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Engaging young children in collective curriculum design

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Abstract In this study we investigate how 5-year-old children in Brazil and their teachers collectively design science curriculum. More specifically, we develop an agency|structure dialectic as a framework to describe this collective praxis in which science curriculum may emerge as the result of children–teacher transactions rather than as a result of being predetermined and controlled by the latter. We draw on a cultural-historical approach and on the theory of structure and agency to analyze the events showing the complexity of the activity inside a classroom of very young children by science education standards. Data were collected in the context of a science unit in an early-childhood education program in Belo Horizonte. Our study suggests that (a) throughout the movement of agency|passivity || schema|resources one can observe participative thinking, a form of collective consciousness that arises in and from lived experience; (b) learning is a process in which a group is invested in searching for solutions while they create schemas and rearrange resources to evolve a new structure; and (c) the emergent curriculum is a powerful form of praxis that develops children's participation from early childhood on.

Resumo Neste estudo investigamos como crianças de cinco anos de idade e suas professoras produzem, coletivamente, um tópico de currículo em ciências. Mais especificamente, desenvolvemos uma revisão da dialética agency|structure como uma abordagem teórica para descrever essa práxis coletiva na qual um tópico do currículo de ciências emerge como resultado da *transação* professora-crianças mais do que de uma ação planejada anteriormente ou controlada pela professora. Baseamo-nos na abordagem histórico-cultural e na teoria da estrutura para analisar os eventos mostrando a complexidade da atividade em sala de aula de crianças ainda muito pequenas. Os dados foram

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coletados no contexto de uma unidade municipal de educação infantil em Belo Horizonte, Brasil, que se situa no Campus da Universidade Federal de Minas Gerais (UFMG). Esta unidade municipal tem como peculiaridade o atendimento de crianças provenientes de diferentes classes sociais, uma vez que se propõe a trabalhar com a comunidade interna à universidade (filhos de professores, estudantes e técnicos) assim como com a comunidade externa ao redor da universidade predominantemente composta pelas camadas populares. A diversidade cultural que distingue essa escola das demais abriu a possibilidade para as professoras experimentarem novas estratégias no desenvolvimento do currículo. Os eventos analisados neste artigo apresentam um momento singular em que a professora e as crianças categorizam algumas idéias sugeridas pelas últimas sobre o que elas gostariam de estudar, de forma a fazer emergir um projeto de investigação. Essa forma de trabalhar com o currículo na educação infantil requer um alto nível de participação de todo o grupo, uma vez que não se tem de antemão os conteúdos a serem trabalhados. Neste caso, o foco do trabalho da professora passa a ser escutar, interpretar e potencializar a demanda de conhecimento das crianças, abrindo espaço para suas diversas manifestações. Para analisar essa prática inovadora, desenvolvemos uma ferramenta teórica capaz de revelar a dinâmica da emergência do currículo. Por meio da dialética agency|passivity, schema|resources descrevemos e analisamos as ações dos participantes bem como os momentos de pausa e escuta do grupo de forma que as crianças e a professora pudessem criar esquemas possíveis de reconhecimento dos recursos disponíveis. Este estudo proporcionou os seguintes resultados. Em primeiro lugar, a ferramenta teórica desenvolvida foi potente o suficiente para revelar a dinâmica da emergência do currículo. Por meio do movimento de agency|passivity, schema|resources pode-se observar uma forma de tomada de consciência peculiar, denominada *participative thinking,* que surgiu da experiência vivida pelo grupo. Agindo e ao mesmo tempo abrindo-se para a escuta do outro, todos os participantes—a professora e as crianças—puderam manejar melhor os recursos presentes na atividade e construir novos esquemas que lhes habilitaram a categorizar as idéias trazidas pelas crianças. Em segundo lugar, pode-se constatar que a aprendizagem é um processo situado no contexto social no qual o grupo investe na procura de soluções que surgem como resultado da reorganização dos recursos disponíveis e dos esquemas recém criados. Nesse sentido, a atividade em curso faz surgir novas estruturas. Finalmente, nosso estudo trouxe evidências de que o currículo emergente é uma forma poderosa de práxis para desenvolver a participação das crianças desde a educação infantil.

Keywords Mediation · Cultural artifacts · Emergent curriculum · Structure|agency

In this study, we investigate how kindergarten teachers and 5-year-old children collectively design science curriculum and, in the process, how cultural artifacts mediate the events that unfold. We are specifically interested in understanding how such collective work fosters both child and adult development. Using a framework that allows us to see the movement between agency and structure, we present a singular but exemplary instant in which the curriculum emerged in the classroom while the teacher and her students work together to create a task to the liking of the children. Neither agency nor structure can provide a suitable account of what happens, but in and from the tension-laden agency|structure unit, new structure (e.g., curriculum) emerges in indeterminate ways. In this article we provide an account of the resulting curriculum design process that is developed with and for young

children. This account is in terms of agency that mobilizes structures, themselves made salient and enabled by agency.

In a previous study, which articulated and theorized how 4-year-old children from working-class backgrounds participate in science-related activities in Brazilians' early childhood education, we develop a concept of learning as arising from a dialectic of participation in social contexts (Goulart and Roth 2006). Our previous study shows that students' agency constitutes the core of the driving force of children's engagement in science-related activities, but is itself enabled by extant, within-person (schema) and across-setting structures (resources). Moreover, students' agency is inherent in and constitutive of participation. The study of children's agency was fundamental to help us understand children's development and learning in science during their early years in and through collective praxis that involves their peers and teachers. In the previous study, we investigated children's engagement in tasks that the teacher had designed. The present study takes into account the dialectic of participation in social contexts and goes beyond our previous work in exploring the agency|structure dialectic while teacher and very young children collectively design science curriculum in, for, and constitutive of their classroom community.[1] Collective design expands not only the control of the community as a whole but also of each member, who, by contributing to the collective endeavor of curriculum design, also expands his/her individual control over the learning environment. That is, this activity is reflexive and recursive in that the members design (future) what the community members will be doing all the while participating in the doings of this community.

As a result of their collective activity, the teacher and children evolve an *emergent* science curriculum, which is a pedagogical strategy that—as our research shows and has shown—has a great potential for creating a positive atmosphere in which all participants exercise agency. In fact, the main purpose of science curriculum in early childhood education is to give young children a new perspective of/on their surroundings by following the lead of their questions, supporting their own investigations, and making available resources that allow them to mobilize their agency. This allows children to gain confidence in their ability of right-correct-valuable judgment of the environment that they inhabit as much as they themselves make it habitable. In other words, science curriculum in early childhood education gives children the opportunity to understand the structures of the social meanings of their surroundings, which thereby become their lifeworlds where they, too, feel connected with nature itself. This is evident in the following episode, narrated by the teacher in one of the meetings for the teacher's professional development.[2]

On this day, the 5-year-old children are asked to provide an existence proof for air in and through a variety of experiments. At some point, one of the children questions the teacher about the possibility of actually seeing the air surrounding them, since it appears to be invisible. Instead of answering the child's question, the teacher invites the group as a whole to go outside and see if anyone could see the air:

01 C: Okay, vamos lá fora ver se alguém pode "ver" o ar.
01 C: Okay, let's go outside to see if anyone can "see" the air.

