

## Cinema, Mathematics Education and Exclusions/inclusions: possible connections

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**Abstract:** This article aims to discuss the possible connections among Cinema, mathematics education and exclusion/inclusion (transphobia) that can be experienced in mathematics classes. Thus, it highlights Cinema as a popular cultural and pedagogical technology, currently through streaming. In addition, it dialogues with the possible crossings, interweaving and connections with the critical, political and social dimensions of educating through mathematics, so that these cinematographic products can contribute to the planning of mathematics lessons. In this way, we focus mainly on transphobia as a theme of exclusion/inclusion and reveal pedagogical connections that can be articulated in the mathematics classroom, for example, the debate about the idea of transformation, coming from and interrelated to the prefix *trans* (from transgender, transsexual, and that refers to the way of being transvestite), in interrelation with the concept of geometric transformation, aiming to constitute/understand the social responsibility and the political *hexis* that we must discuss/problematicize in educational spaces.

**Keywords:** Movies. Series. Transphobia. Geometric Transformations.

### Cine, Educación Matemática y Exclusiones/inclusiones: posibles conexiones

**Resumen:** Este artículo busca discutir las posibles conexiones entre el cine, la educación matemática y la exclusión/inclusión (transfobia) que se pueden experimentar en las clases de matemáticas. Destaca el Cine como tecnología cultural y pedagógica, actualmente vía *streaming*. Además, dialoga con los posibles cruces, entrelazamientos y conexiones con las dimensiones críticas, políticas y sociales de educar con las matemáticas, para que productos cinematográficos puedan contribuir a la planificación de las clases de matemáticas. Con esto, nos enfocamos en la transfobia como tema de exclusión/inclusión y revelamos conexiones pedagógicas que se pueden articular en la clase de matemáticas, por ejemplo, el debate sobre la idea de transformación, originada e interrelacionada con el prefijo *trans* (transgéneros, transexuales y que trata sobre el modo de ser travesti), en interrelación con el concepto de transformación geométrica, con el objetivo de constituir/comprender la responsabilidad social y los ejes políticos que debemos discutir/problematicizar en los espacios educativos.

**Palabras clave:** Películas. Serie. Transfobia. Transformaciones Geométricas.

### Cinema, Educação Matemática e Exclusões/inclusões: possíveis conexões

**Resumo:** Esse artigo tem por objetivo discutir as possíveis conexões entre Cinema, educação matemática e a exclusão/inclusão (transfobia) que podem ser experienciadas em aulas de matemática. Assim, evidencia o Cinema como tecnologia cultural e pedagógica, atualmente, via *streaming*. Ademais, dialoga com os atravessamentos, entrelaçamentos e conexões possíveis com as dimensões crítica, política e social do educar pela matemática, para que esses produtos cinematográficos possam contribuir no planejamento de aulas de matemática. Com isso, nos detemos à transfobia como temática de exclusão/inclusão e revelamos conexões pedagógicas



que podem ser articuladas na aula de matemática, por exemplo, o debate sobre a ideia de transformação, proveniente e inter-relacionada ao prefixo *trans* (de transgêneros, transexuais e que versa sobre o modo de ser travesti), em inter-relação com o conceito de transformação geométrica, objetivando constituir/compreender a responsabilidade social e a *héxis* política que devemos discutir/problematizar em espaços educativos.

**Palavras-chave:** Filmes. Séries. Transfobia. Transformações Geométricas.

## 1 Our teaser/trailer

As we have been working with mathematics education and Digital Technologies (DT) for many years, we have reached a moment in our lives when, quickly and intensely, our educational practices were totally encompassed by DT, once we were taken by the Covid-19 pandemic. This pandemic changed our lives, including our academic lives, and made us reflect about the situation worldwide, especially in Brazil. Thus, the pandemic also created a new research agenda in mathematics education (Borba, 2021).

The research on the role of DT in this period was, on the one hand, fundamental to maintain the exercise of research in such a specific moment, even if the educational practices were often developed in a precarious way. On the other hand, it opened questions that the technology itself and its access triggered and that were invisible, such as the social inequalities imputed to society and that, sometimes, in the recent past, passed "in blank", as well as, the way of mass conduction to false news, made possible by DT.

Our movement, as researchers privileged to be able to maintain social distance during the pandemic (while countless people could not, due to their social function, family and personal relationships or due to their economic situation), made us (re)create and explore more intensely activities that would free us, even if temporarily, from a psychological ecstasy of sadness and affliction in the face of the moment lived. Meanwhile, we were entangled by the experimentation of technological culture through streaming, which, according to Leite (2020, n/p, author's emphasis), is

the transmission, *in real time*, of audio and video data from a server to a device — such as a computer, cell phone or smart TV [...] Generally, the term streaming is accompanied by the words *service* or *platform*, since it has become popular for companies that offer video (movies, series, documentaries) or audio (music, podcasts) to be consumed in real time by customers.

Beyond what we glimpsed, by the official and reliable sources of information, that is, the death rate in increasing movement, the barbarities against science, the negationism, the difficulties of survival, the impossibilities of education and several other irrational forms of public manifestation and disdain, we found a refuge, a crack, an escape crack in the movies via streaming. However, it was not an escape crack, a no-front crack, on the contrary, it was a space for reflection and possible pedagogical action, counting on the recognition of the potential of that technological resource (Cinema via streaming) that was experienced, with another look, in that difficult moment.

Situations like the one we witnessed in the media, especially via streaming, such as that of George Floyd (BBC News, 2020), for example, who suffered a typically racist crime, mobilized us and made us look for other ways of thinking about issues as important as racism. In this sense, the crime that occurred mobilized the world in terms of protests, precisely potentiated by the existence of the internet and all the technological apparatus that supports it,

but generated in us a subjective movement that turned intensely, and mainly, to films and series of this nature, on streaming platforms.

With these movements of indignation and, at the same time, with these cracks of apprehension and reflection, regarding the social injustices, aggravated by the pandemic, was that possible investigative questions emerged between Cinema, mathematics education and exclusions/inclusions of distinct natures.

It was in the meantime that our readings led us to study Cinema and to assume this DT as a cultural technology and as a possibility of change in the ways of seeing, thinking and experiencing the world, its nuances and diversities. In this sense, the articulation, by means of communication and information, in which the world finds itself, advances in a technologically continuous way, but which also suggests the need for a constant debate regarding democracy, citizenship, and social justice in face of the technological environment, as conditions for the person who is a member of a state to obtain them in their fullness. We advocate that people need to be in constant enjoyment of rights that allow them to participate in active political life, which nowadays also becomes technological, however, under the deep awareness of their responsibilities and duties. However, there is still evidence of the absence of social and political conditions for this, particularly in cases arising from discrimination, prejudice, manipulation, or "cognitive dissonance," the latter concept discussed by Festinger (1957).

In this way, highlighting the possibilities that are supported in the DT, such as Cinema, in relation to social responsibility in terms of mathematics education (Rosa, 2022b) and in terms of political *hexis* as disposition to, involving choice (to qualify politics as a process of freedom (Rosa, 2022a)) are paths that we want to go through. Thus, we want to cross the experience with Cinema, with mathematics education and with the debate about different social exclusions/inclusions in order to investigate possible articulations that will contribute precisely to the understanding/constitution of social responsibility and political *hexis*.

