family, the teacher initiates a learning environment to understand the functioning of mortgage loans and manage agreements that would allow in the future the possibility of accessing with greater guarantee to the right to housing. Learning environments as a support for the development of mathematical literacy and democratic competence, some have been designed related to financial education or other aspects.

Alvis & Olmos (2022), with the purpose of promoting critical thinking in elementary school students, present the management of an environment related to the cost of water supply service in households. In Sarmiento (2020), a critical modeling learning environment is shown, where students see the need to analyze the profitability of growing two different products as a tool for their parents to decide which crop is more convenient. Similarly, in Alvis (2019), it is evidenced how economic environments are recognized as sources of mathematical problems by students.

Conclusions

Both the thesis of resonance and that of the intrinsic dissonance of mathematics in the framework of the relationship between Mathematics Education and democracy are complex, given that they are extremes that shape the views that are woven into the role of mathematics in society from a political dimension. In that sense, as Gonzáles (2017) puts it, accepting the resonance thesis seems simpler, even if it generates some distrust, but accepting dissonance implies a hostile and perhaps excessively pessimistic gap regarding the relationship between mathematics and society.

Therefore, it is of great importance as stated by Valero (2017), to recognize not only the positive effects of mathematics in the construction of welfare and progress, but also in the generation of destruction and risks for human beings and society. Therefore, even when it is overwhelming the recognition in the field of mathematical research the formative power of mathematics in the development of a democratic society, seen in the discourse that appears in some curricular reforms, in the manifest interests of educators and researchers, however, this is not the case of the destructive and hostile power that mathematics can have in society. Although there is widespread evidence of negative influence, it is not visible or comprehensible in the eyes of citizens.

Evidencing the informal credit 'drop by drop' as a risky situation where mathematics operates as an instrument of oppression, models a worrying social condition, loaded with vices, injustices, displacements, it is preponderant in the need to see the different forms of participation that citizens make with mathematics in favor of some particular interests. In this sense, mathematics is deeply intertwined in the fabrication of facts of social injustice (Ravn & Skovsmose, 2019), identified in this case with lenders, who act consciously and devoid of any social or legal control, in the generation of premeditated and urgent actions by low-income citizens.

Thus, it is necessary to establish processes that consider the political and ideological nature of mathematics and mathematics education as a social activity, where the potential to contribute to the development of democratic forces in society arises from a combination of factors such as: who is engaged in the practices of mathematics education, whose purposes the practices serve, what objectives they pursue, when and where they occur, and why they are executed.

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Endnotes:

1   According to Law 142 of 1994, socioeconomic stratification is the classification of residential properties in a place, in order to organize utility rates. Socioeconomic strata 1 and 2 generally receive state subsidies.