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From Linearity to Rhizomatic Network: Content Organisation in Curriculum Development in Mathematics

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ABSTRACT

Background: The Mathematics curriculum expresses the control and power materialised in the teaching programmes through the presentation and approach of the contents and in the didactic and methodological guidelines**. Objective**: To explore references that guide the meanings of content organisation in the form of activities in curriculum development. **Design**: Discussion from the perspective of theoretical study anchored in the qualitative research approach. **Settings and participants**: Theoretical discussion that did not involve participants as research collaborators. **Data collection and analysis**: Critical reading and theories of the curriculum field and its implications for the proposals to educate through mathematics, considering curricula as operators of principles and practices. **Results**: The linear organisation operates the technical curriculum, leading to experiences of control and maintenance of the power that knowledge provides, while the organisation as a rhizomatic network provides the curriculum as a product of social demands, placing mathematics at the service of learning. **Conclusions**: The contradictions of principles and practices when mathematically educating indicate the relevance of studying and discussing curricula and how to organise the contents to create the conditions for the production of thought and criticism by Mathematics.

Keywords: Mathematics Curriculum; Content Organisation; Linear Curriculum; Rhizomatic Curriculum.

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RESUMO

Contexto: O currículo de Matemática expressa o controle e o poder materializados, nos programas de ensino, por meio da apresentação e abordagem dos conteúdos e nas orientações didáticas e metodológicas**. Objetivo**: Explorar referenciais que balizam os sentidos da organização de conteúdos em forma de atividades no desenvolvimento curricular. **Design**: Discussão na perspectiva de estudo teórico ancorando-se na abordagem da pesquisa qualitativa. **Ambiente e participantes**: Discussão teórica que não envolveu participantes como colaboradores de pesquisa. **Coleta e análise de dados**: Leitura crítica e teorizações do campo do currículo e suas implicações para as propostas de educar pela Matemática, considerando os currículos como operadores de princípios e práticas. **Resultados**: A organização linear opera o currículo técnico, levando a experiências de controle e manutenção do poder que o conhecimento proporciona, enquanto a organização como rede rizomática oportuniza o currículo como produto de demandas sociais, colocando a Matemática a serviço das aprendizagens. **Conclusões**: As contradições de princípios e práticas ao educar matematicamente indicam a relevância em estudar e discutir currículos e a forma de organizar os conteúdos com vistas a se criar as condições para a produção de pensamento e de crítica pela Matemática.

Palavras-chave: Currículos de Matemática; Organização de Conteúdos; Currículo Linear; Currículo Rizomático.

SITUATING THE DISCUSSION

In this article, we approach the linear and network organisation as a rhizome, of the contents in the mathematics curriculum, as an option when planning classes and creating the didactic and pedagogical conditions that will result in the formative experiences of students. This theoretical essay aims to explore references that guide the meanings of content organisation in the form of activities in curriculum development, rooted in the intentions of the educational system and its pedagogical discourse.

With this, we understand the project of formation of the subjects by mathematics and the principles that guide the practices of teaching and learning implied by the curriculum, which also implies them. Understood as a discourse, text, or verb that is intended to materialise in the ways of thinking, expressing, and producing some groups - situated in a historical, cultural, social, and political context — the curriculum is assumed as a discursive instrument of control and power (Foucault, 2008; Lopes & Macedo, 2011).

In the curriculum development in mathematics, a process that involves elaborating objectives, selecting curriculum materials, choosing contents, support materials, and choosing methodological strategies when addressing and treating concepts in forms of activities, the discourses and control of curriculum power materialise at different levels, as we have already discussed in other works (Lima, Januario, & Pires, 2016; Januario & Lima, 2017).

Among them, the curriculum presented in the form of curriculum materials — either textbooks, activity notebooks prepared by education departments, or apostilled resources organised by teaching systems — have been the main resource that teachers resort to mediate/promote learning situations (Bonafé, 2008; Lima & Manrique, 2020; Almeida, Januario, & Santos, 2020).

As Sacristán (2013) ponders, those materials are responsible for translating the curriculum prescriptions into activities in the didactic and methodological guidelines, conceptual approach, options for student engagement in the resolution process, and conceptions of teaching and learning. They are also the main source of consultation for the curriculum shaped by teachers in the form of didactic sequence, set of activities or teaching projects, as discussed by Almeida (2020). A moulded curriculum is the one planned by the teacher, the one in their lesson, unit, annual plans, among others. The teacher attributes meaning to the curriculum content, either from the prescriptions or, mainly, from the curriculum presented, their professional culture, their conceptions of teaching, and their professional practice.