By inviting them to go outside, the teacher opens up new opportunities for the children to get in touch with their everyday environment, looking for signs that might provide them with clues for the presence and existence of air. Going outside changes the contextually available structures and thereby enables new forms of action (agency) that are not available

[1] The classroom community is both context and product of the teacher's and children's participation.

[2] Pseudonyms are used for the teacher and the children.

in the classroom itself. Once outside, the children note, for example, the movement of leaves in the trees, a fact that leads Roberto to conclude:

02 R: Não é o fantasma que move as folhas da árvore, é o vento.
02 R: It is not the ghost that moves the leaves in the tree, it is the wind.

In uttering, "Let's go outside to see if anyone can "see" the air" (turn 01), the teacher takes the child's question as something meaningful and, by returning the question to the children, empowers not only the questioning child but also the classroom collective as a whole.

From the teacher's discourse and pedagogical choice (to actually take the students outside) it is possible to extract three different dimensions of an innovative practice in science curriculum during and for the early years of education. First, she invites the whole class to go outside and thereby gives her students an opportunity to experience the natural phenomenon under study, integrating them (students and herself) in the investigation. That is, the teacher addresses the whole classroom, including herself as a member of a group that wants/needs an existence proof of/for air. Here, the teacher's response reveals that the question one child proposes is relevant not just to his own learning and understanding, but also, in fact, to the learning and understanding of the classroom collectively. Second, in uttering the word "see" the teacher marks perception as a relevant *sense* for discovering material signs that might allow students to *make sense* of the question and to potentially answer it. Thus, the student's question is legitimated by the teacher who provides the classroom collective with an opportunity to explore the phenomenon together, from their actual points of view and within their current horizon of possibilities of learning and understanding. Third, the teacher's stance encourages the students to share their questioning, to ask about what appears to *them* to be important and salient issues, activating their curiosity about the material world while offering them a time, place, and space for investigating these topics together. She thereby creates the possibility for the children to experience a *sense* of agency and the ability to contribute to the decision-making about what and how to learn.

Once outside the classroom, the children and their teacher have new opportunities for acting. For example, they may identify signs in nature that might provide them with evidence of the existence of air. They may see leaves moving in the trees, a fact that allows them to conclude that a possible agent moving the trees was wind, moving air. Roberto's affirmation that it is the wind who moves the leaves in the trees (turn 02) is evidence of the child's awareness of his own surroundings, and, in this case, is evidence of a significant observation related to his object of study (e.g., air/wind). At that very instant he articulates evidence for the presence of air. It is a salient response to a legitimate question. We observe evidence here for something that might be explained by a psychological schema—i.e., an *ideal* (in contrast to material) structure associated with an aspect of the material world[3]—that emerges from the experience of dealing with the resources at hand: The tree, its leaves, and the presence of wind, all accessible because the students are outside of the classroom. But, this experience also presupposes social-psychological schema by means of which Roberto connects his own sensual perception of the wind to what he sees happening in and to the tree. According to a cultural-historical perspective, it is an apparent

[3] We use the term "ideal" in its cultural-historical activity theoretic sense, that is, as the dialectical complement to its material equivalent. The ideal|material dialectic maps a similar terrain as that invoked in saying that the *material senses* are at the source of *sense making*, i.e., having *ideas* about some aspect of the *material* world.

contradiction, as there cannot be inherent psychological schemas prior to experience. Thus, "sign-using activity in children is neither simply invented nor passed down by adults; rather it arises from something that is originally not a sign operation and becomes one only after a series of qualitative transformations" (Vygotsky 1934/1978, p. 46).

This episode provides us with an example of the way teachers might want to follow children's investigations about their object of study, grounding science curriculum in children's own present perceptions of the environment. It is noticeable here that the teacher in our example presents a context in which children may identify resources for investigating their surroundings. Here again, we have a clue about how structure and agency come about in, and by means of, the children's lived curriculum, not only in its design, but also in what is learned. In this episode, the children experience the phenomenon they are studying in two different ways. First, they are connected with the environment and articulate their own sense, and from their sense perceptions emerges the sense that they are making of the world. Second, by observing the movement of the leaves in the trees, the children have a material object as a resource that provides the opportunity to (a) talk about what they experience, which is something that they cannot directly see (e.g., air/wind), but which is there, and they find evidence of its presence; (b) explain the phenomenon (air/wind) and contrast it with another way of seeing the world; and (c) perceive and comprehend the phenomenon, that is, now they have more resources for talking about the natural phenomenon that they are in the process of studying.

It is from episodes such as this one that we have come to articulate this study around the exploration of agency and structure while a teacher and her very young children collectively design a science curriculum in their classroom. In this paper we describe and analyze an event in which another group of 5-year-old children and their teacher are collectively designing a topic for their science curriculum. The event involves some artifacts, a yellow poster board and some cards on which thematic worlds selected by the children are noted. Mediated by speech, gestures, and body movements, the teacher and her children engage in an effort from which the conceptual structure for a science curriculum emerges. The aim of the currently enacted curriculum task is to organize the ideas that children have ventured during a previous lesson about what they want to explore more systematically by means of a science project. In subsequent sections of this paper we follow the first few instants of the design lesson, when the teacher and the children organize the ideas noted on cards by categorizing them. In this episode, the teacher and children sit in a circle on the floor, an aspect that is part of everyday kindergarten life around the world. In the course of this movement it is possible to see the process in which the science curriculum emerges and motivates the entire group. To analyze the events we conceptualize a dialectical agency|structure unit reproducing and transforming itself dynamically in the dialectical production of the lesson. With this analytical tool at hand we subsequently expand the possibilities of articulating the salient issues.

Dialectical unit of agency and structure

We have noted something like a common belief among educators and researchers that small children do not have enough cognitive resources to engage in more complex tasks, that is, there appears to be a belief that their age limits what very young children can learn. Some researchers criticize this assertion and show us that children do have creative potential from their early age on (e.g., Kirch 2007). In our theorizing, we do not begin with such presuppositions but allow the problem whether very young children can participate in

complex tasks to be an empirical question. In the process we may find that very young children not only participate competently in designing science curriculum but also that they, in turn, produce resources that enable teachers to improve their pedagogical practice.