Our guiding question, then, presents itself as follows:

*“What possible connections between Cinema, mathematics education and exclusion/inclusion issues can be experienced in mathematics lessons in order to contribute to the understanding/constitution of social responsibility and political hexis?”*

To this end, we discuss in this article aspects of Cinema in education, our conception of mathematics education and theoretical perspectives of exclusion/inclusion from Social Sciences and Critical Mathematics Education. Furthermore, we analyze data produced in an edition of the Post-graduation level course "Macro/micro Exclusions/inclusions in Mathematics Education with Digital Technologies", taught in 2022 in the modality of Emergency Remote Teaching (ERT), during the pandemic. The subjects were based on movies and series episodes, as well as on texts about exclusion/inclusion themes related to the movies chosen by the professor. Meanwhile, the participating teachers analyzed scenes chosen by them based on the texts and produced mathematics lesson plans on the discussed themes.

Thus, in this article, we discuss specifically the transphobia theme in order to present the possibilities of connections between Cinema, mathematics education and issues related to exclusions/inclusions of a teacher, her analysis of the chosen scenes and her lesson plan. To this end, we theoretically discuss Cinema in education, mathematics education, and exclusions/inclusions in order to address the possible connections between these perspectives.

## **2 Cinema — a cultural and pedagogical technology**

To begin this section, let's discuss cinema. But, what is it, Cinema? In what ways are

theorists working Cinema with education? In this sense, first, we introduce two researchers, specifically, Bordwell & Thompson (2013), who discuss cinema in a work called "The art of cinema: an introduction". These authors argue that films are so much a part of our lives that it would be hard to imagine our worlds without them. So they argue that we enjoy movies in theaters, but they are also in our homes, offices, cars, buses, planes, because we already carry them in our laptops and cell phones. All we have to do is press a button and the handheld computers already run the movies, or even with an internet connection, via Youtube or other streaming resources, the movies appear, are played, as if they were an enchantment, as if they were a magic trick for our pleasure.

For more than a hundred years, people have been trying to understand why this medium (Cinema) has captivated so much. Films communicate information and ideas and show us places and ways of life that are different, ways of life that we might otherwise never have any contact with (Bordwell & Thompson, 2013). Moreover, these authors claim that in films and with films there is something else at play. "Movies offer us ways of seeing and feeling things that we find deeply rewarding" (Bordwell & Thompson, 2013, p. 29). For example, when we watch a movie that touches us, we say "that movie is good!". This is because either the movie made us laugh (made us happy), or it made us cry (made us sad), or in some way it made us feel. Also, a film is said to be "good" when it makes us think. That is, it moves us, mobilizes us, puts us in a position of questioning, of problematizing, and this also touches us, passes through us in some way. Many times, this mobilization happens in a visceral way. That is, according to Boorstin (1990, p. 110 *apud* Gadanidis & Borba, 2008, p. 49) the visceral way of perceiving a scene, that is, the "visceral eye", allows you to feel your own emotions and not directly put yourself in the character's shoes. It is not feeling what the character feels. This, then, makes you directly experience it yourself, that is, it is your feelings (aroused by the film) that are mobilized by instinctive reactions of the brain, by a primitive, non-rational behavior that can then be explored rationally.

In terms of performance, then, the film touches us, stirs our feelings, and inserts us in a movement of identification, be it in a visual and rational way towards the character; be it in a way of feeling what the character feels, that is, putting yourself in their place; or even a movement of feeling for yourself, moving away from what the character experiences, but putting yourself in their situation and evidencing the very actions and reactions that each one would have. These movements happen, touching on issues that are extremely important to us and that often we would never address them.

Films bring us experiences, they make us live those experiences, often driven by character stories, that we come to care about. In addition, a film can also develop an idea or explore visual qualities, sound textures and ways of seeing light, image, sound, soundtrack. It can involve us, captivate us. It often takes us on a journey, offering this experience that follows certain patterns and engages our minds and emotions (Bordwell & Thompson, 2013).

In terms of Cinema and education, that is, the experience lived with Cinema to educate or to educate oneself, we explore the idea of aesthetic experience, which is already discussed in the universe of mathematics education. Rosa & Pazuch (2014), Rosa (2015) and Rosa (2017) consider experience as the complexity of what is felt empirically, immersed in the body phenomenological dimension. That is, the complexity of what is given to perception as the primacy of knowledge (Merleau-Ponty, 1990). It is the experience itself, which through its objectification, allows actions, situations, and choices to be interpreted. This movement of interpretation is always at the limit of what is indecipherable, inexpressible, incomparable, and immeasurable. However, experience becomes the expression of what is lived, that is, of what

can be described, with words that bring with them historicity, temporality, and spatiality. At the same time, these words bring together the incompleteness of what could be said, but is not. They bring the impossibility of encompassing in what is said what one wants to say. Experience, then, highlights what is given to perception, the configurations of the world, which are harmonically immersed in a panorama, in a background. Experience is about understanding what is lived, about the cognitive production that can happen when thinking about/with what is experienced in the established context. In terms of Cinema, the experience lived with the movie, with the film, strongly assumes the art, the color, the image, the movement, the angulation, the sound... in an aesthetic way. That is, everything that is linked to what plugs us, to what catches our attention, to what connects us, to our affections and aversions. Thus, according to Rosa (2021a, p. 15):

Currently, I understand that the aesthetic experience refers to "[...] the movement of our affections and aversions, how the world reaches the body in its sensorial surfaces" (EAGLETON, 1993, p.17) and this world, for me, is the one understood as life-world, that is, "[...] the ground of all experiences and horizon open to natural and historical-social occurrences and not as a place, space-time in which things are deposited" (BICUDO; ROSA, 2013, p. 62, footnote). That is, in terms of affections, the complexity of what is empirically felt with the life-world, in the dimension of bodily phenomenality and that is given to perception as a starting point of knowledge, makes it possible in mathematics education to assign meaning to the perceived, to reflect and move forward, to educate mathematically, but mainly through mathematics (ROSA, 2018).

Similarly, in terms of dislikes that run through us in different films in which we connect, Rosa (2021a, p.16) reveals her understanding of these dislikes in a way that inserts them into mathematical educational thinking:

[...] one must understand why, as well as what becomes a benefit through this aversion. It is necessary to promote aversion to what is not humanitarian. The aversion must be understood when the situation discriminates, excludes, subordinates. In this case, perhaps there is the defense of the elimination of categories, of stigmas, of labels. However, it is not possible to be innocent, [we need] to understand that today, in terms of sets, we must understand the importance of definition as an act of resistance, that is, you define the group, sometimes you raise flags, the same way you define a domain of a function, in the sense of giving it a condition of existence. Thus, it is important to give condition of existence to everyone in a democratic way, that is, in order to promote different possibilities of aesthetic experiences in mathematics education respecting the subjectivities, the culture and history of each one.

