Educational curriculum materials and pedagogical practice: what is(are) the message(s)?

Reinaldo Feio Lima¹
Andréia Maria Pereira de Oliveira²

Abstract: The objective of this article is to identify and understand the message of pedagogical practice represented in Educational Curriculum Materials texts. We adopted document analysis as a procedure and used the concepts of classification and framing developed by Basil Bernstein. The results point to at least two messages: the material message, characterized by transparency and structure of the text, and the pedagogical practice message, portrayed and characterized by the sequencing of actions and interactions of teacher on “how” to familiarize and overcome students’ difficulties during the implementation of the mathematical task. Therefore, the messages present in ECM texts converge to guidelines aimed at practice, with methodological guidelines indicating aspects to be considered and mathematical content previously produced with the participation of teachers for pedagogical practice.

Keywords: Message. Educational Curriculum Materials. Pedagogical Practice.

Materiales curriculares educativos y práctica pedagógica: ¿cuál(es) es(son) el(los) mensaje(s)?

Resumen: El objetivo de este artículo es identificar y comprender el mensaje de la práctica pedagógica representada en textos de los Materiales Curriculares Educativos (MCE). Adoptamos el análisis de documentos como procedimiento y utilizamos los conceptos de clasificación y encausado desarrollados por Basil Bernstein. Los resultados apuntan al menos a dos mensajes: el del material, caracterizado por la transparencia y estructura del texto, y el de la práctica pedagógica retratada y caracterizada por la secuenciación de acciones e interacciones del docente sobre “cómo” familiarizarse y superar dificultades de los estudiantes durante a implementación de la tarea matemática. Por lo tanto, los mensajes presentes en los textos de MCE convergen en orientaciones dirigidas a la práctica, con lineamientos metodológicos que indican aspectos a considerar y contenidos matemáticos previamente producidos con la participación de docentes para la práctica pedagógica.

Palabras clave: Mensaje. Materiales Curriculares Educativos. Práctica Pedagógica.

Materiais curriculares educativos e prática pedagógica: qual(is) a(s) mensagem(ns)?

Resumo: O objetivo deste artigo é identificar e compreender a mensagem da prática pedagógica representada em textos dos Materiais Curriculares Educativos (MCE). Adotamos como procedimento a análise documental e utilizamos os conceitos de classificação e enquadramento desenvolvidos por Basil Bernstein. Os resultados apontam ao menos duas mensagens: a do material, caracterizada pela transparência e estrutura do texto, e da prática pedagógica, retratada e caracterizada pelo

¹ Doctor in Education. Professor at the Faculty of Exact Sciences and Technology at Universidade Federal do Pará (UFPA). Pará, Brazil. reinaldo.lima@ufpa.br https://orcid.org/0000-0003-2038-7997
² Doctor in Teaching, Philosophy and Histories of Science. Professor of Programa de Pós-Graduação em Ensino, Filosofia e História das Ciências and Programa de Pós-Graduação em Educação, both at Universidade Federal da Bahia (UFBA). Bahia, Brazil. ampo@ufba.br https://orcid.org/0000-0002-8011-5179.
sequenciamento de ações e interações do(a) professor(a) sobre “como” familiarizar e suprir as dificuldades dos estudantes durante a implementação da tarefa matemática. Portanto, as mensagens presentes em textos dos MCE convergem para orientações dirigidas à prática, com orientações metodológicas indicando aspectos a serem considerados e conteúdo matemático previamente produzido com a participação dos professores para prática pedagógica.

**Palavras-chave:** Mensagem. Materiais Curriculares Educativos. Prática Pedagógica.

1 Initial considerations

In this article, we seek to identify and understand the message of pedagogical practice represented in the texts of Educational Curriculum Materials (ECM), intended for teachers who teach Mathematics. For this, we had Basil Bernstein's theory (2003) as our main theoretical and methodological reference. The choice of this theoretical framework is justified because we consider that this theory has explanatory and analytical characteristics, in other words, a language of description that allows the analysis of curricular materials with educational characteristics (MORAIS; NEVES and FERREIRA, 2019).

These authors consider — and from now on we also use in our writing — "Educational Curriculum Materials" as those intended to provide support and significantly expand the possibilities for teachers to learn, to imagine different ways to structure classes of school subjects and to interact with students in the development of school content. The adjective “educational” refers to teachers as learners. In addition, when inserted into classes, ECM provide teachers with authentic and structured assistance in learning new skills and practices (DAVIS et al., 2017; McNEILL et al., 2017; REMILLARD and KIM, 2017).

The term "learning" was used in the sense of generating possible changes in the production of texts by teachers in contact with these materials. For example, this learning can take place through an initial or continuing education course or in professional learning communities. However, teachers' learning also takes place through practices such as: planning, changing, implementing and evaluating these materials (FUENTES and MA, 2018). Thus, we understand that teacher learning can be "a process of increasing participation in teaching practice" (ADLER, 2000, p. 37), one of the functions of ECM being to support teacher learning, and one of the roles of ECM is to support teacher learning. In this case, the teacher is considered a

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3 Sometimes, we will name it by the acronym ECM to avoid repetitions.

4 Whenever we use the word "materials" it is intended to designate the term Educational Curriculum Materials.
professional who uses materials to make didactic and methodological decisions (FUENTES and MA, 2018).

We understand text as any pedagogical representation which is spoken, written, visual, spatial or expressed in the curriculum. In other words, it is everything that communicates a pedagogical relation (BERNSTEIN, 2003). Hence, the parts that make up ECM, such as teachers' narrative, videos, mathematical tasks or even students' solutions, can be considered materials texts, because they communicate a pedagogical practice which, according to Bernstein (2000), configures any relation that occurs in a given social context, such as between teachers and students of Basic Education, in the context of classroom, or between teachers of Basic Education and teachers of Higher Education, in a training space.

Davis and Krajcik (2005) identify Educational Curriculum Materials through elements that constitute them, for example: comments on student responses, videos of a class, online discussion forum, class narratives, which allows the teacher to integrate them in real classroom situations and in different contexts in which teaching and learning processes take place (SANTANA, 2017).