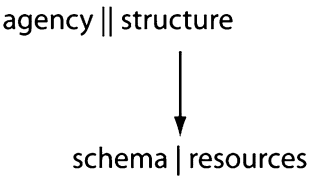
To recognize children's participation for what it is we have to take into account their (own) point of view, that is, the way they perceive their environments, their lifeworlds, and how they deal with the resources and the schemas that they have at their disposition for acting in a productive way. For doing so we now articulate the theoretical tool for analyzing the events in this classroom of 5-year-old children. This framework allows us to understand how the teacher and the children create the activity that permits the emergence of the science curriculum topic in the movements within an agency|passivity dialectic. In designing curriculum together, the teacher and the children in our introductory episode provide one another and themselves with new resources. The children articulate ideas and questions and the teacher turns children's ideas into resources that subsequently enable the entire group to sense, and make sense of, new phenomena. Precisely because the children and the teacher have different backgrounds, different experiences, and different ways of perceiving the ongoing class events, their worlds meet allowing both to move beyond the evident limits of their respective current horizons. At this instant they are both entering into an unknown endeavor, one from which learning emerges in indeterminate and unanticipated ways.

The episodes analyzed below illustrate *participative thinking* in the classroom, a form of consciousness that arises from collective praxis and collectively lived experience (Roth 2008). The praxis constitutes the overarching, all encompassing unit that cannot be further divided into independent elements without losing the phenomena of acting, thinking, and speaking (Vygotsky 1986). This unit incorporates inner contradictions because of the irreducibility of structure to agency or agency to structure: the agency|structure dialectic embodies this contradiction.[4] The societally and culturally structured world not only constrains human actions, but also affords people with the power to act and take control over the world in dialectical production, that is, reproduction and transformation of relevant structure. For instance, in the previous excerpt the teacher and the children are constrained by the educational structures that also enable them to reproduce early childhood education in Brazil (which is characterized by children grouped by age, especial activities planned for inside and outside classroom). However, as the teacher listens to the children she uses her power to act to generate new structures on the inside of the educational system by going outside the classroom and thereby allowing children's questions to drive the curriculum. This means, she does not feel restricted to using the space of the classroom to develop the task, as this might be for many of her colleagues, but she changes a consolidated structure in early childhood education and thereby enlarges her and her children's room to maneuver in anticipation of even more room to maneuver to emerge from the resulting events in the school yard.

Structure involves the dialectical relationship between (material, societal, cultural) resources and (mental) schema (Sewell 1992). In acting, human beings mobilize resources that they recognize in the environment: the *ideal* schemas generate the (*material*) perception of the (material, societal, cultural) resources, but the (material, societal, cultural) resources themselves release relevant (ideal) schemas. More so, the schemas have developed in the course of human transactions with the world from which the resources have

[4] We understand this relationship by means of the analogy with light, which can be understood, depending on the situation, as a wave or as a particle. But neither wave character nor particle character can be reduced to the other that is, explained by means of the other perspective.

emerged as salient figure against a more diffuse and unarticulated ground. Returning to the opening episode, we may think of the movements of the material leaves in the trees as resources that come to exist as soon as they are salient to the children. From this encounter emerges a new schema that enables them to cognize and re/cognize these same resources—the movement of the leaves in the trees—and thereby move to a new form of understanding that now is incorporating the phenomenon of air. Here, then, a new resource emerges in and populates the children's lifeworld both in ideal and material form: they now actively sense the movement and make sense of it as evidence for the presence of moving air. In this case, the schema arises from an orientation, the taking up of a position with respect to the world from which emerges the experience of observing a phenomenon that can be perceived, pointed to, and talked about within the collective as a whole. That is, the movement of the leaves has become a collectively available resource (material sign) for supporting arguments about the existence and presence of air. The dialectical theory therefore can be expressed in terms of the following model.



To understand the power to act—i.e., the degree of agency mobilized at an instant of praxis—it is necessary, however, to capture another *moment* of human experience that stands in an asymmetric relation to agency.[5] This moment is passivity, which is the dialectical complement to agency (Roth 2007). Passivity does not mean not participating or not being engaged in a situation, because saying "I don't participate" or "I don't talk" simply means being agential about non-participation. Rather, every aspect of agency is accompanied by passivity, a fact that we can easily understand when we think of the material body as resisting movement. The necessity to include passivity in a theory of agency also is evident when we consider the sense of touch, which requires the movement of the fingers across a surface and the opening of the sense of touch so that it can be impressed upon by the environment. Agency|passivity therefore constitutes a dialectical unit. Thus, for example, when Roberto and his peers do go outside and *actively orient* their senses *to be impressed by* the world, here the light from the leaves that allows them "to see" the movement, to be impressed by it (literally, metaphorically, and therefore metonymically), and therefore to make sense. Learning about something we have not known before therefore means both moving forward into new terrain *and* opening up to allow the senses to be impressed upon, which leaves a trace in our bodies that allows us to make sense, which is sense itself.

This ever-so-brief analysis shows how making sense by mobilizing the senses is both agential and passive so that passivity becomes an irreducible complement of agency. Bringing passivity into its appropriate place, that is, into a dialectical relationship with agency, allows us to improve the theoretical framework to understand *participative*

[5] Consistent with materialist dialectics, we use the term *moment* to denote any structure that is smaller than the unit. As outlined, moments are not elements, because structures smaller than the unit cannot be understood independently because they are mutually constitutive and therefore express the unit only one-sidedly and incompletely. We use the term "instant" whenever we refer to time.

thinking in a dialectical perspective. The theoretical structure of agency and structure can then be expressed as

$$\text{agency}|\text{passivity} \;||\; \text{resources}|\text{schema}.$$

In this study, we articulate lived curriculum in terms of the articulated dialectic. Our analysis goes further, as we create a tool to analyze the events and to conceptualize praxis when small children design curriculum collectively. Within any moment of praxis, the agency|passivity dialectic embodies contradictions, which means to act (to create new possibilities of being in the world) and to stop (to be opened for recognizing the available possibilities). The relation of agency and passivity creates tensions from which learning and change emerge in indeterminate or unanticipatable ways. Using this tool as resource, we now turn to the analysis of the events that allowed the kindergarten children and their teacher to design curriculum together.