In other words, mathematics education with Cinema (not considering it as a physical space — a movie theater, but understanding it as a spatiality of perception — as the primacy of knowledge (Merleau-Ponty, 1990)), with movies, series, episodes and everything that encompasses them, reveals to us a movement of education through mathematics, allowing us movements and sensations of pleasure, but also movements and sensations of social and political aversion to prejudice, discrimination, injustice...

In critical terms, we agree with Henry Giroux (2011), an author who discusses Cinema in education. This author takes Paulo Freire's critical pedagogy as a basis and states that education has to be considered as something that goes far beyond schooling. He argues that education has to include the spaces, the practices, the discourses, the maps of meaning and affect produced by cultural and pedagogical technologies. These cultural and pedagogical

technologies are in our culture, in this broad culture, the mass culture. This culture, then, has become a great force or the main force in the production of subjectivities, of desires, of modes of identification (ways in which you identify with something or something, ways of feeling yourself being the other that, at that moment, is yourself (Rosa, 2008, 2022a)).

For Giroux (2011), pedagogy has become central to the discussion of subjectivities, also to the creation of particular modes of agency, that is, modes of acting with a will and sense of accomplishment, and in this case, public pedagogy represents a new cultural politics, which has film as a prominent medium. Pedagogy is public because you go to see a film and you can learn a lot from it. So as a form of public pedagogy, film combines entertainment and politics, often and mostly with a lot of humor (making people laugh, using nuances of comedy). Marvel movies, for example, which deal with superheroes and which by principle would highlight fiction, fantasy, the fantasy world itself, only, no longer limit themselves to this. They promote political aesthetic experiences, which bring in the experiences of their characters intrinsic psychological aspects. Nowadays, it has become profitable and common for these fictional hero movies to carry, for example, an environmental or planet-saving message, making us reflect. At the same time, these movies today also make us laugh. The movie "The Avengers" (2012) shows in several scenes a comic approach, while exploring the reflection on the destruction of the world.

In this sense, Cinema can and often does involve entertainment and politics. This involvement happens under a claim of memory, although this claim is in a contested way (Giroux, 2011). The contestation occurs because of cultural differences and the distinctly varied social and historical information enacted, i.e., the memory of "good guys" and "bad guys" related to an environmental issue, for example, carries with it a "weight" on the power relations established and transmitted officially and unofficially. This, then, puts in doubt who are, in fact, the "good guys" and the "bad guys".

Giroux (2011) also says that films do not only provide a pedagogical space that opens the possibility of interpretation as intervention. They do, however, make clear the need for forms of literacy that address deeply political and pedagogical issues, through which knowledge, practice, discourse, images, values, are constructed and come to be part of our lives. Often, it is through films that we can perceive certain issues that we live with today. There is a script and an entire cinematographic production implicit, sometimes in several subliminal messages, that we need to recognize, reflect upon, discuss, or, at least, question. Film, for this author, allows conversations that connect politics, personal experiences, and public life. It is, then, about broader social issues. Thus, film offers ways to rethink both the importance of political culture and public pedagogy. Both being central to what it means to make the political more pedagogical and the pedagogical more political.

Pires & Silva (2014), in turn, discuss why Cinema is a medium that plays an important role in the production of school knowledge. They come to discuss the didactic use of Cinema, which does not mean simply showing a movie in the classroom. What these authors call didactic use refers to Cinema as

“field of experimentation where knowledge is experienced” (MAUAD, 2009, p. 247). Instead of watching it as a form of mimicking social life, we propose a school "disorganization" of the images produced by reified cinema, so that we resume the ability to see and think in face of the growing inflation of images. [...] Second, it is also relevant to consider the development of a cultural learning that favors the expansion of a critical visual analysis of cinematographic films. Critical in the sense of calling attention to the cultural meanings produced by the films, the power

relations to which they would be articulated and, finally, what social practices they promote and produce (Pires & Silva, 2014, p. 611).

Saying that the field of experimentation is where knowledge is experienced is supported by the fact that each one can intentionally transport themselves (by living that experience with the film) to the film itself, bringing to consciousness what is perceived. Thus, instead of just watching the film as a mimicking, a reproduction of social life, Pires & Silva (2014) propose a school disorganization of the images produced by Cinema. This means going beyond, questioning, problematizing what appears, what is presented, what is exposed as synonymous with virility, power, or supremacy of a certain stereotype of an individual or nation. To retake critical thinking, in face of the growing inflation of images, becomes a prominent act in the educational action with Cinema. There are many images being played, continuously or from a certain perspective. But what does this image played with this luminosity or this angulation mean? To what end does what we perceive mean? What is the reason? What is the motive? What is behind this composition?

For example, there is a film called *Vertical Limit* (2000) in which the opening scene features a mountaineering family on a gigantic cliff, climbing it. The dialogues are about the musical repertoire the family is singing while climbing. A legitimate American repertoire, with typically stereotypical actors, under expectations of action and anxiety presented by the focus and blurring of the cliff, which reveals its exorbitant height and a leafy eagle that flies and grunts with intensity. But what is most thought-provoking? Actually, one needs to disorganize the images by questioning the reason for the scene with the eagle, for example. To problematize it, questioning the reason why it starts and ends the scene with the apex of adrenaline experienced in this introduction. We state this because, was the eagle there, which is a symbol of the United States of America (USA), by chance or coincidence? Or because the scene conveys virility and grandeur in making a very rational and courageous choice? Were both paintings presenting American culture as rational and courageous? Or is it simply coincidence, since the filming takes place in a canyon in the USA?

One way to understand the Cinema and exercise criticism over it is in how it is educationally experienced. Questioning the images, questioning the scenes, their composition, the characters' attitudes, and trying to identify why they act that way, is one way to experience Cinema educationally. Another way is to perform a critical visual analysis of the images and their sequencing in the films, in order to provoke media literacy, glimpsing what is behind each choice of direction and editing. Pires & Silva (2014) highlight, then, the critical positioning in order to draw attention, mainly, to the cultural meanings produced.

We can glimpse a certain scene in which prejudice is implicit in the character's speech, gesture, and look, and this prejudice is presented because it is established in the context of the scenario in question. For example, it is possible to perceive the power relations that permeate the cinematographic work itself, whether they are structural or purposely placed as a way to problematize, question, and highlight what is experienced in everyday life. These relationships make up the intentions of the author, the screenwriter, the director, and the actors' own performance. They can be configured as questioning or can be articulated with each other and with the history, the culture, and the positioning of these people. In any case, the pedagogical action of disorganizing these images, of strangeness, of problematization, configures the educational action with Cinema, for questions such as: what would be the social practices that promoted the scene, identified as prejudice (even if gestural)? What social practices produce these power relations? How to position oneself in relation to these practices?

This critical view of Cinema is the view we defend as educational *praxis*, it is the position by which Cinema is understood as cultural, pedagogical and public technology, according to Giroux (2011). This cultural and public technology, at the present moment, seems to be amplified, since there is an interconnected cultural distribution, due to the internet and the digital format of films and series distributed through streaming. We consume, today, the Cinema produced by several cultures, in different places, because streaming brings together several platforms, which are accessed from our homes. That is, our homes have become our movie theaters.