Producing curriculum — in the understanding of moulded curriculum — corresponds to a practice of curriculum infidelity, in which the teacher-curriculum relationship occurs by adapting and creating, taking as a basis the curriculum materials available (Januario & Lima, 2019; Januario, 2020). It requires teachers to mobilise their knowledge to organise and select the mathematics contents in the form of activities, having their principles, beliefs, and conceptions as beacons and, as intentionality, the achievement by students of the objectives developed, which considers the formation of concepts and the construction of learning with senses and meanings.

The ways of organising the curriculum — actualised in the contents, in the way activities are presented and how they approach the contents in the images that illustrate ideas underlying these activities and in the orientations to teachers — is what embodies the discourse of power over the formative process of students, with mathematics as an instrument for what Lopes and Macedo (2011) understand as the "practice of meaning, of attribution of meanings"

based on statements that will enable learning and influence thinking, knowledge production, and social behaviours (Foucault, 2008).

Next, we address the senses operated by statements about curriculum to help us understand the theoretical anchoring of content organisation. In the two subsequent sections, we explored the concept of linearity and rhizomatic network as an option to organise the curriculum and, therefore, the mathematical contents. We conclude the text by presenting our considerations about the curriculum development implied by those options.

CURRICULUM AND ITS CONCEPTIONS

Among the different conceptions of education is the one anchored in rational assumptions of knowledge organisation. Learning occurs through a linear and cumulative process, in which new information is organised sequentially to then be received and accumulated by cognisant subjects.

In this sense, teaching programmes are designed to prepare students to learn more complex content, for which a solid background knowledge base with a lower degree of complexity is required, logically structured, and obeying a typology and thematic focus. The principle is to train the specialist student to meet the need for the logic of the labour market, which requires skilled labour. Or yet, meet the logic of the educational system that determines the control of what is taught and learned, captured, and measured through structured and large-scale assessments.

This way to understand education and conceive teaching programmes expresses the sense of curriculum that resides in a technical rationality of understanding the formative process and the organisation of the conditions for it, especially influenced by Bobbit's (1918, 1924) and, later, by Tyler's (1949) work.

John Franklin Bobbit and Ralph Winfred Tyler, together with John Dewey and Werrett Wallace Charters, are considered the precursors of the curriculum as a forum for epistemological discussion, referring to the US higher education institutions in the 1920s, when the curriculum and education departments were created, associated with the study of educational policies.

In the United States, this period was marked by the industrialisation process and large migration movements, which intensified the massification of schooling and made it necessary to discuss the educational administration to rationalise the processes of curriculum elaboration, development, and

assessment.

As Silva (1999) ponders, outlined as a product of the industrial era, the curriculum is conceived as an educational knowledge structure of massification of the industrial society. According to this author, this view of qualification, or education, is expressed as a curriculum that is defined in a list of school contents or subjects, in which the transmission of knowledge as cultural heritage is aimed.

Like in other countries, in Brazil, the industrialisation process and migratory movements intensified the massification of education, making school an apparatus to train a specialised workforce to meet the logic of the new social contexts, especially the large centres on the economic rise. The school began to be seen as knowledge transmission institution, where the teacher conveyed a content list, and the school disciplines embodied the set of knowledge cultured and validated by a community that was often from outside school, therefore, far from students' real formative needs, i.e., ignoring the students' experiences, school and community social context, and the individual or collective questions that crossed the interior of the classrooms.

This view reflects the curriculum traditional theory, which aims to transform the student into a functional product, an appropriate workforce for the system of industrial factories, controlled by a qualified technician who predicts the results to be obtained. School and curriculum are at the service of industrial production, the labour market, and economic interests, and the contents are treated as means that enable the qualification of subjects, linearly organised in teaching programmes.

The traditional curriculum, or technical curriculum, develops skills as a process in which the new information (contents) is memorised, with the teacher as a representative of formal knowledge, organising and creating the conditions for the standardised education of students. The teaching process is neutral to social and cultural issues, and the teaching programme is organised into disciplines, with well-specified objectives, contents, methods of approach, and the expected results in the form of an assessment, which leads to a unitary, disconnected, and dispersed knowledge (Zabala, 1998).