The context of this study: transforming early childhood education through research—practice partnerships

The concept

The present research took place in the context of a unit of early childhood education in its first year of operation, in 2007. This unit is located on the campus of the Federal University of Minas Gerais, Belo Horizonte, Brazil (Fig. 1). The university itself and the municipality concomitantly support this unit. For this reason it is available to the university community (including the children of professors, students, and employees) and to families who do not have members working at the university. Hence, this school accommodates a diverse set of social classes (e.g., middle and working class children), a fact that distinguishes this school from other Brazilian establishments that are attended by children from specific social classes. In the context of Brazilian early childhood education, the mix of social classes in schools such as it is practiced in this unit is a novelty. This project therefore also has political overtones in that it attempts to break down the social barriers still prevalent in Brazilian education. This innovation led to numerous discussions in this unit of early childhood education, especially during its first year, a process amply documented at many

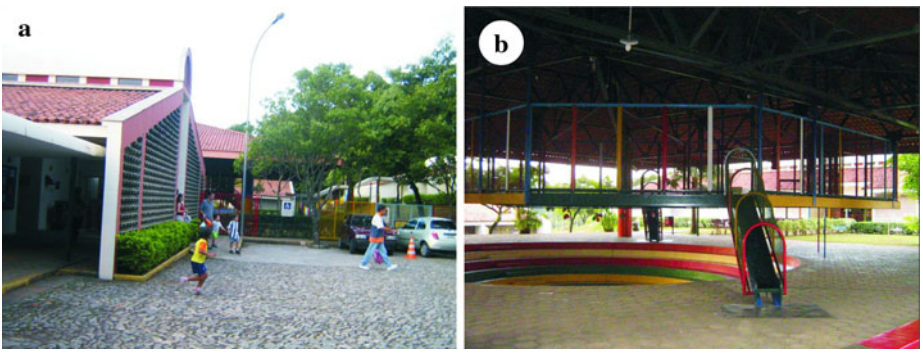


Fig. 1 View of the *Unit of Early Childhood Education* at the Federal University of Minas Gerais. **a** Children leaving the premises; **b** the play area

levels in our data sources. The discussions involved the school principal, coordinators, teachers, and parents, the main concern being the re-conceptualization of the ways of understanding children, parents, and curriculum. This is an ongoing process still under way, and the participants are still involved in attempting to conceive, realize, and make successful this novel political-pedagogical project.

Although more child-centered educational practices are already reality in much of middle-class early childhood education in Brazil, it is not common in working-class schools. To the present date, working-class children are restricted to day-care programs, where they do not necessarily have access to the same cultural resources available to students in schools for the upper classes. However, this situation has changed somewhat in the course of the past decade with the inclusion of early childhood education in the basic education system. This inclusion, which was a result of a large social movement, has unleashed a series of changes in the way kindergarten teachers have developed their classroom practices. The process of increasing child participation in classroom events has been a challenge for these teachers because it requires them to manage more exploratory work on the part of the children (Quinteiro and Carvalho 2007). This challenge leads to others that teachers are unfamiliar with, such as having to deal with unexpected moments (i.e., aspects) inside the classroom and also with uncertainty. If we change the perspective of work with the children, that is, if we do not ground the practice of kindergarten pedagogy in direct teaching—a flow of knowledge from teachers to children—but in supporting children's way of seeing and interrogating their surroundings, then we will meet the unexpected and uncertain. The uncertainties of both how to explore the content chosen by the children and how best to support the child and to conduct positively the activity has been a considerable challenge experienced by the Brazilian early childhood educators as a consequence of opening up to an increasing participation of children. It is precisely in this context that our study situates itself, concerned with understanding a more child-centered approach not only to learning in given curriculum structures but also to the designing of these structures.

The discussion of involving young children in the shaping of curriculum is not restricted to the Brazilian educational system. Over the past decade, the quality of early childhood education has been the subject of discussion among educators and researchers around the world (e.g., Rainio 2007). The discussion focuses on the enhancement of the quality of the learning environments for young children and the role adults should take in those settings. The main purpose has been to improve the conditions for children's development by increasingly making room for their participation. This movement has created opportunities for shifting early childhood education practice, theory, and research.

Within this discussion about the changing nature of early childhood education, the curriculum for young children has been problematized. It was in Italy that the concept of a "contextual curriculum" was created and developed from the early 1980s onward (e.g., Rinaldi 2006). The basic tenets of a contextual curriculum suggest that what we teach children is not a list of contents determined in advance by coordinators or administrators, an organization of educational settings in which teachers and children lose their ownership of their own learning. Instead, the new focus is to listen to children, hear and interpret what they say, and then mobilize resources that allow the children to empower themselves in their cognitive needs and demands. In this sense, listening on the part of the teacher is more than just hearing what the children say, but making themselves available to the children and engaging them in a variety of forms of expressing themselves and registering the experience that they have. Children, in the first years of their lives, experience their surroundings and develop suitable theories about the physical and societal world that is

enriched and challenged through dialog with others. In this process, children acquire an awareness of their capacity to think, have an opinion, and develop an identity. The main purpose of a contextual curriculum is to sustain these competencies and to open up spaces for children's manifestations of the sense they make in the process of a dialectical production (i.e., reproduction and transformation) of the curriculum.

This way of thinking about quality in early childhood education is aligned with a concept of development and learning in which human beings do not respond to stimuli but to lifeworld structures (Holzkamp 1992). According to this view, human beings live in a world always and already (societally and culturally) structured and do not only react to the contingencies posed by the surrounding world but also have the power to transform this world, which implies their agency to promote changes all the while being passive with respect to a world that predates their own existence. From this perspective, there is a dialectical relationship between the individual agency and the structures of their lifeworlds, which means, the structures constrain actions but, at the same time, by means of their agency|passivity, human beings can change and be changed by societal conditions. In this way, teachers and children who participate in our research are not just constrained by the educational structures (e.g., the educational system, the school's policy, the activities that they should develop, and so on), but also they mobilize their power to change their life conditions.

Others, too, become involved in the education of the children, and in their involvement, increase their power to act. Thus, in our project at the Unit for Early Childhood Education, parents are actively involved (e.g., Fig. 2a) and the constraints placed on what should happen and the associated possibilities for the lived curriculum emerge especially from the parents' demands. For example, as this unit is attended by children from different social classes the expectation concerning schooling differs among parents. There is a tendency on the part of middle-class parents to request tasks to be based on curriculum contents, especially literacy, versus a tendency on the part of working-class parents to request tasks that ensures childcare. Within this movement, which expresses constraints and possibilities for actions, the educational phenomena we are reporting here develop.