Stein and Kim (2009) understand that ECM, through its elements, present two possibilities of support for teachers: the first contemplates the ability of materials to anticipate what students can do in response to classroom tasks; the second refers to the transparency of materials, as they communicate to teachers the pedagogical and mathematical ideas, as well as the guidelines for the underlying use contained in the tasks, since they give indications of a certain pedagogical practice (PRADO; OLIVEIRA and BARBOSA, 2016). This is because these elements (student solutions, videos of class moments, etc.) may indicate signs of the teacher's experience of implementing a particular task, signs from experience of teacher's implementation of a particular task, that is, the different ways in which the task can be explored, reproduced, adapted and worked on in classes, making visible teacher's role as interlocutor between students and mathematical content conveyed in the tasks (AGUIAR and OLIVEIRA, 2017).

ECM can be used by teachers in training for long-term learning (LAND; TYMINKI and DRAKE, 2015). Therefore, the parts that make up these materials can be used as another didactic resource to support possible changes in teachers' practice. When applied in conjunction with other professional learning opportunities, they are positioned to support such changes (DAVIS et al. 2017; FUENTES and MA, 2018).
From a political perspective, Educational Curriculum Materials can be an intermediary link between policy and practice; it means, they serve as a means to implement public policy movements for Education (PACHECO and PIRES, 2017; JANUÁRIO; MANRIQUE and PIRES, 2018).

Thus, the corpus of the article consisted of Educational Curriculum Materials developed by groups from three Higher Education institutions: Observatório da Educação Matemática da Bahia (OEM-BA), of Universidade Federal da Bahia; Grupo de Estudos e Pesquisa sobre Formação de Professores que Ensínam Matemática (GEPEFOPEM), of Universidade Estadual de Londrina (UEL); and Grupo de Estudos e Pesquisas das Tecnologias da Informação e Comunicação em Educação Matemática (GEPETICEM), of Universidade Federal Rural do Rio de Janeiro (UFRRJ).

The article is organized as follows: in the next section, we present the theoretical background of the study, which is based on notions of classification, framing, and message from Bernstein's theory. Next, we detail the methodological procedures used, develop the analysis, and conclude with final considerations.

2 Theoretical aspects

In this section, we present the theory of Basil Bernstein (2003), in particular, the main concepts that support our study, especially classification, framing, and message, in view of the research objectives. Such a theory provides a systematic theoretical framework which makes it possible to analyze the what and how, it means, the relations of power and control represented in ECM texts.

For Bernstein (2003), the relations arising from pedagogical practice present a hierarchical attitude, which is guided by the regulation of power and control in the communication between teacher and student. As stated by Bernstein (1996), the understanding of these principles of power and control operated in pedagogical practice occurs according to two concepts: classification and framing. The classification principle refers to contents to be conveyed, dealing with what can be said in communication between the different categories, for example, subject categories — teachers and students, discourse categories — Mathematics content, Portuguese content, etc. Regarding the school context, this principle allows us to examine the forces of boundaries between school subjects (MORAIS; NEVES and FERREIRA, 2019).
Among other aspects, the principle of classification helps to identify, in ECM texts, the separation or approximation between different school subjects, which translates relations of power communications implicit in the specialization of each content presented in these texts, which will be strengthened when there is a clear separation or distance between categories, it means, the contents are well isolated from each other, so the rule is: things must be kept separate. On the contrary, classification can be weakened when there is a blurring or an approximation of boundaries between categories. Then, there is a reduced separation between content and knowledge areas (BERNSTEIN, 2003; MORAIS; NEVES and FERREIRA, 2019). Framing refers to the control over communication, that is, the how it can be said in communication relation, which goes through the way the content is selected, sequenced, paced, and the assessment criteria are defined in classroom, it means, how teaching and learning process is conducted. For example, framing can be strengthened when, in one of the categories, in this case, in teacher/student relationship, the teacher assumes explicit control in pedagogical relation, being exclusively responsible for the choice of content, methodology and evaluation to be worked on, which is weakened when students have some form of more apparent control in this relation (BERNSTEIN, 2003; MORAIS; NEVES and FERREIRA, 2019).

According to Bernstein (2000, 2003), discursive rules refer to four characteristics of pedagogical practice: selection, sequence, pacing, and evaluation criteria. The selection rules concern who selects the topics to be addressed, the contents and the tasks developed; those of sequence refer to who establishes the order in relation to the previous aspects; those of pacing concern those who establish the relation between the amount of content transmitted and the time needed to acquire them; those of evaluation criteria refer to those who establish the text to be apprehended, which may be explicit or implicit (MORAIS; NEVES and FERREIRA, 2019).

In order to explain the concept of message, Bernstein (2000, 2003) uses the terms ‘code’ and ‘communicative context’. A code is a tacitly acquired regulatory principle that selects and integrates relevant meanings (classification), forms of realization (framing) and evocative contexts (interactive practices, for example, between teachers and students), that is, it is the codes that enable subjects to read and create texts. In other words, it is talking about the form and the content of a given
curricular and pedagogical design configured through classification and framing. Hence, the code has the function of regulating the relationship between and within communicative contexts (BERNSTEIN, 2003).

The term 'communicative context', on the other hand, refers to the context in which pedagogical practice takes place (family and school, community and school, school and work). As an example, in school communicative context, mediated by the use of ECM, the acquisition of codes takes place, and it is in this scenario, through relations of power (classification) and those of control (framing), that messages conveyed in ECM texts are characterized.

The message, as Bernstein (2003) points out, corresponds to communications relations characterized by links of power (classification) and control (framing) between discourses (intradisciplinary and interdisciplinary relations); spaces⁵ (teacher/students and between students) and subjects (teacher/students and students/students). Thus, ECM, by representing a pedagogical relation, carry a message, an expectation of contextual fulfillment – the what and how teaching is done in the pedagogical practice represented in their texts. Therefore, as texts that they are, ECM also communicate about pedagogical practices to which they refer, enclosing a message.

In view of what has been presented, and having ECM as the object of research, the objective of this study is to identify and understand the messages of pedagogical practice represented in ECM texts. Furthermore, considering the theoretical precepts which underlie the understanding of the object investigated in this article, we present the methodological procedures and data analysis process in the following section.