In the traditional school, the knowledge historically accumulated by humankind is valued, reverberating in encyclopedic and ordered learning in a logical sequence. Thus, the assessment is the pedagogical instrument by which the student must reproduce what has been learned, showing in their resolutions the techniques and strategies taught by the teacher and only by them validated.

Knowledge, or learning, results from assimilation, accumulation, and reproduction, as a product of a passivity process in which one learns to do something.

If knowledge is historically constructed and accumulated by humankind, we can say that it is part of a dynamic process, implied by new events and information located in the subjects' social context. From this, we can apprehend that the curriculum can be conceived from the practices and experiences of teachers, students, and their community. Such as a discourse in action, which is modelled according to issues that require problematisation and critical analysis production. Curriculum can also be understood as a verb, which indicates occurrences, status, phenomenon, intentionalities, and subjectivities, assuming different formats, conjugated by (and conjugating) issues and problems that are part of the world-life of the subjects of the school community and its surroundings.

This way of conceiving the curriculum, which breaks with the technical tradition, started in the 1900s, anchoring itself in the emerging movements of progressive education, with John Dewey as its representative. A philosopher and thinker in the field of education, Dewey contributed to changing the former notion by conceiving the role of the school and the formative processes based on a political and social commitment. His books — such as *The School and Society* (1900), *The Child and the Curriculum* (1902) and *Democracy and Education: an introduction to the Philosophy of Education* (1916) — guided, and still guide, the change of paradigm in the role the curriculum has in critical thinking production. The book *The Project Method*, published in 1918 by William Heard Kilpatrick, is also considered a landmark in this way of understanding the curriculum. Although it is not a work that addresses issues related to curriculum, from a conceptual and theoretical perspective, the book brings notions of curriculum organisation that considers the students' experiences and what arouses their interest in study as a baseline for learning situations, having in the projects the methodological strategy that enables such education proposal.

In a progressive conception of education, the curriculum combines practices that recognise the role that the school plays in producing a less unequal society, in the democratisation that involves society and the subjects, and in the democratisation of knowledge (Beane, 2003). In practice, the curriculum has intentionality, and the subjectivities of the teachers, students, and school community — management team, educational technicians, students' relatives and school neighbourhood – are elements that constitute it, validate it,

and embody it, differing from proposals conceived by experts who know little about the daily life of the school and its subjects.

As subjects located in social and cultural contexts permeated by social discourses and their problems, the teachers and students can bring to the classroom the issues that are significant to them and that require study and criticism production. Problems can be considered as themes, which require knowledge to be problematised. This knowledge is related to various sources of information and different school disciplines, which, for Beane (2003), breaks with the idea of teacher as holder and representative of formal knowledge and students as subjects who arrive at school without a knowledge base.

Beanes' discussions lead us to understand that, in the progressive view of education, the curriculum ceases to be neutral to society and its issues, with the school and the disciplines as questioners of the knowledge and power that it can exercise, depending on the approach given in learning situations. School practices favour the dominant culture of their community. Teachers and students examine what they feel relevant and significant so that they understand more comprehensive and complex social issues, producing meanings from their places of speech and social relations.

The ways of conceiving the curriculum development of the different disciplines - especially mathematics, the focus of discussion in this article - are implied by the meaning of curriculum. Thus, the options for organising and selecting the contents, and the conceptual, methodological, and didactic approach, as well as how the assessment is carried out, are anchored in different curriculum proposals, which can be taken as an "instrument of social control" or as inducers of an educational process "as a means of reducing the social inequalities generated by urban industrial society" (Lopes & Macedo, 2011, p. 22-23).

In line with the beliefs and conceptions of teachers who teach mathematics and with the models of education that a given educational system adopts, those options will characterise the learning conditions to be created and made available to students, implying educational processes through mathematics, which can express control and power over subjects or enable them to expand their critical power and mobilise it in the relationships they establish at work, in the family, at school, and in other situations in society.

When planning mathematics classes, the organisation of contents is an important task, because the way the different objects of knowledge are arranged in the planning can reduce or expand the possibilities of construction of learning

and students' attribution of senses and meanings to the themes studied, as shown by Almeida (2020) in his research. Thus, it is pertinent to know and discuss the criteria for organising the contents in the mathematics curriculum.

The curriculum materialised in a programme or teaching plan can have the contents organised from different criteria, such as methodological axis, fundamental ideas, the linearity of the contents, the contents as a network of meanings, among others. For this article, we will discuss two of those criteria, namely: linear organisation and network organisation.