The proposal for an emergent curriculum for early childhood is linked with this view of human development. It is a proposal for allowing children's agency to develop further at the very instance that their agency is called for. Hence, the curriculum emerging in our project promotes a greater participation of children beginning in early childhood. This also constitutes a powerful instrument to a problem frequently identified and criticized

Fig. 2 **a** Parents inside the school; **b** view of the classrooms from the courtyard

especially in the western world: Educational institutions fail to develop in students a critical and a creative attitude that allows them to participate as full citizens in political-societal process, thereby contributing to develop a democratic society. Unfortunately, most schools still ground their pedagogy in a transmissive teaching, based on student's inertness, which shows a strong tendency to reproduce this cycle (Freire 1968/1987). Especially in Brazil, where the society struggles with tremendous inequality, this approach to early childhood education therefore has tremendous possibilities for changing society as a whole.

The project

This study is part of a research program concerned with the practice of early childhood education in the public schools of Belo Horizonte, Brazil. We investigate the possibilities arising from children's participation in the social-societal context in an experimental school (see Fig. 2b for a view of the classrooms from the courtyard). Within this overall program, the present study was conducted in a unit attended by 200 children from the ages of four months to five years. The episodes analyzed here derive from the events in one class of 18 children and their teacher. Ten of the children are from the working class—parents' formal education include elementary school and, sometimes, part of high school—and eight come from middle-class families—the parents from the middle class generally have a university education, some being professors at the university. All of the children have had school experience before arriving at the Unit for Early Childhood Education.

Since our study took place during the first year of the school's operation, the teachers in this school, too, come from diverse schools—and have different levels of teaching experience. The two teachers that worked with the 5-year-old children had different backgrounds. One of them had graduated with a degree in pedagogy; she had specialized in early childhood education. The other was in the process of taking a course in pedagogy at the university. Both were adjusting to the environment and the school rules, especially with respect to the different kinds of parent demands.

Data collection began during the first month of the school year. As a professor in the Faculty of Education at Federal University of Minas Gerais, the first author Maria Inês had a special role. Because this was a new project, members of the education faculty were called upon to assist the school in accomplishing its Political Pedagogical Project (PPP). Thus, the first level of the research project was to follow the PPP group, which included the school principal, coordinators, teachers, members of the municipality, professors, students from the faculty of education, and parents. At a second level of the project Maria Inês assisted the teachers of the 5-year-old children to reflect about the curriculum in their classrooms. Once a week, these teachers met with her. Together they watched lessons that had been videotaped in the teachers' classrooms and elaborated new ways of engaging the children that would promote them to learn. At a third level, her involvement consisted in an immersion experience in the two classrooms for 5-year-olds, where she also videotaped the science lessons that the teachers taught during the meetings. Here, the purpose was to follow how the children and their teachers appropriated and enacted the planned science curriculum.[6]

[6] The second author (Wolff-Michael) became involved as an analyst. Already in a previous project, the two authors had collaborated in making sense of the data that Maria Inês had collected. As an outsider, he was in an ideal position to enact an analysis from a first-time through perspective. This perspective prevents readings and hearings in which the final outcomes of a study, inherently unknown to all participants at the time of data collection, are taken as a posteriori resources to explain why things have happened in the way they did.

As everybody was new to the school, the first approach was to assist children and teachers to create a new habitat (lifeworld). It is not surprising therefore that they decided to get to know and understand the school and its environs as a place that they inhabited and created for habitation. As the school was located on the university campus, teachers and children planned field trips into the environs. During these trips the children could see the variety of the environment and felt fascinated with the woods and the creek on the campus. The two teachers planned together a variety of tasks to involve the children and to create a good atmosphere that allows them to go further asking questions and making hypotheses about the environment. Music about Planet Earth's care and drawings and a big panel built with the help of the children are examples of what the teacher proposed. After these initial tasks the children and the teachers were ready to design a specific topic of science curriculum together.

The circle: places and spaces for children and teachers to design science curriculum

This investigation was designed to explore two main questions: (a) what is required for the teacher and the children to achieve the complex activity of designing a curriculum? and (b) how does a teacher consciously and unconsciously conduct her/himself in and toward this trajectory? In the episodes that we present next, the teacher and the children, mediated by language and artifacts, collectively design a curriculum. The perspective we adopt in this investigation takes salient forms of language and artifacts as potent mediating resources. Language is understood in its double function: expressing and producing thoughts. Artifacts can be recognized in their main function, that is, to mediate the transactions[7] of human subjects with one another and their actions toward the physical world. Because of their instrumental and communicative character, these mediating resources render irreducible the relation between the individual and the collective. In this context, we describe and theorize the trajectory of the process of designing science curriculum collectively. Using the materials at hand, the children and their teacher produce a movement that allows us to see structures and agency in a dialectical perspective.[8]

A way to see how a new curriculum plan emerges from the enacted curriculum in this lesson is as follows. Having brought some artifacts—a poster board with cards on which the ideas students uttered on the previous day are noted—the teacher asks for suggestions on how to place the cards. Because she asks the children, the teacher cannot know what they will say, and therefore she cannot anticipate what will emerge from this lesson segment. As soon as the first card is placed on the poster board, a new resource for action and therefore new action possibilities become available. Some of the emerging possibilities are realized by the children and the teacher, leading to ever-new possibilities and opportunities. The specific end result of such a lived enacted curriculum cannot be anticipated. We use an agency|passivity dialectic as the origin of the emergence of the curriculum. We describe and articulate the process in which the vision of a curriculum motivates praxis and the concrete result of which will be a curriculum plan. We describe the episode in three

[7] The term transaction refers to the relationship between moments of activity, that is, structures that cannot be understood on their own.

[8] Fifteen lessons (learning sessions) were videotaped between May and November of 2007. After the class, collaborative meetings amongst teachers, coordinators and Maria Inês were held, where they discussed what had happened in that day, as well as to prepare some possible ways to continue to explore the unit with the children. The episodes we analyze next were extracted from the first learning session that occurred in May 24, 2007.

sections. In each section, we articulate, drawing on the agency|passivity dialectic as a device, those moments of activity that either elucidate children's voice or exhibit how they co-participate in designing the curriculum with the teacher.

In the first section we illustrate how the teacher organizes the classroom space (forming a circle with the students around the pedagogical materials) in such a way that a focal point emerges from the resources at hand, a space that in turn organizes children's and teacher's participation. This focal point is important for subsequent orientation, as the class collectively makes sense of the ideas that the children have articulated on the previous day, now recorded on individual cards. In this view, we show how agency is activated and mobilized to create structure, which simultaneously (a) generates more room to maneuver for the teacher and the students and (b) constrains future actions. We also articulate how participants in this context need to accept being affected by learning, as one cannot predict how the situation and the Self will be transformed in the process. The teacher's reception of children's silence, for example, serves us to illustrate with a concrete example how agency realizes itself in passivity as the teacher lets herself be touched by the resources at hand (which include the students' silence), resulting in dialectical production that not only reproduces but also transforms (expands) her agency.