3 Method

The study is qualitative (FLICK, 2013), descriptive and documentary (SÁ-SILVA; ALMEIDA and GUINDANI, 2009). We justify the adoption of the method based on the search for understanding and discussion about the content of digital or electronic documents, interpreting and presenting data and information on a given topic (LÓPEZ, 2015). We defined as corpus three ECM documents developed by groups of Higher Education Institutions (HEI): Observatório da Educação Matemática da Bahia (OEM-BA); Grupo de Estudos e Pesquisa sobre Formação de Professores que Ensinam Matemática (GEPEFOPEM) and Grupo de Estudos e Pesquisas das Tecnologias da

⁵ Spaces refer to the organization of classroom and to the resources used in material-teacher-student relation.
Informação e Comunicação em Educação Matemática (GEPETICEM).

ECM produced by OEM-BA, based at Universidade Federal da Bahia, named ECM1, are available in a virtual environment (www.educacaomatematica.ufba.br) and are open educational resources, so they are freely distributable. They are in public domain and are openly licensed, allowing them to be used or adapted by others. This material explores Mathematics content from Elementary Education II, and it is composed of: a) Curriculum material, b) Commented curriculum material for teacher, c) Student solution, d) Narrative, e) Teacher solution, f) Planning, and g) Videos.

The second, named ECM2, was produced by Grupo de Estudos e Pesquisa sobre Formação de Professores que Ensinan Matemática (GEPEFOPEM), based at Universidade Estadual de Londrina (UEL). Access was granted through authorization from the Group coordination. This material explores the Elementary Education math topic Algebra, and it is composed of four sections for presenting different aspects of the lesson: 1) Before the lesson, 2) The lesson, 3) Reflection after the lesson, and 4) Putting it into practice.

The third, named ECM3, was produced by Grupo de Estudos e Pesquisas das Tecnologias da Informação e Comunicação em Educação Matemática (GEPETICEM), based at Universidade Federal Rural do Rio de Janeiro (UFRRJ) and made available in a virtual environment (www.gepeticem.ufrj.br). This material explores Mathematics content from Elementary Education II and Secondary Education in a Dynamic Geometry Environment with Information and Communication Technology. Each ECM consists of the following elements: a) Presentation, b) Task, c) Answers, d) Narrative, e) Videos, f) Forum, g) Chat, and h) Comments.

The analysis and interpretation of texts of the three ECM were developed through the language of description of Bernstein (2003) based on the relation between internal and external languages. The external description language corresponds to the materials (dialogue between empirical data and internal description language), which derives from the internal description language, allowing the identification and characterization of the conveyed message and the construction of categories related to the object under study (MORAIS; NEVES and FERREIRA, 2019). Therefore, the analysis of ECM consisted of two moments: thorough analysis and cross-reading of the three materials.

In this way, the analysis of what and how is configured in pedagogical messages
conveyed in ECM texts, taking into account the relations between discourses, spaces and subjects that are established in the pedagogical practice. Thus, based on the concept of classification, we characterize the relation between discourses (interdisciplinary and intradisciplinary) and spaces (teacher and student spaces and student spaces) in the materials texts based on the analysis of variation of demarcated or blurred borders expressed in their texts; through the concept of framing, in the relationships between subjects, teacher/students relationship is located. This relationship can occur as a function of discursive rules (selection, sequence, pacing and evaluation criteria). The following section describes the analyses, inferences, and discussions carried out on the corpus of this research.

4 Data presentation and discussion

In this section, data that make up the corpus of this article are listed and discussed by articulating the objective and the theoretical framework. In order to better understand the data analysis, we present the what and how of the pedagogical practice reported in the texts of the materials.

In other words, what is taught and how it is taught in each material which, consequently, implies discursive rules that define and distribute — who can transmit, what, to whom —, and under what conditions, as we see in a priori categories elaborated from the researchers’ interpretation of data, which were analyzed and interpreted in light of Bernstein’s (2000) theory and ECM literature.

4.1 The what and how represented in ECM1 texts

In the relations between discourses, it is found the relations between discourses from the same subject (intradisciplinary) and between discourses from other subjects (interdisciplinary). Thus, what is said in the texts of this material, in general, evidences the presence of school mathematical content referring to Geometry. In Bernsteinian terms, what is said about this content is reinforced by its purpose, as we can illustrate: “The purpose of this text is to narrate the implementation of a task on the exploration of angles, in particular, consecutive and adjacent, complementary and supplementary angles, carried out in 2013” (Extracted from ECM1 teacher’s Narrative tab).

In one of the parts of the material, it is suggested: “Teacher, you will be able to question students about what they understand by half-line, characterizing it [...]”; You can ask students what makes a bisector different from a ray” (Extracted from ECM1
teacher Solution tab). This excerpt shows that the teacher, in the development of the mathematical content, made explicit the concepts of bisector and ray to be explored.

In Bernsteinian view, there are indications that school mathematics content does not show the articulation between content from other disciplines (interdisciplinary relation). For example, in one of the parts of the task comment it is mentioned: “Teacher, observe if students know that the sum of the internal angles of a triangle is 180º. Discuss with students the congruence of two angles” (Extracted from ECM1 teacher’s Narrative).

The message in these excerpts suggests, in general, in the interdisciplinary relation, that mathematical content is worked in an isolated way, expressing a pedagogical practice in which the development of the content is restricted to Mathematics subject classes. As pointed out by Bernstein (2003), in this case, the contents are separated by strong limits, which can affect other categories of pedagogical practice (discourses, spaces, subjects). Thus, the mathematical task of this material does not contemplate the relation between contents of other disciplines (interdisciplinary). It only refers to Mathematics, which characterizes a strengthened classification. In this way, there is an integration between different contents of Mathematics subject (intradisciplinary relations), as we can illustrate: “In order to accomplish the task, we work in a technological environment which can explore geometric and algebraic concepts” (Extracted from ECM1 teacher Solution tab). This relation occurred in an articulated manner: the material text pointed out that the teacher tried to explore the relation of geometric concepts with algebraic calculus, favoring intradisciplinarity. In the message conveyed, in this case, there are signs of the presence of a weakened classification, as relations have been established between different contents within the discipline.