It is evident, however, that the experience of being in the movie theater itself, as a *locus* of cinematographic reproduction, is qualitatively different from the experience of our home, due to the size of the screen, the sound intensity, and even the type and quantity of popcorn we consume. Because of this, it is not because we currently have the movie theater at home that we should give up the experience of the official movie theater, since the technological apparatus of the movie theater allows the intensity of the aesthetic experience lived to be amplified and, mainly, to be other, to be modified. It is a pleasurable and unique experience. Thus, it is not a matter of substitution, but of popularization of opportunities and experiences.

Especially with the pandemic, the educational issue of Cinema jumped into our eyes, since the experience in a movie theater was not necessary and the experience of the movie theater at home was possible. In this way, besides being a cultural and pedagogical technology, Cinema became evident to us, as a social context, as a *political technology*, since it required a practical action in favor of cultural freedom, freedom and critical reflection to the situation that was being experienced.

In theoretical terms, we consider Cinema, as a conception, as a *political technology*, because, according to Williams (2015), the action of producing and watching cinematographic products, is an art or craft, centered in the "practical arts", coming from the sense of science, but that is distinguished from knowledge (science) itself through its practice/application (technology). It has, in terms of products, that is, the movie theater, the projector, the movie, the film, and now the streaming itself, its residual sense (in logia) of its systematic treatment. It becomes, then, a technological medium, which assumes, according to Arendt (2002), its adjective "political", since, in our view, it also proposes the reflection of freedom, based on the plurality of people, having as its meaning their own freedom. Politics is, then, in between, it is done as a chance and space for freedom. This freedom is given by acting, by taking initiatives, and by the possibility of constituting "a new beginning". In other words, Cinema can become a practical and reflexive movement, supported by theory, in terms of production and analysis, that turns to the conscientization of collective liberties through the affections experienced in the intentional experience of scenes and performative acts.

Thus, we discuss how we theoretically understand the conception of Cinema, also via streaming, as a cultural, pedagogical and political Digital Technology (DT). This last idea, that of *political technology*, in the context of the cyberworld, profitably acquires the digital facet as a backdrop, given the libertarian movements, of awareness and democracy that spread in the networks. Although this occurs, we recognize that there are also counter movements, of political disputes, which sometimes preach the dismantling of democracy using democracy itself to support their claim. Still, we position ourselves from the perspective of our understanding of the experience with DT based on media literacy as a purpose. Therefore, we emphasize our critical position in front of all the situations that emerge. Thus, to analyze possible connections between cinema and mathematics education, we must first discuss our understanding of mathematics education and present our critical, social, and political biases as fluid and dynamic



interweavings of these at the core of this field (mathematics education).

### 3 Mathematics Education — advocating a mathematics with lower case

We understand mathematics education as a field that studies, investigates, and experiences aspects that involve both educating oneself mathematically and educating oneself through mathematics (Rosa, 2008, 2010, 2015, 2018, 2022a, 2022b). Educating oneself mathematically refers to the act of understanding the techniques, the mechanics, of calculation, of solving, of certain uses of mathematical tools, of certain mathematical objects, so that one can think in the world. So, teaching and learning, as ways to proceed mathematically, choosing the appropriate mathematical object for a given type of problem, correctly performing the handling of all mathematical tools, are, respectively, educating and educating oneself mathematically. Therefore, learning to read (Freire, 2000) and write critically the world through mathematical thinking is, in our view, the act of educating oneself through mathematics. Thus, going to a store that says that it allows an installment plan, and that the merchandise can be paid in five installments with no interest in relation to the cash value, and understanding that it is not "with no interest", because the interest rate is already included in the purchase price, becomes a specific example of this act of educating oneself mathematically. That is, it is not enough to make the correct calculation, but to go beyond. This implies that a cash purchase at this store means anticipating the amount with interest in five times at the time of purchase.

Educating through mathematics means collaborating with personal and collective experience. Mathematics education is a field that is also woven with affective aspects that are pertinent to each person's way of being, with linguistic components, with sociocultural components, and that focuses on the individual and collective common good (of cultural groups, families, tribes, societies, civilizations), with the need for survival and, more than that, transcendence.

In various socio-cultural contexts, the need for survival and transcendence are understood as a collective project. Thus, mathematics education is to help survive and, above all, to transcend in this world in which we live, in which we participate and are inserted in diversely experienced realities. Then, the field of mathematics education does not fail to meet, fundamentally, it does not fail (and should not fail) to respect the ethical principles of autonomy, integrity, beneficence, non-maleficence, and social justice, which are agreed upon by different cultural, social, and political groups, which are also part of the field itself.

Our critical view of thinking, of trying to relate, to compare, to measure, to spatialize, etc. underlies the very mathematical thinking allocated in the conception of mathematics education that we assume. This conception advocates for lowercase mathematics (Fiorentini & Oliveira, 2013; Rosa, 2017; Rosa & Bicudo, 2018), which is not inferior because it is written in lowercase, that is, it is not lesser, it is only aimed at all. A mathematics that allows understanding differences, understanding the value of the other.

Mathematics, or better, mathematics with a lower case (Fiorentini & Oliveira, 2013; Rosa & Giraldo, 2023) comes to transgress, to strange Mathematics (with a capital letter). This Mathematics (with a capital letter) is seen as disciplinary, powerful, unique and finished. It is synonymous with difficulty, of being for the few, that is, only for those who have the "gift". Thus, this "Mathematics" needs to be transgressed, overcome, not with the intention of abandoning it, despising it, but with the intention of placing it in a larger movement. It is important because it collaborates with different and important tools that are part of mathematical education. But, it needs to be transgressed because the education through mathematics is not limited to this mechanical, structured, disciplinary mathematics. Thus,

among other ways to strange Mathematics with a capital letter is to think of it with connections, with articulations, it is to transform it into a mathematics that makes sense, situated, that is, that acts for the critical reading and writing of the world, acting for the collective survival and transcendence.

#### 4 Exclusion/Inclusion — senses and meanings

Exclusion/inclusion: what is this concept? Why is it presented with a slash between the words exclusion and inclusion? Why don't we just talk about exclusion? Or don't we boil it down to a question of inclusion?

In this sense, we start with Wanderley (2001, p. 17-18, our emphasis) discussing exclusion, so that this author reveals that

from an epistemological point of view, the phenomenon of exclusion is so vast that it is almost impossible to delimit it. Taking a "western" cut, one could say that *"excluded people are all those who are rejected from our material or symbolic markets, from our values"* (Xiberras, 1993:21). In fact, there are values and representations of the world that end up excluding people. The *excluded are not simply rejected physically, geographically or materially, not only from the market and its exchanges, but from all spiritual riches, their values are not recognized, that is, there is also a cultural exclusion.*

Wanderley (2001) deals with the phenomenon of exclusion from an epistemological point of view, stating that the excluded are not only linked to geographic or material exclusion, as, for example, in the absence of access to digital technology, but are also linked to the absence of recognition of knowledge, of values, and of the "I" itself. That is, there is also cultural exclusion, as, for example, in Brazil, the exclusion of people whose religion is of African origin. They are excluded, rejected, conditioned to an (im)placed stigma, as if their religion was "something of the devil", "of the demon", since, beforehand, if it is of the "devil", "of the demon", culturally, it is already ingrained in the minds of society as being something bad, evil, that is, something that is no good. This political discourse seeks to stipulate a division between the "us" and the "rest". The "us" as the dominant set, which represents the people of a certain doctrine, which is defined as right, as correct, and the "rest" is what is outside this set. Then the "others", the outsiders, are those who are excluded.