LINEARITY IN CONTENT ORGANISATION

When discussing the characteristics of a technical curriculum, Beane (2003) describes it as that one that systematises the knowledge to be taught in disciplines, limiting the knowledge to be taught and to be learned in specialities. The disciplinary curriculum within the public education system is usually designed and implemented by government agencies, based on proposals from the federal level, implying state and, as a consequence, municipal proposals and guidelines.

When discussing content organisation criteria in the mathematics curriculum, Pires (2000) highlights the different educational reforms in Brazil as having triggered curriculum reforms. The author refers, in particular, to the reform movement called Modern Mathematics, which aimed to implement changes in the approach and presentation of mathematical contents in different countries, which occurred in Brazil from the 1960s until the early 1980s.

Up to that period of migratory movements and the urbanisation of large centres promoted by the installation of industries and the expansion of trade, students needed to be qualified to work in those new scenarios, especially to form the workforce that the new social and economic context on the rise demanded. Mathematics was given the importance of instrumentalising the subjects, enabling them to perform their activities in factories, offices, commerce, and other services.

Taking as reference Foucault's (2008) thinking, mathematics - along with other school disciplines — was a power device, which controlled the standardisation of what students, potential labour force, would build in terms of knowledge to exercise their citizenship and their professional activities. Therefore, the approach, presentation, and treatment given to the contents favoured know-how-to-do, the reproduction of techniques and strategies to the

detriment of producing thought and criticism for the living conditions of the peoples of the different regions.

If this proposal for mathematical education contemplated the needs of the labour market in this period, the advancement of science and technology and its implications for life in society in the 1970s gave rise to demands for more specialised training. Although mathematics was important to qualify the workforce, the new scenario began to give importance to the education of new scientists, specialists in the production of technologies that could favour the logic of the market. The discussions of Pires (2004) lead to the understanding that mathematics began to be given the importance of instrumentalising students to specialise and become the creators and producers of technologies that would favour the large entrepreneurs and, as a consequence, boost the purchase and sale market, enhancing economic relations. In this sense, the mathematics curriculum would need to undergo a modernisation process.

From an analysis of mathematics curricula developed up to this period and, mainly, after the movement of modernisation of mathematics, Pires (2000, 2004) identified linearity as a way to organise the contents in teaching programmes, supported by Cartesian conceptions and technical conception of curriculum.

Just as the technical (traditional) conception of curriculum, linearity is embodied in the idea of knowledge as accumulation, in the disciplinary logic of mathematical knowledge, which is structured in the succession of contents. This succession requires order in approaching and presenting the contents, which is justified by its importance in approaching a subsequent content, usually with greater complexity, following a graduated order.

Figure 1 illustrates the idea of linear organisation of the mathematics content. The line represents a sequenced trajectory and determines the beginning and signals the completion of a given teaching plan; the points represent the contents that should be addressed, respecting the order in which they appear in that plan. Those points (contents) juxtapose without ever disorganising what has already been built; "each point is subordinated to a kind of 'total order': it has a defined place, and in no way can its appearance be anticipated or postponed" (Pires, 2000, p. 70).

Figure 1

Illustration of a linear organisation (Authors' Preparation)

This organisation is based on the concept of prerequisite for approaching new content. As a prerequisite, a specific content serves as a basis for learning others, related and dependent on the previous one. The underlying meaning of education is that students can only effectively construct learning if they have constructed other learnings, which serve as essential resources and support for the understanding of new knowledge and the formation of new concepts.

Here, we are not opposed to the idea that for the students to learn a new concept, or new information, it is necessary that they have in their cognitive structures ideas related to this new knowledge; what we are emphasising is that this relationship does not need to be established from a succession of contents, organised in a rigid and linear sequence.

As Pires (2000) points out, it is an organisational practice that leads to an excessively closed curriculum development and inflexible to the characteristics and needs that the class of students can demand, as well as to the social issues that arouse the interest of the school community. In this practice, the teacher plays the role of a mere transmitter of information, and the student of a receiver; his mind is seen as a shallow tablet or an empty bucket, which is filled with the information, ideas or contents transmitted to him.

The linear curriculum, therefore, technical, conceives mathematical knowledge, materialised in its contents, as capital for cultural accumulation and ornamentation. It is organised around the mathematical knowledge produced and stored by humanity, in different times, regions, and contexts. In this sense, the contents reflect the idea that knowledge must be preserved for future generations and to be again given the opportunity when the occasion becomes necessary.