In this sense, the weakening in the value of classification means that in pedagogical practice, expressed in ECM1 texts, the integration between contents is proposed through the mathematical task. In other words, it can favor the constitution of an integrative vision of Mathematics, as well as every subject needs an organization logic so that the teacher can, gradually, build with the students the mathematical content in an articulated way, either between different contents of the same discipline, be articulated with other school subjects either between different contents of the same subject or articulated with other school subjects (RODRIGUES, 2015; PRADO;
OLIVEIRA and BARBOSA, 2018).

Regarding the space of students in performing the mathematical task, we observed that “students raise hypotheses, discuss and argue about their ideas more intensely, without having to compete for speech with a larger group” (LEAL, 2015, p. 103). This is evidenced in the following excerpt: “Aiming at solving the task, the class was divided into groups of three students, and 50-minute classes were used – two for implementation and one for socialization of ideas developed in implementation” (Taken from the Teacher Narrative tab of ECM1).

This excerpt exemplifies that the room space organization was made in the form of small groups to perform the mathematical task, which can result in more possibilities of sharing among the group members both the ways of solving the mathematical task and the materials and instruments used to solve it. Hence, there are indications that, when performing the mathematical task in small groups, students space may be focused on those specific members among whom the performed text circulates, causing isolation among them and resulting in a weakened classification.

As for the relation between teacher space and student space, ECM1 texts make explicit the sharing of spaces between subjects during pedagogical practice, as the excerpts show: “One group of students presented (to teacher) parallelogram as a trapezoid. With this, I shared with class” (Extracted from ECM1 teacher’s Narrative tab). Or, teacher continuously moves among the groups making pedagogical interventions, explaining, listening, responding and helping students to progress in the mathematical tasks (PRADO; OLIVEIRA and BARBOSA, 2016). As an example, we present an illustrative passage: “However, my role was to go from group to group promoting some reflection on the answers given and analyzing the notes they made” (Extracted from ECM1 teacher’s Narrative tab).

The message conveyed in the relation between teacher space and student space, suggested in ECM1 texts, has rather blurred boundaries, it means, spaces are shared by both different students and teachers. In addition, students are invited to share spaces during pedagogical practice, exposing their conclusions, while teacher moves among the groups: “students worked in pairs in a cooperative attitude, and this was important because there is interaction among them” (Extracted from ECM1 teacher’s Narrative tab). Hence, it is a matter of considering communication as the orientation of pedagogical process, situated in the mathematical task, in the text that
students produce together and with collaboration of teacher, as one tries to coordinate the mathematical task of each one with that of other groups (GUERREIRO et al., 2015; ESTEVAM and BASNIAK, 2018).

Thus, interactions become intense and indicate a relation characterized by weakened classification. It suggests a pedagogical practice in which spaces are used by everyone, regardless of their social position. In the relations between subjects, there is the teacher/student relationship identified in the discursive rules: selection, sequence, pacing, and evaluation criteria.

In relation to the discursive rule selection of pedagogical practice content, the way in which the development of the mathematical task is said, the material text suggests the action of teacher in explaining the use of resources to assist in approaching the mathematical content to be taught, such as: “eraser, ruler, protractor, pencil, scissors, compass, craft paper, printed task, manipulative materials kit, Geogebra software” (Extracted from ECM1 Planning tab). In another moment, the use of technological resources was suggested, as in the following quote from the teacher: “In order to accomplish the task, we work in a technological environment which can explore geometric and algebraic concepts” (Extracted from ECM1 teacher Solution tab). In Bernsteinian view, there are indications that, first, ECM1 text determines the elements that constitute the mathematical task, and, second, teacher, by reproducing it in classroom context, holds this control, and students are only responsible for solving it. The task presents a strengthened framework with the control of selection, placing itself in the material text and in the teacher, not giving any margin of control to students.

The sequence of pedagogical practice contents represented in ECM1 texts shows, in general, the course that students must follow to solve the questions of the task. The structuring of the mathematical task explains to student how to proceed with the solving as a whole, such as: reading the text and then solving the question or forming groups and then solving the question. This means to infer, in material-teacher-student relation, that the locus of control is exclusively centered on material-teacher, not giving any margin of control to students. Therefore, the control of sequencing falls mainly on the teacher who, using such tasks from the material, must make clear the rules of realization that students must follow for the text production, as we observed in excerpt: “I read the first question and asked students to pay attention to the question, as the procedures carried out at that moment would be important for the resolution of
it” (Extracted from ECM1 teacher’s Narrative). We can deduce that the extract shows teacher’s action in explaining the task, that is, he/she has control over the sequence which students must follow to solve the task (producing the texts), as this is not clear to them. The sequence is conducted according to the structuring of the mathematical task, featuring a strengthened framework in this regard.

In general, the texts show that teacher controls the pacing of pedagogical practice contents, as can be seen below: “They were given time to carry out the procedures” (Extracted from ECM1 teacher’s Narrative). In Bernsteinian terms, there is evidence of a strengthened framework as those involved in teaching and learning process, in pacing of class, in teacher-student and student-teacher relationship, follow the pacing/guidance of teacher in explaining/listening: “I instructed them (referring to students) to consider, in the two triangles with two sides identified, the hypotenuse as being their base”. [...] I suggested to students to name the sides of the triangles and, then, observe and compare with the two triangles which had identification of the three sides” (Extracted from ECM1 teacher's Narrative).

The excerpts below point to possible indications that the discursive rule evaluation criteria corresponds to control exercised by material-teacher-student regarding the explanation of objectives and indications on the accomplishment of the mathematical task, that is, what it is expected to produce and how do to achieve this production in solving the task, as we see in the sentences: “I started the class by telling students that we were going to develop a task which involved classifying triangles”; or: “After these initial clarifications, I distributed the tasks to the groups and then, the manipulative material kits”; or: “In this task, students were invited to construct and recognize consecutive, adjacent, complementary and supplementary angles” (Extracted from ECM1 teacher's Narrative).

Regarding the material text, the analysis shows that teacher made clear to students the mathematical task objective and the procedures to be done, explaining to class what should be interpreted. In addition, the objectives are determined by the material text since, when working in classroom, teacher expresses these objectives based on the interaction with students.