It is important to understand that both people whose material resources often do not allow them to survive, and people who are culturally presented as being outside the dominant set, are part of the group that is outside, that is, the rest, the excluded ones.

Sawaia (2001) also discusses this relationship of what is inside with what is outside the dominant set, deals with what is said as "us" and as "others," stating that issues of inclusion are only necessary because exclusion has already occurred. Thus,

what we want to emphasize *by opting for the dialectical expression exclusion/inclusion* is to mark that both are not categories in themselves, whose meaning is given by specific invariant qualities contained in each of the terms, but that *they are of the same substance and form an inseparable pair*, which is constituted in the relationship itself. The dynamics between them demonstrate the capacity of a society to exist as a system. This line of reasoning allows us to conclude, paraphrasing Castel (1998), that *the exclusion/inclusion dialectic is the fundamental aporia on which our society experiences the "enigma of its cohesion and tries to conjure up the risks of its fracture"* (Sawaia, 2001, p. 107-108, our emphasis).

For the author, then, the expression exclusion/inclusion is a dialectical expression because inclusion does not exist if there is no previous occurrence of exclusion. In this way, when we are faced with the examples presented, that is, when we sympathize with the absence of material conditions of existence or even the cultural exclusion of individuals or groups, we need, before we want to include the excluded people, as a gesture of empathy, to ask ourselves: where do we want to include them? Include exactly where? Include them in a universe already conditioned by pre-defined power relations? Would it be this? To include in a universe already conditioned by a dominant culture? Yet, in this process of inclusion, do we wish to continue conditioning these people to practices, values, attitudes pre-determined by the dominant group? That is, the group that is inside? The "us"?

In this sense, it is worth pointing out that the act of including someone means, in fact, that there has already been an exclusion. So, our research and our political and social stance in mathematics education do not search for inclusion, but for non-exclusion. The fact of respecting, welcoming, and not thinking that there is a supposed "right" of someone to accept or not accept another person or some situation, already mobilizes the conception that we defend. Non-exclusion refers to a process of being educated through mathematics, that is, a process in which the ways of thinking mathematically provide conditions to understand/constitute social responsibility and political *hexis* as citizens. The social responsibility of each person is understood, according to Rosa (2022b, p.30), as "the possibility to predict the effects of their behavior in relation to society, in view of its structures or conditions, and correct them [...] in educational terms, specifically, mathematical education". That is, we need to educationally, in this case, educationally through mathematics, being based on mathematical thinking, open possibilities of social awareness, of predicting the effects of our behavior and correcting them as a society. Therefore, so that exclusion does not occur, we initially seek to develop non-exclusive, non-excluding activities, activities that are not restricted to a stereotype of student and/or to a certain way of thinking what mathematics is and how to produce it (Rosa & Giraldo, 2023). Activities that remember the social and cultural specificities of the students in terms of location, spatialization, measurement, comparison, relation, etc. Also, we seek for activities that instigate critical reflection on these social issues, in order to try to mobilize the *political hexis* (Rosa, 2021b, 2022a) of the students. In this sense, *political hexis* is understood by Rosa (2022a, p. 219) as disposition (*hexis*) or "state of the soul that makes us qualify in such and such a way" that is, to possess a disposition, involving choice, to qualify politics, a disposition to politics itself". Thus, *political hexis* can be considered as a prominent factor in democracy, as agency, as a way to give voice to the excluded. The *political hexis*, then, becomes the disposition itself, that is, a posture that assumes as premise the fluid political mobilization, the equity in what refers to political participation itself, and, consequently, freedom, respect, and acceptance of differences.

Sawaia (2001) still intones that the idea of social inclusion is nothing more than the process of disciplining the excluded. Therefore, a process of social control and maintenance of order in social inequality. She gives an example, that is, the Favela Tour, an example whose particularities can be understood in Viator (2022). Sawaia (2001) points out that slum tourism creates transportation to bring tourists, mainly foreigners, to visit the slums. This allows the slum to maintain itself and consequently receive financial resources, which would be an interesting form of inclusion. However, it draws attention to something important and sometimes unnoticed. The financial inclusion movement exploits and exposes a suffering reality, whereby the suffering of "others" becomes pleasurable in the eyes of the tourist. In other words, it is interesting to find out how these "slum dweller" people live, how they inhabit a very large number of people in a single residence, which could perhaps be called "home" by the

tourists. So, we ask: what is this reality? How do they reinvent themselves with little money? So, is this what we call tourism?

Tourism itself becomes an action of inclusion, of financial and social benefit, at the same time that it is not perceived that this inclusion or these benefits only emerge because exclusion was already present. The lack of public policies. The lack of housing conditions, the lack of even basic sanitation, these are shortcomings that already existed before the Slum Tour movement.

In this sense, thinking about these issues in the mathematics classroom, for us, becomes paramount. It is not enough to calculate how much money can be raised with a venture such as the Slum Tour, but to raise the underlying issues, to go beyond, to transpose the problems (Rosa & Giraldo, 2023). We need to stop and think about these issues in order to support possibilities and investigate the action of exclusion with mathematical contributions (financial education, statistics, analysis of projections, probabilities, etc.).

Furthermore, we ground our critique of inclusion *per se* through what Skovsmose (2019, p.71) argues, as this author states that inclusion is a contested concept, questioning "inclusion in what? [...] of whom?". For him, this inclusion may be excluding rather than including, in the sense of excluding those who become the target of discourses such as "who is 'normal' and who is not", as if there is, in fact, a set of "normal" people. So, homosexual people, transsexuals, people with disabilities, for example, are said, are called, many times, not normal people, or even, with more intensity, abnormal.

This attitude is configured as homophobia and/or transphobia, or in general LGBTQIA+phobia. Homophobia, in particular, understood in this study also in an expanded way (because here it covers what lesbian women [lesbophobia] and bisexual people suffer), is considered as stated by Toledo (2018, p. 35), that is, "[... ] the term homophobia has been commonly employed in reference to a set of negative emotions (dislike, contempt, hatred, distrust, discomfort, or fear) toward homosexual people" and this means that treating them as abnormal is part of this bundle of negative emotions. Transphobia, in turn, is considered in this article from what Podestá (2019, p.363) states:

The term transphobia, through its translation of the original Anglo-Saxon term *transphobia*, is a concept on the rise to designate and analyze the multiple violences against transgender people — people who experience transgeneracy. Typically, the term can be evoked to represent a heterogeneous group of specific violences that affect transsexual women, transvestites, trans men, non-binary people, and others. Conceptually, transphobia — naturalized and normalizing social sanction against trans people — has a relationship with the abjection and stigmatization unfolded from the phenomenon of transgeneracy, in the context of a gender norm dependent on cisgeneracy. The importance of the concept can be analyzed in relation to the growing autonomization of the trans movement in contemporary Brazil and the emergence of the field of transgender studies. The concept, in turn, can refer to other concepts for theoretical treatment of violence, such as homophobia and genocide.