Having its centrality in the development of content, the linear curriculum reflects the conception of education in teaching and learning content, and expresses the traditional school, in which knowledge echoes the interests of agents external to it, generally, to maintain control over the subjects' formation in terms of learning and producing criticism (Beane, 2003).

As a consequence of linear organisation, teaching plans are guided by the logic of cognitive objectives, with which the development of capacities of the reasoning, identifying, knowing, comparing, analysing, applying, among others, is given priority.

From an analysis of teaching plans, sequences of activities or chapters of curriculum materials, we can identify the linearity in the organisation of contents of the same thematic unit, for example, numbers. When conducting interview sessions with a group of teachers who teach mathematics in the final years of elementary school (middle school), about the relationship they had with the curriculum materials, Soares (2020) identified the group's concern to linearly address the contents, justified by the absence of prerequisites of their students or how easy would it be for them to learn. This same organisation was observed by the author in the curriculum material prepared by one of the teachers, whose theme was quantities and measures. Specifically the curriculum materials, from a reading of different summaries, we can identify the organisation in themes structured in an isolated way, for example, a chapter that deals with fundamental operations (addition, subtraction, multiplication, and division); another chapter that deals with quantities and their measures; another that addresses the properties of flat forms; another in which different types of graphs and their construction are addressed.

If we consider the approach to some given content, we can identify linearity when dealing with fundamental operations, for example, when we first teach addition and then teach subtraction, followed by multiplication and, finally, division. The approach to the properties of flat shapes begins with the idea of a point, moving to a straight line, a plane and, later, to the study of the shapes and their classifications.

Regarding the methodological strategies for approaching and presenting the contents, the linear organisation restricts the curricular development for the presentation of concepts and definitions accompanied by examples, and subsequently requests the resolution of exercises, the exploration of techniques, and the resolution of problems that little privilege students to manifest more elaborate cognitive demands, the opportunity to question or mobilise different resources and knowledge. Problem solving, for example, is used only for the application of techniques and rules learned previously. This mode of curriculum organisation also restricts the teachers' practices to the reproduction of what the curriculum and curriculum materials propose, reducing the possibility of replanning the teaching action, seeking more significant actions that explore and associate the concepts addressed with the

students' daily lives, covering regional and cultural diversities.

CONTENT ORGANISATION IN RIZOMATIC NETWORK

The school and its community — teachers, students, management team, and other employees — are not isolated from social issues; they are implicated by local and regional problems and, in this sense, what goes through school spaces needs to be problematised, questioned, discussed, and contemplated.

This understanding reflects the meanings of a curriculum that takes social demands as a baseline for learning situations; that considers different issues and problems brought by students or teachers, or problems that affect the school, as contents that need to be studied and brought ~~to~~ a critical understanding of social phenomena, their causes, and possible solutions.

Obviously, this curriculum is built on a logic that breaks with the technical conception of education, of a linear and disciplinary organisation of knowledge. In this curriculum, the contents and disciplines are at the service of social problems; they aim to instrumentalise the subjects to collect, select, categorise, and problematise different information and, thus, produce critical thinking about them, questioning their causes and seeking alternative solutions to the problems.

The process of studying a problem requires varied knowledge, whether from one or several disciplines. A problem, as a study theme, is a curricular integrator, as Beane (2003) highlights, which reverberates an organisation of the contents as a rhizomatic network.

In botany, a rhizome is a usually underground stem of some plants that accumulates nutritious substances, uniting several shoots that can branch out and turn into a bulb or a tuber. Regardless of its location in the plant, a rhizome can function as a branch, root, or stalk. It is formed in a decentralised way, differing from the tree model by its ability to connect one point to another, without a pivoting root, i.e., there is no point that serves as a pivot.