In this perspective, some authors have focused on the need to make the evaluation criteria discourse rule explicit (MORAIS; NEVES and FERREIRA, 2019), because, through this rule, it is possible for students to recognize the text that we want
them to produce. Thus, the message for this discourse rule was a strengthened control since the texts of this material were characterized in terms of presence of goal and/or explicit statements about what the mathematical task was about and what they intended the students to accomplish, it means, in material-teacher-student relation, control is exclusively centered on material-teacher, giving no margin of control to students.

Hence, the characterization of ECM1 text global message, in terms of dimensions of the what and how presented, suggests, in general, that the message shows the following aspects: (1) strong interrelation between the mathematical contents to be learned by students, translated by a weakened classification in intradisciplinary scope; (2) existence of a clear boundary between the contents, which is determined by a strengthened classification at the level of interdisciplinarity, because it does not present any margin for interaction; (3) blurring of boundaries between student/student spaces and between teacher/student space, that is, a weakened classification in the relation between spaces; (4) strengthened teacher control over discursive rules; (5) clear explanation of the text to be acquired (text to be learned), designating a strengthened framework in teacher/student relationship of the discursive rule evaluation criteria.

4.2 The what and how represented in ECM2 texts

The mathematical tasks represented in ECM2 texts, in terms of interdisciplinary discourse, do not present integration between subjects of school curriculum, which are based on developing only contents of Mathematics. Hence, they do not present scope for interaction with other school subjects. In this way, strengthened classification means that there is a clear boundary between contents. As a consequence, we can assume that the message represented in this type of task is that contents must be separated, and Mathematics subject must permeate the entire teaching and learning process. Therefore, establishing interdisciplinary relationships will encourage students to link concepts from Mathematics itself and from other subjects of school curriculum, requiring a connection which will lead them to reach a higher level of scientific knowledge abstraction (SOUZA, 2015).

Regarding the discourses, ECM2 texts express a pedagogical approach which promotes the articulation of mathematical contents: Numbers and Algebra. What is referred about these contents is clear in the objectives of the mathematical task: “one
of the objectives of class is to perceive regularities, determine several terms of sequence and express in natural language and/or in symbolic language the generalization of the relations found” (Extracted from ECM2 Before class tab). Based on this extract, the text suggests that pedagogical practice, when developing the mathematical task in classroom, involves the concern of making students perceive the concept of regularity and variables that are implicit in the task, which creates articulation of Arithmetic with Algebra in Elementary Education.

In the light of Bernstein's theory (2003), the mathematical task expressed in ECM2 texts reinforces the closeness in the relation between intradisciplinary discourses, in other words, between different contents of Mathematics subject (PRADO; OLIVEIRA and BARBOSA, 2018). This linking of Numbers and Algebra content took place from teacher's action in explaining: “The task there was number one, which looked like this: indicate above the total number of beads for each figure” (Extracted from ECM2 The class tab). In the same way, teacher's action of questioning appears: “Go Guilherme and Franciele. It was to describe a rule. What is a rule? What are we going to understand as a rule?” (Extracted from ECM2 The class tab).

In short, the extracts are based on the implementation of the task when we infer about teacher-student communication, locating, in the intradisciplinary relation, the moment when the first speech refers to the content exclusively focused on operations and numerical equality (for example: 3 + 4 = 7 or 7 + 9 = 16 or 3 + 5 = 4 + 4). In this case, when suggesting a discussion with students about the first item of the task and asking them to indicate the total number of beads in the figure, it signals student's record to the content “natural numbers”. Algebraic content is implicit in teacher's second speech when she asks students to write a rule that allows them to determine the total number of beads of any figure in the sequence. Therefore, in pedagogical practice represented in this material texts, mathematical contents are integrated through the mathematical task (PRADO; OLIVEIRA and BARBOSA, 2016), characterizing a weakened classification.

On relations between student spaces, represented in materials texts, we extracted some excerpts that seemed most significant to illustrate what can be cited about the relations between student spaces. Hence, we find in lesson plan that “first, teacher will organize the classroom for the development of the class since work will be done in groups of three students each” (Extracted from ECM2 Before class tab). In the
excerpt presented in the previous lines, the conveyed message shows that the teacher focuses on organizing the class into groups of three students, which suggests, in our view, that spaces, in the classroom, between students expressed in ECM2 texts were occupied randomly, since they appear organized in small groups to perform the mathematical task, and they must discuss it with the other groups (MOTA; RODRIGUES and CYRINO, 2015). Hence, we assign a weakened classification, as students have possibilities to share, among group members, ways of seeking strategies to solve the mathematical task or materials used in solving the task. In order to identify the connection between teacher space and student space, we extracted some excerpts that seemed most significant to illustrate the relation expressed in this material: “Yeah, I will accompany them, I will go there, try to guide them aiming at seeing if they’re succeeding [...]. So, it is a strategy to accompany the groups [...] I will separate the board and ask each group to put their solving and then present it, explain how they did it” (Extracted from ECM2 Before class tab).

These excerpts from ECM2 suggest, in general, that the relation between teacher space and students space occurs while the teacher follows the realization of the topic under study in each group, from a guidance perspective: she explains, clarifies doubts, proposes questioning and tries to guarantee the development of the tasks without compromising students’ autonomy in order to provide an environment in which they can communicate and reason mathematically (among themselves and with the teacher). It establishes communication of ideas with each other, valuing thoughts coming from everyone in the group (GUERREIRO, et al., 2015) or between teacher and students, sharing the use of blackboard and chalk on the task at hand (RODRIGUES, 2015).