In the second section, we complete that analysis by illustrating how participants produce new schema to deal with existing resources. We thereby articulate the resources|schema dialectic in terms of the agency|passivity dialectic. These new schemas give the students and the teacher opportunities to make sense of the ideas that the children bring or have brought forth. In the final section we articulate an instant in classroom praxis when the children and the teacher experience an impasse, and show how resolving (i.e., transforming) the situation pushes the activity ahead. In the course of this account, we show that both the teacher's and her students' engagement can be described in terms of the agency|passivity||resources|schema dialectic, and that this dialectic allows us to observe the emergence of the curriculum.

The emergence of a focal artifact

A previous study has shown that artifacts play an important role in mediating transactions amongst participating subjects and provide resources for individuals to make sense of the situation (Roth et al. 1999). These tend to orient participants spatially, socially (group size), and intellectually. The three moments of space, social configuration, and cognition transact such that they give rise to different forms and contents of talk with only slight changes in one of the moments. Thus, artifacts provide resources to structure activities, mediate conversations among students and teachers, prepare and set up scenarios in which actions and conversations may unfold, and shape the curriculum that thereby both goes on and unfolds (takes on new and unexpected aspects).

As a way of organizing the science curriculum around the students' ideas and experiences, Denise, the teacher of the 5-year olds in this study, asked her students on the day before what they wanted to study. The children offered up many topics. On this day in the circle (Fig. 3), Denise tells the children that she had noted on the cards what they had said during the lesson of the previous day. She continues.

01 Denise: Turminha, olha aqui. Vocês disseram muitas coisas que vocês gostariam de estudar. Mas eu acho que nós vamos ter que organizar isso, porque tem muita coisa que vocês gostariam de saber.

01 Denise: Kids, look here. You said a lot of things that you would like to study. But I think we have to organize it, because there are a lot of things that you would like to know.

With the pile of cards in her hand, Denise reads the cards one by one before placing them seemingly randomly on the poster board. She does so by first holding the cards with her right hand, and reading aloud what is written on the cards, thereby making available to the students the content of each card which she then places on the poster board (Fig. 3a). During the time that Denise displays the cards on the poster board, none of the students utters a word. The only sounds that can be heard are those that Denise's voice create.

02 Denise: Olha: o céu; o planeta; a lua; como as flores nascem? A neve; como fazer gelo; o que tem no jardim das flores? flores, fogo e lenha; o balão e o ar quente; sol; nuvens; dinossauro; as estrelas; o mar; a Terra; a água; como é o fundo do mar? como se constroem as coisas? Mas nós não podemos estudar tudo junto.

02 Denise: Look: the sky; ((Denise displays this first card on the bottom of the poster board and then the others, one by one)) the planet; the moon; how the flowers are germinated?; the snow; how to make ice; what is in the flower garden?; flowers; fire and firewood; the balloon and the hot air; sun; clouds; dinosaur; the stars; the sea; the Earth; the water; how is the bottom of the ocean? How can one build things? But we can't study everything all together.

As soon as she places the first card ("the sky") on the bottom of the poster board, it becomes both a resource and a constraint for subsequent actions. Anything done after this placement is with respect to the previous action and the position that the "sky" has taken on the poster board. Denise's actions mark the beginning of a perceptive order with respect to which any next card would have to be placed. Both as resource and constraint, the first card and the way it orients and marks the space within the circle affords resources to the agency|passivity dialectic. Even (and precisely) when a subsequent action has been enabled ("afforded"), it is passive with respect to this enablement. Thus, if the next card were to be placed next to or on top of the first card, the action would denote that there is something that is the same about the two cards (contents); if the next card is placed somewhere else, it might indicate that there is a difference. That is, the first card on the poster board provides the opportunity to express sameness or difference in the next action, an opportunity that comes with the placement of the card but did not exist before. Thus, because of the radical uncertainty the outcomes of any action constitute both resource and constraint. The subsequent action, however, is confronted with the existence of the first and is passive with respect to the enablement or constraint created by the first.

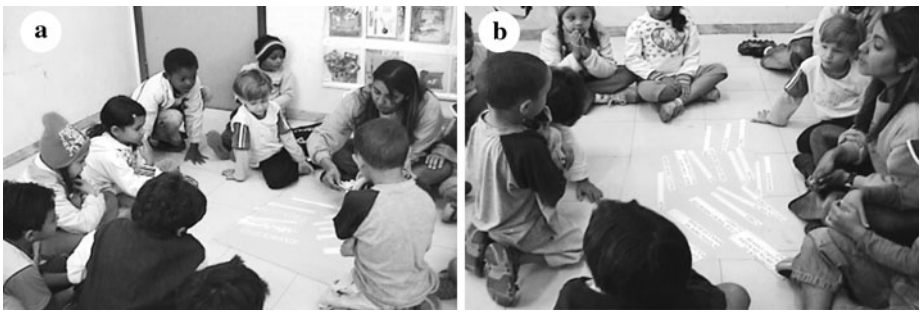


Fig. 3 **a** Fernando, who is sitting outside the circle, close to the door, turns his gaze when Denise displays another card; **b** all the cards are displayed on the poster board

The way in which Denise's action unfolds encompasses, therefore, the agency|passivity dialectic. In displaying the subsequent cards, one by one on the poster board (Fig. 3b), Denise makes this resource available for the children. Each one of the cards is a resource and a constraint that sets up the starting point of what can unfold thereafter. This focal point makes for a strong engagement among students in the sense that whenever the teacher adds a new card to the poster board, the children look at it (even Fernando, who at this moment is sitting somewhere else outside the circle, turns his gaze to the poster board at some time that the teacher adds another card, as illustrating in Fig. 3a). Denise displays the cards in front of the children as if they could read them, although not everyone in the circle is completely alphabetized. These embodied actions (reading the cards aloud, spreading them on the poster board, gazing to the children and being together around it) are an invitation to participate. In this scenario the teacher is actively passive in relation to the outcome of her own action whereas the children are passively active in relation to the disposition to participate in the activity.

After reading and displaying the cards, Denise affirms that they cannot study everything all together, because of the large number of cards they can see spread out on the poster board ($N = 19$) (Fig. 3b). Denise thus suggests that they have to organize them. Hence, at this moment of the teacher—student transactions, the artifacts (i.e., cards and poster board) provide opportunities for mediating students' memory, perception, attention, and thinking about the activity. We observe transactions because the teacher, too, learns from the engagement with the children and improves her professional practice. Participation *is* learning because it inherently leaves traces within, and therefore transforms, all participants.