In philosophy, a rhizome is an epistemological model theorised by Deleuze and Guattari (1995) in the work *Mille Plateaux: Capitalisme et Schizophrénie*, first published in 1980 and translated into several languages. Considering its characteristics in botany, the rhizome illustrates the epistemological system in which there is no pivoting reference but fasciculated roots. The rhizomatic model breaks with the logic of propositions or statements

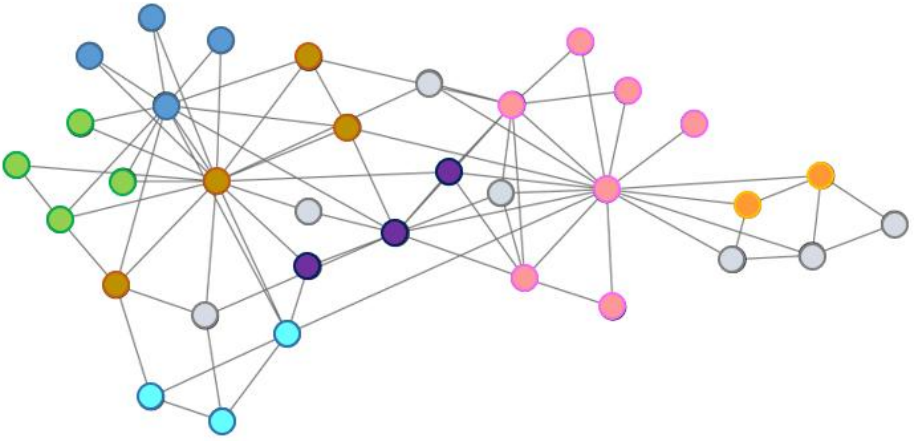
based on hierarchical subordination structures and conceives the structure of knowledge elaborated simultaneously from different points under the influence of different conceptualisations that communicate with each other in a network of connections.

In the discussion of curriculum, the definition of rhizome in botany and its concept in the field of Philosophy lead to an idea of content organisation that breaks with the logic of linearity, starting with a model in which the knowledge to be taught and to be learned can be organised in such a way that one content focuses on any other, or any others, regardless of its reciprocal position, meaning, and directionality.

Conceiving the Mathematics curriculum as a rhizome gets close to Pires' (2000, 2004) belief, based on Serres (1967), for whom the contents can be organised as a network of meanings. Thus, like the rhizomatic model, in this organisation, each point constitutes a knowledge to be constructed by students in mathematics classes; the branches are the interrelations between the points of the same or other thematic units, and the different paths that can be taken to connect some content to the other, thus indicating that there is no homogeneity in the paths that connect one point to the other and that there are different pathways, directions or tracks to interconnect this knowledge and make the associations, existing and necessary interrelationships with each other as illustrated in Figure 2.

Figure 2

Illustration of the rhizomatic network organisation



As a rhizomatic network, the mathematics curriculum can be organised by different contents, related to each other by different incidences. There is no privilege, or greater degree of importance, between the contents to be addressed, and no subordination between them, "it is, therefore, a network, a diagram as irregular as possible, where we can vary to the maximum the internal differentiation" (Serres, 1967 *apud* Pires, 2000, p. 115).

Considering the rhizome as a model of curricular organisation in a network does not necessarily imply flexibility. Deleuze and Guattari (1995) consider that in this epistemological model there are lines of solidity and organisation fixed by groups of similar concepts; those groups constitute the relatively stable territories within the rhizome, however, any structure of order can be modified, as it is possible to unfold each content into multiple dimensions since each concept is formed in connections with other concepts.

When theorising curricular organisation in Mathematics, Pires (2000) considers that a given order is needed to approach content, highlighting that some learning is important for others, to expand the senses and meanings to be given to content; however, without the rigidity, inflexibility, and idea of knowledge as an accumulation of linearity, i.e., the focus is not the ordering of concepts, but their articulation.

The rhizomatic network organisation considers the students' and teachers' life experience and the social problems that arouse the interest of

study. Questions and problems are treated as contents that relate other contents of mathematics and other disciplines to them. This organisation is thus committed to the integration of knowledge and conceives education as an integral education of the subjects involved by it and by them implicated. Especially because the subjects' integral education presupposes that they understand society, their social, economic, and cultural contexts and can, as full citizens, intervene in the reality in which they live. Thus, it is opposed to the linear organisation of the curriculum and, consequently, to the technical conception of education.

The rhizomatic network organisation also comprises the gradual development of the complexity of knowledge, since students of different ages are part of different groups, experience different experiences, and access different knowledge. In this context, this type of organisation respects the principle of heterogeneity, in which both nodes and connections are heterogeneous. It reflects the idea that a curriculum needs to be organised to respect the diversity of the public involved, either by belonging to different age groups or by different social groups, by different cultures, regions, among other diversities that require a curricular organisation that meets the specific needs of each audience.