That is, analogously, the violence of being considered not normal, makes up the abjection and stigmatization of the human being. This implies that we, as mathematics educators, should assume a position in front of this violence, these negative emotions (when we want to be restrained in relation to this issue), these atrocities, cruelties, inhumanities, expressed verbally and/or physically.

These questions, then, permeate the idea of what is training, education, with social

responsibility and political *hexis*, since this education also implies putting into suspicion the very concept of inclusion, that is, contesting it. Nevertheless, what do we want to include? Include where? Include in what is called normal? If inclusion is detached from exclusion as an amalgam, then, for example, are we advocating the lying gay cure, as if this were possible, in order for this person to be included?

Thus, we moved to research how to educate through mathematics in a non-excluding way, in order to understand that any inclusion is intertwined with a previous exclusion. In this sense, through Cinema as a cultural, pedagogical and political technology, we mobilized ourselves to experience it in order to seek connections of the experiences with Cinema, through the development of mathematics lesson plans of teachers in a post-graduation course. We then evidenced our performative methodological movements so that the possible connections between Cinema, mathematics education and exclusion/inclusion issues could emerge.

## 5 Methodological Movements: our chosen scenes

Our methodological movements are based on qualitative research, which is concerned with "deepening the understanding of a social group, an organization, an institution, a trajectory, etc." (Goldemberg, 2000, p. 14), and, in our case, is concerned with the understanding of groups of mathematics teachers in different moments of training. In the meantime, according to Rosa (2012, p. 234-235),

the use of Qualitative Research methodology in a given study, among other things, is linked to the researcher's choices. However, these are not simple choices, not just any choices, but those that depend on the experiences, beliefs and knowledge of this (ALVES, 1991) [...] [, from] their understanding of what education is, how knowledge is produced and what are the possible paths to pursue epistemological elements [...].

The choices of this study, then, are based on the understanding that mathematics education is a field that studies, investigates and experiences aspects that involve both educating oneself mathematically and educating oneself through mathematics. Thus, in this article, we analyze a mathematics lesson plan of a teacher participating in the second edition of a course of the Postgraduate Program in Mathematics Teaching (PPGEMAT) of the Federal University of Rio Grande do Sul, in the academic semester 2021-2. This course, whose title is "Macro/micro Exclusions/inclusions in Mathematics Education with Digital Technologies" has as objective precisely the discussion presented in its title, to discuss macro/micro exclusions/inclusions in mathematics education through DT (mainly, cinematographic products). It happens in the perspective of reading texts, analyzing cinematographic products, projecting math classes, working with Digital Technologies and producing video classes.

In this way, the themes of gender, homosexuality, transsexuality, senility, disability, empowerment, as well as racism, ageism, prejudice, discrimination, insult, slander and defamation (specifically promulgated by fake news), bullying and cyberbullying, for example, are discussed in this discipline. It assumes the analysis of film products based on scientific texts and the projection of mathematics lessons as an ongoing pedagogical practice in the discipline.

In this article, however, the data that will be presented are about a single plan prepared during the course of 2021-2 (January to May 2022) that occurred entirely at a distance in the ERT (Emergency Remote Teaching) model, during the pandemic: the plan was prepared by a participant in relation to the theme of the meeting called "Mathematics Education, Queer Theory and Gender Exclusion/inclusion — transphobia". Thus, after the distribution of the free and

informed consent form to the participants and their acceptance to participate in the research, we recorded all synchronous meetings in Microsoft Teams (communication platform used by UFRGS) and collected the asynchronous activities that consisted in analyzing a chosen scene (after watching the indicated movie product), based on the texts selected for reading by the participants, and producing a mathematics lesson plan. In this article we use the written productions of a participant, this productions were made as a product of the film analysis, as well as her lesson plan designed in the indicated meeting.

In order to investigate "*What possible connections between Cinema, mathematics education and exclusion/inclusion issues can be experienced in mathematics classes in order to contribute to the understanding/constitution of social responsibility and political hexis?*" we present the debate meeting, its objective, the date it took place, the cinematographic products indicated, the texts that served as analysis, the participant (by means of a pseudonym, which was chosen by her, with the condition of being a public person and with some social, cultural, artistic, scientific or intellectual contribution facing the debated theme), her lesson plan and, consequently, the analysis of the plan facing our guiding question.

## 6 Cinema, mathematics education and exclusion/inclusion issues: possible connections

We started with the presentation of the Week 8 meeting: 03/22/2022 — Mathematics Education, Queer Theory and Gender Exclusion/inclusion — transphobia, which made available the following film products that the course participants had to watch, choose one scene (at least) and analyze:

**Figure 1:** Pose (2018) — Season 1 - Love is the message



Pose, set in 1987, follows Blanca (MJ Rodriguez), an LGBTQ ball attendee who takes in some people marginalized by society, such as talented homeless dancer Damon (Ryan Jamaal Swain) and sex worker Angel (Indya Moore), who has fallen in love with a client. Centered on Blanca's life, this is a story of ballroom culture, the gay and trans community, the violent AIDS crisis, and the decline of capitalism. [...] The plot sensitively explores the experiences of LGBTQ people, especially trans people, delivering an exciting and little-seen storyline to the audience.

Season 1 — Episode 6 "Love is the message".

**Source:** Adoro Cinema (2020)

**Figure 2:** Meu Preço (2020)



Morena is a beautiful transvestite call girl who joins her transsexual friends for another night of routine and struggle for survival. However, when she encounters a new client, she brings her past to the surface in a violent and harrowing way."

**Source:** Meu Preço (2020)

The analyses of the chosen scenes were based on the following texts: Neto &

Barbosa & Giraldo (2018) that discuss the beliefs about mathematics teaching of two undergraduate students of Mathematics who participated as fellows in an extension project, which offered a course focused on pre-university education for LGBTQIA+ people living in Rio de Janeiro slums. The study shows that the experiences with this group of people led the participants to recognize that the traditional models of teaching do not contemplate the demands of building a school that breaks with the process of subordination and that it is necessary to deconstruct the idea of hierarchization of knowledge, promoting the appropriation of the school space by the students. Also, the text by Rosa (2021b) that discusses how mathematics education can help sustain the struggle of the LGBTQIA+ population in terms of resistance and survival, as a way to educate through mathematics, for the understanding/constitution of political *hexis*, facing respect, manifestation and emersion of gender subjectivities. The theoretical article presents the concept of political *hexis* in connection with Queer Theory, discusses the sex-gender system from a critical perspective and proposes a didactic-pedagogical reflection on binary numbers, in order to raise the understanding of the expansion of gender typologies in the world, in line with the respect for differences.

Thus, the participant *Jaqueline Gomes de Jesus*<sup>1</sup> who is a teacher from Rio de Janeiro, but is pursuing her Master's degree in Mathematics Teaching in Rio Grande Sul, chose this pseudonym for recognizing the importance of choice in the LGBTQIA+ milieu in her city. She currently works as a teacher in elementary school, but has already accumulated classroom experience for ten years. She then made the analysis of the film products and chose two scenes, in order to articulate the theme in her lesson plan, as presented in Chart 1.