The process of making the emergent curriculum suggests that participants work towards something that they want to investigate (both actively and passively), the arising motive being oriented to a certain object. This object/motive then becomes the orienting moment (the "object/motive") in subsequent activity (Leont'ev 1978). That is, participants are actively expressing their intention to investigate, but they are at the same time passive with respect to *what* they will learn, for if they already knew what they will learn, they would not have to learn it. The focal point, initiated and offered up by the teacher, therefore generates a growth point, the beginning of a phenomenon that unfolds in time as it concretizes itself; and in concretizing itself it develops. From this movement, the plan for a curriculum emerges out of the presently enacted science curriculum. We now return to Denise and the children in the circle.

03 Professora: Quem vai me ajudar? Oh, de um lado…
03 Teacher: Who is going to help me? Oh, on one side …((the teacher rests her hands over the poster board.))
04 nós podemos colocar tudo
04 we can put everything ((Denise adjusts the card where is written the word "water" to set a space, which is in the top of the right part of the poster board. With her right hand opened, she marks the top of the right space in the poster board))
05 que… deixa eu ver…
05 that… let me see… ((Her right hand goes from up to down in the right part of the poster board.))
06 (0:07)
07 está na água? Como nós podemos colocar isso?
07 is in the water? How can we put it? ((She moves her gaze from the poster board to the children, turning her head from one side to the other, looking at all the children.))

In this excerpt, the teacher proceeds by asking children for help ("who is going to help me?" [turn 03]) and by stating an idea of her own ("in one side we can put everything that…" [turn 04]). Through her gesture—resting both open hands over the cards—she makes available to and for the students what "everything" really means, that is, all the cards. She gazes at the children and says, "let me see… "(turn 05) inviting them to participate. At the same time, she adjusts a card on the poster board (Fig. 4a), letting herself be helped to find the right word before she continues, "is in the water?" (turn 07). She thereby suggests that she might be looking for cards mentioning things that could be found in the water. By looking at the cards, Denise makes it possible in this way to *receive* inspiration for specific words, though we do not know without further evidence which words suggested themselves to her. In fact, we are always passive to our own words, the words we use in speaking, which most frequently come out of our mouths, sometimes remain at the tip of our tongues without any chance to force them out, and remain inaccessible at times despite all efforts of seeking them. In speaking, in contrast to writing, we do not *construct* sentences but receive the words; and grammar is as much a situated achievement that we succeed in as much as we receive it.

Exhibiting an instance of the agency|passivity dialectic, Denise initiates the cards' categorizations for the entire group. As resources and constraints, the cards are spread out on the poster board. They constitute a physical memory of what has been done on the day before, and they constitute materializations of the students' ideas to be manipulated to create a curriculum plan.

At the same time the cards also imposes limits to what will be done in the course of this unfolding curriculum because each idea appears only once and the poster board delineates a limited space for the organization of the existing cards. The task in itself is open-ended. The teacher has not brought it "ready-made" from home, suggesting that she is open to give up a categorization aligned with her adult perspective. Rather, she opens up to existing possibilities from which an order will emerge that results from a genuinely collective endeavor. In so doing, the teacher and her students are in a position of speaking, hearing, and enacting knowing in each instant of the activity. This speaking/hearing complement enables Denise to guide and to be guided at the same time, allowing the emergence of a categorization system for the cards. Contributing by picking up the "water" card and managing a space around it on the paper, Denise sets the beginning of a trajectory, in which eventually all the group members will walk. However, the way it will happen is still open, and it will depend on the participation of the group.

To conduct such an organization, schemas—i.e., specific perceptions of the resources that are part of the social structures—are required. The resulting organization of the cards itself will constitute a new schema in which the students' interests will be arranged and connected to one another. For example, to design a curriculum in such circumstances, a

Fig. 4 **a** Denise adjusts the card that contains the word "water" at the top of the right side of the poster board; **b** Denise marks the right side of the poster board to be water's side; **c** Denise marks the left side of the poster board to be land's side

first schema is needed to enable the recognition of the resources at hand (material artifacts, but also the other participants). Thus, as the teacher is the most experienced individual in the group, she is the one who can read the cards (oriented to her) and recognize them as resources for the creation of new schemas. Because Denise acts as a mediator between cards and children—by reading the contents of the cards aloud—the students are enabled in their agency related to the use of some aspects of the resources to develop new schemas, which means, to recognize the cards as resources for creating categories for organizing and determining the planned-curriculum-yet-to-come. Partly because of her position as a mediating agent, the teacher is also the one who proposes to the students to engage in organizing the material. Looking at the students she says, "let me see," and then awaits children's manifestation of ideas. For a fragment of 7 s (turn 06), she is waiting and open to ideas but, at this point, the children remain silent.[9] In this instance, the teacher's utterance creates a possibility for the students to express themselves. However, the students presently do not contribute to the talk. In fact, by not responding to the teacher's invitation, they create a condition where Denise begins to take a next turn although, by marking her utterance as a question, she has exhibited the intent (in and through her invitation) for students to take the next turn. Looking at the cards and listening to the teacher's words, the students do have some resources at hand and it is plausible if we say that they allow themselves to be affected by these resources (e.g., some students gaze to the poster board, others to the teacher), but do not activate relevant schema to undertake Denise's call in the amount of time (7 s) she makes available to them.

In response to this situation, allowing herself to be affected by the students' silence, the teacher adjusts the card that contains the word "water" (Fig. 4a), suggesting, "we can put everything that…." At this instant the teacher is actively passive and her active passivity allows her to be open and make sense of whatever the artifacts show, which means, any sign that she may recognize as salient and significant. She is susceptible to the resource and has activated the schema that permits her to realize that this card could be used to label the first category. Thus, she places this first category, "the water" (Fig. 4b), not with a statement but with a question, indicating that it can potentially be discussed. In so doing, the teacher reaffirms the collective dimension of the activity, which she hearably confirms in her subsequent utterance ("How can we put it?" [turn 07]). In using the plural personal pronoun "we," she does not just invite the children to participate, but she also opens a real sharing space, accepting the resources that 5-year-old children have to participate in this kind of activity. Indeed, Denise's invitation subsequently will be taken in a literal sense by one of the students, Bela, who is sitting on a chair outside the circle. Bela approaches and starts gesticulating toward the cards.

The emergence of a new order

In response to Denise's last invitation "how can I put it?" (turn 06), together with the creation of the "water" category, Bela is moving to the circle, ready to contribute somehow. "Put it in the octopus," she says. Denise takes her utterance as a suggestion to move along in providing more structure for enabling students' engagement: She creates a second category, "the land." Denise answers: "The octopus lives in the water… so, can we put it on this side everything related to the water and on the other side, everything that is

[9] There is an extensive literature on wait time suggesting that most teachers wait less than 1 s for students to respond (e.g., Tobin 1987). In this context, therefore, Denise has provided the children with a lot of time for responding.

related to the land?" She has the approval of the children: Bela nods. We now examine how this new schema emerges as a classroom event, and how it plays out in the organization of the students' ideas, enabling the artifacts to fully appear as resources for students' participation in the design of their curriculum to come. Science curriculum thereby comes to be a recursive event, always happening and always something to be realized in the future, a planned and enacted curriculum-to-come.