We conclude that, in general, the relation between the different spaces expressed in ECM2 texts has rather blurred boundaries because these spaces are shared by both students and teacher, that is, this relation is characterized by a weakened classification. We also infer that students are invited to share the spaces during pedagogical practice, exposing their ideas, strategies and possible conclusions to the mathematical task. In terms of how it is taught, as for the discursive rules: selection, sequence, pacing, and evaluation criteria (the how of pedagogical practice), they define the relationship between the subjects (teacher-student) in teaching and learning process, and they are defined based on different variations of framing.
Regarding the discursive rule *selection* of pedagogical practice contents, the mathematical task was formulated only by questions, which gives scope for students to have notions on how to proceed with the texts. In this way, we can deduce that, even if student has a small margin of control over how to solve the mathematical task (producing the texts), both ECM2 text and teacher are responsible for the development, insofar as the control of selection rests with teacher since he/she was the one who directed, indicated and explained to students at all times during the performance of the task. This can be seen in the following statements: “Pay attention, we have a task that we have to follow as a team. Everyone follows along. Then, we have number one: indicate above the total number of beads for each figure” (Extracted from ECM2 The class tab). As a result, the mathematical task presents a strong degree of framing with the control of content selection, situated in ECM2 text, conferring, *a priori*, to the teacher to develop what is determined in the task.

As for the discursive rule *sequence* of pedagogical practice contents, the material presents a structured mathematical task. In other words, a kind of script containing a group of questions that students should follow to solve the task, as we observe in teacher’s action of orienting: “I will ask each group to put their solving, then, present and explain how they did it. One item at a time. It will be item by item” (Extracted from ECM2 The class tab). It means that, in material-teacher-student relation, control is fundamentally centered on material-teacher. In this case, class sequence was exclusively controlled by the teacher: “For the presentations, we will first choose those in which the students have reasoned by recursion and/or have used a table. Next, we will choose solvings that used the rule in natural language and, finally, those that used symbolic language to represent the rule” (Extracted from ECM2 Before class tab). In these excerpts, the teacher controlled the sequence in which the students' presentation of resolutions of the mathematical task would take place. There is a structured chain of learning, that is, students follow the instructions as instructed by the teacher. Thus, we can conclude that the message present in this sequencing mode tends to be framed in material/teacher/student relation.

Data suggest that the message about the discursive rule *pacing* of pedagogical practice leads to the strengthening of teacher/student relation, since the control is explicit on the part of teacher in the organization of time and pacing of learning: “Teacher: today you will have some time to solve this task. In another moment, the
teacher reinforces this statement: "Come on, then, today you will have some time to do this task, when the time is up, I will tell everyone. It's over, keep silence" (Extracted from ECM2 The class tab).

The message conveyed in the above extracts portrays that the accomplishment of the mathematical task follows an order according to which it must be done; she also has complete control over the time needed for the development of the task. Hence, we see a strengthened framework in pedagogical practice, in other words, the teacher is the one who sets the rhythm of study and content learning, chooses and dictates the rhythm at which students' solvings will be presented, and rarely takes their rhythm into consideration. This is because teacher invites students to pay attention to the correction, and determines that they start with the first question, which demonstrates control and ordering: “one item at a time, first one, number three, then four, but then three everybody, four everybody” (Extracted from ECM2 The class tab).

In our analysis, the message conveyed to the discursive rule evaluation criteria corresponds to control exercised by material-teacher-student regarding the explanation of objectives and indications on the accomplishment of the mathematical task. ECM2 texts suggest that teacher sought, at the beginning of the task, to present the type of work that students should perform, as well as the condition they should have to solve it, as can be seen in the speech: “Pay attention, we have a task that we have to follow as a team. 'The necklaces' is the title of the task. Everyone following” (Extracted from ECM2 The class tab). In addition, teacher was concerned with making the purpose of the mathematical task explicit to class: “Well... at the beginning of the task introduction, I tried, somehow, that they understood what was to be done. I tried to make sure they knew” (Extracted from ECM2 Reflection after class tab). This means that, in material-teacher-student relation, control is essentially centered on material-teacher, not giving any margin of control to students, which indicates a strengthened framework.

Therefore, in terms of what and how dimensions, the excerpts from ECM2 suggest, in general, that the message had the following characteristics: (1) the contents of Mathematics subject were proposed in isolation from other subjects in the school curriculum (strengthened classification at interdisciplinary level); (2) the contents were explored in an integrated way through the task, conveying an idea of approximation in the relation between mathematical contents (weakened classification
at intradisciplinary level); (3) the boundaries between spaces were blurred in relation to teacher/student and student/student spaces (weakened classification between spaces); (4) strong teacher control in selection, sequence and pacing; (5) explanation of the discursive rule evaluation criteria, making the texts to be learned explicit to the students.

4.3 The what and how represented in ECM3 texts

ECM3 text clearly refers to Geometry (what) mathematical content, being presented/developed with more conventional resources (paper, pencil, concrete material, etc.) or with computer support (BAIRRAL, 2016). Hence, we present excerpts from this material which seemed most significant to illustrate the mathematical concept that teacher developed in classroom: “They (referring to the students) drew a red line through the three points, moved the line and the triangle, and noticed that the points were collinear”. “The students knew that the orthocenter is the meeting of heights” (Extracted from ECM3 teacher's Narrative tab).

These excerpts indicate that the exploration of mathematical concepts (collinear points, orthocenter) was the class focus. In order to develop them, the material suggests to teacher the use of technological resources, such as: computer, internet, calculators, tablets, smartphones, spreadsheets, software, etc. These resources can help in the development of mathematical content, so that students can discuss, reflect, conjecture, organize data, solve problem-situations and, mainly, in valuing learning situations that bring these technologies incorporated into school pedagogical practices (CASTRO, 2018).

Furthermore, the use of these technological resources in pedagogical practice enabled the relation between intradisciplinary discourses (between different mathematical contents). We gauge this in the sentence: “We aimed to work with solving systems geometrically in GeoGebra, in order to explore the relationship of Algebra with Geometry” (Extracted from ECM3 teacher's Narrative tab). It results in a weakened classification, since the mathematical task suggests the integration of different contents covered in Mathematics subject.

In this case, teacher worked only with contents of Mathematics subject without relating them to external texts or to another subject. So, mathematical contents are integrated through the task as well as the didactic treatment given to them. The
mathematical task was only worked according to the subject formal content, being silent in the face of content from other subjects, which characterizes a pedagogical practice in which the contents are integrated through Geometry. The message conveyed in ECM3 texts points out that, in the development of the content, there was a strengthened classification, it means, teacher kept the clear boundaries between the contents of each subject.