**Chart 1:** Analysis of Teacher *Jaqueline's* Scenes and Lesson Plan

**POST-GRADUATE PROGRAM IN MATHEMATICS TEACHING**

**Discipline:** Macro/Micro Exclusions/Inclusions

**Teacher:** [REDACTED]

**Student:** [REDACTED]

**Meu Preço**

- Scene in which Morena goes to the hotel room with her brother.

**Pose**

- Scene in which Paty talks to her husband's "mistress" and discovers that she is a transsexual, and not believing it asks to see her sexual organ.

When we are introduced to a new person, a new piece of information, or a new context, we are always impacted in a positive or negative way. This is how it is with subjects we don't know, don't have much ownership of, and in some cases don't try to appropriate (or don't want to); and from this comes the lack of care we take in approaching certain issues, treating people we consider "different" from us, judging them, and even treating them with a lack of empathy.

According to APA's Dictionary of Psychology:

[...] understanding a person from their frame of reference rather than one's own, so as to vicariously experience their feelings, [the] perceptions, and [the] thoughts. Empathy does not itself involve motivation to help, although it can turn into consideration for the other or personal suffering, which can result in action. In psychotherapy, the therapist's empathy for the client can be a way to understand the client's cognitions, [the] affections, or [the] behaviors (2010, p. 335 *apud* Moitoso and Casagrande, 2017, p. 214).

<sup>1</sup> "Jaqueline is an activist of the black and LGBTQIA+ movement and a psychology professor. She was the first black trans woman to receive the Chiquinha Gonzaga medal, an award created by the Rio de Janeiro City Council with the purpose of honoring female personalities who stand out for democratic, humanitarian, artistic, and cultural causes. She is also the author of the book 'Transfeminism: Theories and Practices'" (Eller, 2021, n/p).

This lack of empathy is what most of the times happens when we don't put ourselves in the other person's place and/or we simply ignore the other person's reality and prefer to treat people with total indifference and judgments. This can be seen in the case of Morena who was treated several times with indifference by her mother and brother who beat her many times when he found her, and in the end could not make any judgment about her sister. In Paty's case, the betrayed wife, besides judging the woman her husband went out with for working in a drag queen nightclub, also does not accept when he says that she is a transsexual.

We notice that when the gender issue is addressed in a conversation or even in a classroom, it is still blocked when we move from talking between boys and girls or/and men and women. Sometimes this happens because we don't know about the subject, how to approach it, or because we don't care about such a discussion. In this context,

And it is in this scenario of debates and confrontations that it is necessary to show that it is not the physical and biological characteristics that establish the differences between women and men. In fact, it is not any physical or biological characteristic that determines any gender. That is, the discussion of gender permeates issues that go beyond a hegemonic, heteronormative, male and white position/imposition. (ROSA AND SANCHET, 2021, p. 8).

Having said that, the fact is that every day we need to pay more attention to such issues and be prepared for a discussion that does not fall into judgments or the use of pejorative terms, as we can observe in the scenes highlighted, since in Morena's case her brother did not accept her the way she is, but he also got involved with transsexuals. In Paty's case, the lack of information (and respect) made her treat her husband's mistress with indifference when she found out that she was transsexual. And we as teachers need to be aware of these issues (including us mathematics teachers). Thus,

We note that, already from the end of the 20th century, several researchers began to counter the common sense ideas that academic Mathematics is the only possible form of mathematical knowledge, and should therefore determine the ways in which Mathematics is taught at various levels, and that such knowledge is neutral, apolitical, and devoid of cultural context. (NETO; BARBOSA; GIRALDO, 2018, p.608).

Therefore, we as mathematics teachers also have to discuss these issues with our students in class and not consider ourselves as a field of exact sciences and that we don't need to work with such a subject, keeping us in a neutrality in relation to the context.

But for this we also need to keep ourselves informed and with property for such discussions, because it is not just talk for talk's sake or/and talk in an erroneous way. To this end, we can also appropriate mathematical content for insertion in this context. In this sense,

[...] it is important that mathematics education assumes its social responsibility, in order to put into discussion its own stance towards the maintenance of a heteronormative model of Mathematics class. Also, mathematics education needs to be estranged from any willingness to remain supposedly "neutral" with regard to the role of mathematics education in the face of issues of gender and sexuality. Therefore, we move on to the next session by bringing binarity into the debate from a mathematics classroom perspective (ROSA, 2021, p. 77).

The author further states that:

[...] Educating through Mathematics, that is, correlating mathematics itself to the understanding of gender, for example, discussing binarity, in our view, is a way of being queer, of being queer, and consequently, resisting. That is, taking this kind of discussion to the mathematics classroom is to demonstrate a political hexis and enable students to understand or even constitute their own hexis. (ROSA, 2021, p.84).

In light of the above, for the estrangement not to be classified as something merely mistaken and negative, we must appropriate concepts and contents that make us leave the comfort zone. That lead us to discussions with clarity, with context, empathy, and positions that show us not only our students but also our colleagues how important this place of speech, of struggle, and of resistance is for those who are considered strangers.

### Lesson Plan

Thinking about introducing the discussion of gender:

I would ask the students to look up the meaning of some words and answer some questions.

1. What does transformation mean?



2. In your life would you say you have gone through many transformations? Which ones?
3. What is the meaning of isometry? Would you say it is related to mathematics? What about outside of it?
4. What is the meaning of gender? Do you think this concept is linked to mathematics? Why or why not? And outside of it?

Next the students should choose 12 artists and then try to divide them into the color groups: purple, blue, white, and pink.

I would follow with some activities about geometric transformations that could continue the subject during the execution, trying to bring the reflection that even with different transformations that a person can go through, they is still a person; a human being that deserves to be treated with respect.

Source: Research Data

When investigating the possible connections between Cinema, mathematics education and exclusion/inclusion issues, we understand that the analysis of scenes and the lesson plan of teacher Jaqueline highlight apexes of the experiences of trans women and transvestites portrayed in cinematographic products and commonly perceived in everyday life. In both cases chosen by Jaqueline, "*Meu Preço* • Scene in which Morena goes to the hotel room with her brother. *Pose* • Scene in which Paty talks to her husband's "mistress" and discovers that she is transsexual, and not believing it asks to see her sexual organ", the exclusion/inclusion of transgender and transvestite people is evident, since, "excluded are all those who are rejected from our material or symbolic markets, from our values" (Xiberras, 1993, p. 21 apud Wanderley, 2001, p.17-18, our emphasis). Morena, a transvestite who ends up going to the motel with her own brother who does not recognize her and who physically assaulted her in her adolescence, registers the distancing between the two (to the point that her brother does not recognize her) after the family exclusion experienced by Morena. Also, Angel a trans woman who lives a romance with a married man and is required to present her sexual organ in order to "prove" that she is trans, mobilizes us to the structural exclusion existing in society. That is, while Angel was a woman lover, Paty considered the betrayal in one way, but upon discovering that Angel was trans, the non-acceptance (revealed by the requirement to demonstrate that Angel was *trans*) perfects the structural exclusion in the face of sexuality and gender. That is, structural adjectivation culminates in naturalized and normalizing social sanction against trans people and this has an intimate relationship with the abjection and stigmatization unfolded from the phenomenon of transgeneracy (Podestá, 2019).