Regarding the approach and treatment of the contents, methodological strategies that both place students at the centre of the pedagogical action, as agents of the construction of their learning, and create the conditions so that aspects of the social reality, local and broader, can be problematised and better understood, are valued.

Taking as reference the students' previous knowledge, teaching plans and learning situations are elaborated within the notion that mathematical knowledge is given through a process of individual and social construction in a variety of contexts. In those plans, sequences of activities or curriculum materials, the idea of a rhizomatic network is present in the connection between contents of different thematic units, as well as the articulation with contents of other disciplines.

To give an example, Figure 3 refers to the curriculum material *Cadernos da Cidade Saberes e Aprendizagens*, elaborated within the Municipal Department of Education of São Paulo and distributed to students and teachers of its education network. When observing the skills listed in Unit 1, we identified contents from three different thematic units (Numbers, Algebra, and Geometry) in the set of their activities.

Figure 3

Example of an organisation of network content (São Paulo, 2019, p. 12)

The rhizomatic network organisation collaborates with the expansion of approaches and contexts of the contents. It enables establishing different relationships between contents and different thematic areas, it integrates the curriculum and knowledge, provides conditions for the learning process to make more sense and be more meaningful by enabling issues that are relevant to the students or problems of social reality to be taken as contents and baseline for an integral formation.

This organisation does not deny the so-called cult knowledge, traditionally present in mathematics curriculum, but places it at the service of an educational experience in which the curriculum is the product of the social demands brought into the classrooms by those who are the purpose of the educational process, i.e., the students. This requires changes in understanding the role of the curriculum and changes in the way mathematics is conceived as

a school discipline (Bueno, Alencar & Oviedo, 2017; Masola & Allevato, 2019).

(IN)CONCLUSION

The narrative of a complex society, constantly changing, immersed in economic and technological phenomena, which demands critical education and leads students, potential citizens, to produce critical thinking and discourse, has crossed the school universe and implied curricula from prescription to assessment. It has also implied the ways of conceiving the school disciplines in relation to the knowledge they gather and provide in learning situations.

Especially mathematics, it has been given the character of instrumentalising subjects to deal with the countless information, select it, and treat it in the light of knowledge that leads them to make decisions that reflect the common good. From this perspective, it is no longer so recent to consider that mathematical knowledge is essential for students' education and, as a consequence, in the education of teachers who teach it.

This way of undertaking mathematical training has materialised in the objectives and guidelines of the curriculum documents, materials to support the development of curricula, and teaching plans. However, it is necessary to question the practices of teaching and learning mathematics and the principles of these practices.

Research in the field of curricula in Mathematics Education, especially studies that touch the professional teaching knowledge, has shown that, although there is the narrative of an emancipating experience of the formative process, the curriculum operated in teaching practices often seeks to standardise knowledge and experiences and limit the production of students' thinking.

If, on the one hand, there is awareness and the desire for curriculum development to break with conservative thinking, on the other hand, in practice, the logic of the production of technical knowledge has been privileged. If, on the one hand, the production of knowledge is conceived as a rhizomatic structure, in which learning experiences are based on a network of meanings, on the other hand, we have observed teaching proposals that little consider the students' life experiences and social issues as a starting point for learning situations, putting into practice a curriculum structure in the logic of linearity, which little converges to the integration of knowledge.

These contradictions, so present in the proposals to teach and learn

mathematics, have increasingly shown the importance of the study, research, and debate about the curriculum and how it reverberates in proposals for teacher education and the education of children, young people, adolescents, and adults. The current context, in which technologies have enabled the dissemination of numerous information, many of them produced with the ideology of manipulating people's ways of thinking and acting, illustrates how relevant and urgent the debate on curriculum is, especially the study of critical proposals for education by mathematics.

In this article, our objective was to reflect on educational proposals for students and how to organise mathematics content when planning classes and choosing or elaborating curriculum materials. Thus, we hope this can contribute to the debate and serve as a starting point for expanding our knowledge about curriculum and about proposals and principles of education through mathematics.

AUTHORSHIP CONTRIBUTION STATEMENT

GJ and KL conceived the idea presented. APP designed the organisation of the article. GJ and KL developed the theoretical proposal. APP developed the discussion. GJ, KL, and APP actively participated in writing, critical reading, and discussion of ideas and reflections textualised in the article.

DATA AVAILABILITY STATEMENT

The data discussed in the article will be made available upon reasonable request, which will be provided by the authors.

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