When analyzing the relation between students' space, ECM3 message clearly points to a blurring of borders. We present some excerpts extracted from material sources on this relation: “Most of the undergraduates were in different places in the classroom. We distributed the sheets with the task to students and informed them that they could do it as a group. The students exchanged ideas with each other, as they sat in pairs or trios” (Extracted from ECM3 teacher’s Narrative tab).

We understand that these excerpts communicate characteristics of pedagogical practice in students' space. In other words, it is about the implementation of the mathematical task in which it is possible to infer different representations in relation to the spaces between the students. In general, students appear organized in groups (pairs or trios) or distributed throughout the classroom. Therefore, the message conveyed in these excerpts shows that students freely chose the space they would occupy in exploring the topic under study even though this organization could limit interactions and dialogue between them, since some students could even have their backs to the others. However, this action may or may not favor students with a greater possibility of sharing, among the group members, their strategies or doubts when solving the mathematical tasks, as well as sharing materials and instruments used in solving the tasks. In this case, we say that pedagogical practice has a weakened classification (BERNSTEIN, 2003).

With regard to the relation between teacher and students space in the organization of pedagogical work, ECM3 message presents a blurring of boundaries between teacher space and students spaces, as teacher guides students, being able to analyze emerging strategies (DINIZ, 2017) as a questioning agent that promotes open activities according to the technological dimension. In other words, teacher goes to students space and participates with them in carrying out the mathematical task: “As the class developed, I tried to clarify doubts of students who were having difficulties and encourage pairs that presented better performance by proposing new questions”
We notice, in this extract, that the teacher shows himself/herself as a questioner, a challenger, in the sense of provoking questions, opening dialogue for the investigation of how to do and what to use in exploring the topic in classroom. It is a dialogue that is situated in the mathematical task and in the text that students and teachers produce together, which makes connections of each other’s ideas and values thoughts coming from everyone in the group (GUERREIRO, et al., 2015; ESTEVAM and BASNIAK, 2018). This means that there is a weakening of isolation between spaces of teacher and students, which suggests a pedagogical practice in which spaces are used by everyone, regardless of their location (BERNSTEIN, 2003).

Regarding the way he/she taught (the how) and the relations between discourses, the teacher/student relationship present in the discursive rules was used: selection, sequence, pacing and evaluation criteria. The selection and organization of the mathematical content to be taught and the theme of the mathematical task were built by the coordinator and members of the group, as can be seen in the coordinator’s speech addressed to the group of teachers: “Let’s set up a calculator workshop” (Extracted from ECM3 teacher’s Narrative tab). Thus, we can infer that the choice/selection of content in pedagogical communication may be linked to the idea that what is present in ECM3 text needs to be worked on, configuring fidelity in the selection of content.

In this case, the selection of pedagogical practice contents is made and organized by the coordinator and the members of the group, conferring, a priori, to the teacher to develop what is determined in the material text. This denotes that ECM3 texts report a message in which the selection of topics to be addressed, the mathematical tasks developed and the contents will be defined and organized by the coordinator and group members, that is, centered on the teacher, which characterizes a strengthened framework.

Based on the discursive rule sequence of pedagogical practice contents, we identified the following expressions that denote teacher’s action in explaining the order of solving the mathematical task: “[...] I began the activity by talking about the number pi and about its discovery process, highlighting the role of Archimedes of Syracuse [...]”. In another moment: “I asked them to organize a table on a separate sheet of paper to write down the data so they could organize data collection with the calculation
of the ratio between length and diameter, I asked them to compare it to the value of pi” (Extracted from ECM3 teacher's Narrative tab).

In general, ECM3 texts convey a message characterized by a pedagogical practice with a strengthened framework, since the selection and organization (sequence) of contents are carried out by teacher. Therefore, the use of the verbs “started” and “asked” configures teacher’s total control, since the performance of the mathematical task follows an order determined by him/her.

For the discursive rule pacing of pedagogical practice contents, the materials texts highlighted the time required to perform the mathematical task: “[...] lasted approximately 40 min” (Extracted from ECM3 teacher’s Narrative tab).

However, even though time control can be a markedly strong aspect in the interactive classroom contexts represented in the materials texts, we found no evidence of teacher control marking or controlling time at the beginning or during performing the math task or reminding students of the time limit. So, the rhythm was marked by the speeches of the teacher(s) in the excerpt below:

*The activity started in the classroom where I explained the different types of graphics and the format/nomenclature association. Then, I went with the class to the Education Informatics Laboratory, where I established the questions that were answered succinctly. I wrote down, on whiteboard, the topics listed in table form, including the pertinent quantity for each question. Next, after students had accessed Planilha org. Calc. software, I asked them to transcribe the tables on the computers (Extracted from ECM3 teacher's Narrative tab).*

In this extract, the teacher did not explain to class the time that would be used to learn the content, but his/her speeches during the mathematical task correspond to the strengthened framework, as they represented, in addition to a pedagogical procedure, a mechanism to control the rhythm of teaching and learning relationship. Hence, the pacing of class was explicitly marked by the oral questioning by the teacher(s).

The evaluation criteria discourse rule corresponds to control exercised by material-teacher-student regarding the specification of objectives and indications about the accomplishment of the mathematical task. In general, we observed that the materials texts presented the task objective, as well as explained to students what they should interpret, as can be seen in the sentences: “The objective is to explore the regions of the circle and their denominations”; demonstrating teacher’s action in explaining: “I’ve started the activity by talking about the properties of the circle and its
elements: center, radius, diameter” (Extracted from ECM3 teacher's Narrative tab). Through the materials texts, the evaluation criteria were explained to class. It happened as the mathematical task was being developed, as the teacher presented the objective and the mathematical content of the class. It means that in material-teacher-student relationship, control is exclusively centered on material-teacher, which characterizes a strengthened framework, since the text to be acquired by the student became explicit, in this case, the properties of the circumference.

In terms of what and how dimensions, the excerpts from ECM3 suggest, in general, that the message had the following characteristics: (1) There is a close relationship between mathematical contents, it means, a blurred border between them, which evidences a weakened classification; (2) The interdisciplinary discourses are presented in a totally isolated way, featuring a strengthened classification; (3) Weakening of boundaries between student and teacher spaces; (4) Strengthened framework in relation to the discursive rules selection, sequence, pacing and explanation of evaluation criteria rules (text to be apprehended).