In this sense, Jaqueline connects Cinema through the works about exclusion/inclusion to her math class. In her planning, then, Jaqueline starts with a discussion about transformation (1. *What does transformation mean?*) and this reveals her intentionality in what she wants to discuss in the math class. Discussing what transformation is pervades "the queer conception [that] carries with it the idea of transformation and this idea already assumes by itself a queer perspective, because the very "trans" of the word is a prefix that supports a situation or action that goes "beyond". That is, beyond to form is to transform, beyond to ascend is to transcend" (Rosa, 2021b, p. 77). At the same time, the transformation to be discussed assumes the geometric tenor in terms of geometric transformations, but, before, the teacher forwards this connection naturally, questioning their students in subjective terms (2. *In your life would you say you have gone through many transformations? Which ones?*). Then, she brings a research term related to geometric transformations, without delivering, revealing, informing its meaning, letting the students investigate it (3. *What is the meaning of isometry?*) and come to their conclusions (*Would you say that it has a relation with mathematics? And outside of it?*). In our view, Jaqueline proposes to discuss a subject common to mathematics and gender issues, that is, the prefix trans and the meaning of transformation, allowing herself to go beyond, articulating and provoking bridges of meaning between the themes (4. *What is the meaning of gender? Do you think this concept is linked to mathematics? Why? And outside of it?*) Jaqueline,

in our view, does the critical reading (Freire, 2000) and writing of the world, through mathematical thinking assumes a possible connection between gender identity (as this shows itself to the world) and the idea of geometric transformations, provoking the act of educating through mathematics. Jaqueline reveals that *"I would follow with some activities about geometric transformations that could continue the subject during the execution, trying to bring the reflection that even with different transformations that a person can go through, he or she is still a person; a human being that deserves to be treated with respect."* In other words, Jaqueline strange Mathematics with a capital letter by thinking it with connections, with articulations, transforming it into a mathematics that makes sense, that is, that acts for the critical reading and writing of the world. Thus, she bases the individual and collective survival and transcendence of transsexuals and transvestites, with their psychological (in the sense of resisting and going beyond what is (im)put on them by society) and corporeal (sometimes) transformations, in the mathematical thought of geometric transformations, because, by symmetry, translation, rotation, reflection and homothetia, for example, the figures are transformed, but they do not stop being figures.

Jaqueline attributes the lack of recognition of the human often to the absence of empathy (*This lack of empathy is what most often happens when we do not put ourselves in the place of the other and/or simply ignore the reality of the other and prefer to treat people with total indifference and judgments*) exemplifying this statement with the movie "Meu Preço" (*This can be seen in the case of Morena that was treated several times with indifference by her mother and brother who often beat her when he met her*) and showing the transphobia in the sense of violence suffered by Morena, since transphobia "[. ...] can refer to other concepts for theoretical treatment of violence" (Podestá, 2019, p. 363). In this sense, Jaqueline with Cinema and the reality experienced with the films, advances and, in terms of affect, manifests in her mathematics class the complexity of what is empirically felt with the life-world, enabling a mathematics education in which meaning is assigned to the perceived, that is reflected and advanced, that is educated mathematically, but, mainly, by mathematics (Rosa, 2021b, 2018).

In this sense, Jaqueline reveals that the *"fact is that every day we need to pay more attention to such issues and be prepared for a discussion that does not fall into judgments or the use of pejorative terms"* which, for us, focuses on the contribution of the analysis of film products for the understanding/constitution of her political *hexis* and with her planning for that of their students. Jaqueline with this statement, presents her disposition to (*hexis*), that is, her *"state of the soul that makes us qualify in such or such a way' the freedom of trans people, in the perspective that we all go through different transformations, going beyond, that is, Jaqueline manifests a disposition, involving choice, to qualify politics, a disposition to politics itself' involving and correlating mathematics to life. She states "we as teachers need to be attentive to these issues (including us mathematics teachers)"*, that is, we female teachers need to be attentive, show our disposition to democracy, as an agency, and to give voice to the excluded. She shows her stance that assumes as a premise fluid political mobilization, equity regarding political participation itself, and, consequently, freedom, respect, and welcome to differences, in this case, the diversity of *trans* and transvestite people.

Similarly, by indicating that *"we as mathematics teachers also have to discuss these issues with our students in the classroom and not consider ourselves as from the field of exact and that we do not need to work with such subject, keeping ourselves in a neutrality towards the context"*, Jaqueline presents us with the understanding/constitution of her social responsibility by foreseeing the effects of her behavior towards society in view of its structures or conditions, in this case, of facing the supposedly neutral mathematics discipline. It suggests the correction in educational terms, specifically mathematical education, of what is little or not

discussed in the mathematics classroom. Thus, based on mathematical thinking, it opens possibilities of social awareness towards the idea of transformation, and correlates the idea of "transforming oneself" to the concept of geometric transformations, whose effects can be discussed and reflected upon in favor of our behaviors, correcting them as a society, and not in a way that supposedly keeps them neutral because we are from the exact area.

Thus, the film products offered Jaqueline ways to rethink both the importance of political culture and public pedagogy in mathematical terms. Both (culture and pedagogy) being central to Jaqueline's designed lesson, which makes the political more pedagogical and the pedagogical more political.

## 7 Final Considerations

By asking "*What possible connections between Cinema, mathematics education and exclusion/inclusion issues can be experienced in mathematics classes in order to contribute to the understanding/constitution of social responsibility and political hexis?*", we conducted an investigation in front of a course whose participants were post-graduate mathematics teachers. In this course, the participants watched indicted films, read the suggested texts, chose specific scenes, analyzed them and designed mathematics lesson plans.

In the meantime, as an example of possible connections between Cinema, mathematics education, and exclusions/inclusions, we discuss the analysis and lesson plan of teacher Jaqueline, who presented connections, in terms of classroom debate, between the idea of transformation, coming from and interrelated to the prefix *trans*, from transgender, transsexual, and dealing with the way of being transvestite, and the concept of geometric transformation. The teacher makes and provokes connections of mathematical meaning with the transformations that people go through in life. These transformations of life, experienced by teacher Jaqueline with the cinematographic works, which were watched and analyzed by her, carry examples that are shown in the experience of Morena, the main character of the movie "Meu Preço" who is a transvestite and in the life of Angel, a trans woman character in the series Pose.

In this vein, we indicate that the connection/articulation created by teacher Jaqueline, whose mathematical foundation conceives and supports the transformations experienced by people and, in evidence, by transgender and transvestite people, by questioning the meaning of gender and the connection of this meaning to mathematics, is fruitful. More than that, it engages in the mathematics class a critical approach to discussing empathy, about humanity and equity, suggesting the contributions that such a class can bring to the understanding/constitution of social responsibility and political *hexis* of their students. Cinema, mathematics education and issues of exclusion/inclusion can and should be explored in mathematics classes, reinforcing our social and political commitment and awareness in terms of mathematics education.

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