Next, we present the conclusions of the article and discuss the implications of this study for the field of research and practice.

5 What is(are) the message(s) for Educational Curriculum Materials?

As mentioned at the beginning of this article, our objective was to identify and understand the message of pedagogical practice represented in the texts of Educational Curriculum Materials. Thus, we were able to observe, through data generated in this investigation, what can be alluded to about the learning of Algebra and Geometry contents, with the purpose of learning the mathematical content directed to a certain concept (or more than one). In other words, there is a transparency of the text on the subject referring to data exposed there, which, in turn, is the result of intentional production and is elaborated according to a conveniently articulated organization and structure, containing the following items: (i) the topic of the mathematical task; (ii) the objective(s) of the mathematical task; (iii) the mathematical content to be addressed; (iv) the time for carrying out, discussing and systematizing the mathematical task; (v) the operationalization of the topic under study; and (vi) the systematization of learning that took place during the mathematical task solving. Such a structure of ECM can be understood as material message.
We understand, in this sense, that the material message represented by written texts, images, and a set of dialogues about the theme and problematizing the use of the mathematical task, in order to provide practical subsidies that help us understand how pedagogical teaching practices occur, may reinforce or mitigate the learning of Algebra and Geometry contents. This makes it possible to indicate its curricular role of content support, as well as to present instructional functions of ECM (by proposing objective, time, operationalization, systematization of the mathematical task, which aim at facilitating learning) (CURY, 2019). These mathematical tasks present themselves as a possibility for applying this concept and the structural analysis model itself, as well as for organizing the sequenced content, represented in ECM texts, insofar as their structures create, legitimize and reproduce a distance/approximation between discourses and spaces (BERNSTEIN, 1996, 1998). It means understanding that the material message takes place in the arena of context of production and circulation of texts.

With regard to how it can be said, it is defined by teacher's actions when implementing the mathematical task in the classroom, which is triggered by a certain sequence of communicative actions, such as explaining, listening, guiding, asking and accompanying, which have an aim, that is, they are directed towards the achievement of an objective/learning involving a characteristic way of sequencing, with specific actions and referrals that constitute the procedure of how one learns. Teacher's actions are understood, in this document, as forms of participation in educational action, characterizing a message of practice. This message of practice creates, conditions and organizes the possibilities for the variation of control in material-teacher-student relation for discursive rules and regulates the selection of contents to be learned, the sequence established for this learning and the rhythm at which this will occur, as well as the assessment criteria determined (or not) for teaching context, leading students to understand the information, focusing and guiding them to carry out the mathematical task represented in the materials texts.

This means understanding that the message takes place in the arena of context of practice and "reveals a system of practice guidance, for through it occurs a 'natural' selection about what the teacher should learn and, consequently, what he or she should teach and how to do it "reveals a practice guidance system, because, through it, there is a 'natural' selection about what the teacher should learn and, consequently,
what he/she should teach and how to do it” (LOPES, 2015, p.130); therefore, it refers to interactional aspects of pedagogical practice and to those who have control over discursive rules, configuring how teachers provide students with spaces and times for their participation in the development of the mathematical task solving.

In summary, the presented characteristics of the message, present in the three ECM converge toward practice-oriented orientations. Hence, it is an ECM with methodological guidelines that indicate aspects to be considered and mathematical content produced that can be used for/in training of teachers who teach Mathematics, insofar as these guidelines can be involved in exploratory, problematizing, and argumentative activities for pedagogical practice in which the teacher participates, in which it deals, at the same time, with anticipatory pedagogical actions – because they take place before the pedagogical practice (e.g. planning, production, implementation) – and with emergent pedagogical actions - that happen during pedagogical practice (for example, guiding, questioning, explaining, listening, accompanying, asking, etc.), resulting from interactions between teacher and students and among students which occur throughout the development of the mathematical task.

Therefore, what and how can be said, as discussed above, are not isolated, but interrelated in different communicative contexts aimed at teaching and learning Mathematics. Based on the findings of this research, it is possible to deduce two messages from the analyzed contexts: the material message, which is characterized by transparency and text structure, because it contains a set of information for the context of transmission of content discussed in the classroom space, betting on the materials texts as elements that support the learning of teachers who teach Mathematics; and the pedagogical practice message, which is portrayed and characterized by teacher's sequencing of actions and interactions on "how" to familiarize and overcome students' difficulties during the implementation of the mathematical task.

Among the possible fundamental implications highlighted in this study, for the field of research and practice, we emphasize that it is an emergency field of study of special interest, but it is scarcely investigated. It reinforces the need for investigations about ECM arising from public policies in the field of Education and/or Mathematics Education, since the elements of the structure of materials can determine what is taught and how it is taught – this must be contained in pedagogical practice
(BERNSTEIN, 1996) –, and ECM is essential to bring to the classroom new methodological proposals. Such argument can be proven with research results of Lima (2014), Pacheco (2015), Januário (2017) and Santana (2017) when evidencing that ECM is guiding curriculum choices, much more than prescribed documents such as the Curricular Guidelines, and can promote significant changes in teacher and student learning (REMILLARD, 2018).

As for the pedagogical practices of using ECM, studies by Souza (2015), Pacheco (2015), Aguiar and Oliveira (2017) and Diniz (2017) argue, based on the results, that they directly affect learning and participation of teachers when using, in pedagogical practice, as another resource for the realization of mathematical concepts, procedures and ideas. This helps to support teaching work and, consequently, favors student learning through pedagogical teaching practices and through the mathematical tasks used that manage the sequencing of actions.

In addition to the implications in the field of research and practice, we believe that ECM texts can be resources in the training of teachers who teach Mathematics, articulating/deepening both the contents involved in the mathematical task and didactic knowledge.

In order to conclude, what we explain here does not denote a value judgment about the Educational Curriculum Materials analyzed or about pedagogical practices expressed in these materials texts, but considering what was observed in the studies discussed, it may be possible to make the final question: what strategies of resistance and change do teachers exercise when making use of Educational Curriculum Materials?

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