As Bela moves toward the circle, the teacher continues by creating a second category ad hoc: "the land." She does so in speech and gesture. As the word "land" is not one of those she had written on a card, Denise locates it gesturally on the left side of the poster board, opposite to the space defined for the "water" category (Fig. 4c). As many postmodern scholars point out, there are no neutral, disinterested and therefore unpolitical actions: Every action and its material result provide resources for subsequent actions, thereby breaking any symmetry that might have existed before. That is, in the present situation the first term "water" has marked out, and broken the symmetry of, the spatial and conceptual arrangements so that pointing somewhere else and naming it "land" become possible as an alternative to what exists: physical and conceptual ordering mutually reinforce each other. From there on, Denise picks up the remaining cards one by one, asking the students to decide with her in which of the two categories it belongs. Two columns form on the poster board, going down so that it seems they will occupy the entire space once all the cards will have been sorted. The children are then oriented to the poster board, eagerly contributing to the task at hand by moving the cards or physically and verbally pointing to areas on the poster board (Fig. 5).

Being in an actively passive position the teacher and the students produce a way to categorize children's available ideas by making an order emerge from the dialogical relation including themselves and the resources: the cards, the ideas, and the poster board. The schemas, generated in the course of this transaction, the consciousness of the emergent order, make the resources come forth as salient figures against a more diffuse ground as the students are now enabled to use the cards in designing their curriculum together with the teacher. In this section we illustrate how the participants deal with existing resources, which means, we conceptualize the agency|passivity dialectic to understand the way new schemas give them the opportunity to make sense of the ideas written in the cards.

08 Professora: E o mar, onde vamos colocá-lo?
08 Teacher: What about the sea, where we are going to put it?
09 Ivan, Carol e Jose: Aqui, na água.
09 Ivan, Carol and Jose: Here, on the water's. ((Talking at the same time. Carol and Jose bend over the poster board pointing to the water's side.))
10 Professora: Como as flores nascem? É no lado da água ou no lado da terra?
10 Teacher: How do the flowers grow? Is it on water's side or land's side?

Fig. 5 **a** Bela helps the teacher to arrange the cards; **b** Bela taps her finger to the land's side while another child says, "land's"; **c** Carol, Ivan, and Jose bend over the poster board pointing to the water's part

11 Crianças juntas: Na terra.
11 Children together: Land's. ((Teacher places the card in the the land column))
12 Professora: Céu.
12 Teacher: Sky.
13 Bela: Na terra.
13 Bela: Land's. ((tapping her finger to the land's side. The teacher places the card))
14 Professora: Flores.
14 Teacher: Flower.
15 Bela: Na terra.
15 Bela: Land's ((pointing the land's side))
16 Jean: Cruz credo, Bela!
16 Jean: Good grief, Bela! (Teacher places the new card))
17 Professora: Fogo e lenha.
17 Teacher: Fire and firewood.
18 Bela: Na terra.
18 Bela: Land's. ((pointing the land's side were again the card is placed by the teacher))
19 Professora: Planeta.
19 Teacher: Planet.

In this situation, the teacher creates a focal point that catches children's attention. We understand this from a cultural-historical activity theoretic perspective, whereby perception, attention, reasoning, and emotion then may work together to create a sense of what is happening and of what exists (Vygotsky 1987). In the present instance, this means that a perceived order emerges on the poster board and becomes available to all as the resultant artifact of previous actions. The teacher and the children together create a structure that, at one and the same time, constrains them and allows them to categorize the content of the cards. On the one hand, the two categories can be attributed to a sorting schema, but on the other hand, they also force the students' idea to be associated with either one. We can perceive the interdependence of their actions as a process in which the structure is emerging having both intended (intentional) and unintended (unintentional) dimensions. Bela begins to point to the "land" side by tapping her finger on the poster board marking the space (Fig. 5b). Carol, Ivan, and Jose bend over the poster board arrangement that contains (in an objectified way) and stands for their ideas, choosing the right place to put the cards (Fig. 5c). Most of the children are now engaged, articulating ideas: "land… water…." The response is not only discursive. Their bodies also participate in making available evidence of the children's involvement. A conceptual order emerges together with the perceptual one. The teacher reads all the cards aloud: "the sea" (turn 08) and "how do the flowers grow?" (turn 10). Children analyze each word and make a decision about which category matches with the subjects that they created the day before. More than just designing curriculum, they are already engaged in learning about the environment.

Bela shows the place where the cards should go so quickly that it prevents the other children from answering (turn 13, 15, 18). At least some of the children are conscious of this, as made available to all when Jean utters an interjection: "Good grief, Bela!" (turn 16). The children now are so excited that it becomes a contest in which they dispute who is going to articulate the place where an item belongs. There are bodies that move forward toward and backward from the poster board, fingers that point to the places, faces smiling, and an even louder interjection: "Good grief, Bela!" indicating the possible winner.

In this description, we articulate how the schemas|resources and the agency|passivity dialectic plays out in the design of a curriculum with and for the student, as the emergence

of a new schema (conceptual order) gives the students and the teacher opportunities to make sense of and organize the ideas that the children have previously brought forth and continue to bring forth as part of and constituting this living and lived science curriculum. The emergence of the two-fold water—land categorization results in the establishment of an order that affords new forms of action, as it allows other cards to be categorized and constrains the placement of these cards. Meanwhile, it also becomes a constraint when a new card brings about the unexpected challenge: where to place "planet." In the next section we explore in detail this last part of our classroom episode.

Participative thinking as an outcome of agency|passivity dialectic

The appearance of a new term that does not appear to fit either of the two existing categories (land, water) challenges the order that has emerged thus far. We provide a way of perceiving what happens before returning to Denise and her children. The practice of thinking collectively is mediated when new content (the planet) appears and does not fit into one of the existing categories. It is not simply that the teacher will pass in what follows the correct information to the children about which side this new content should be placed. Sign-using actions here make sense only after a series of transformations (Vygotsky 1978). The consciousness that arises from this collective praxis (i.e., participative thinking) embodies schema|resources and agency|passivity contradictions. The first contradiction exhibits that the resource is at hand (the card that contains the word "planet") but the children do not have the schema that allows them to find an appropriate category; that is, they do not have another category that could include the card with the content "planet." For this reason, the teacher and the children briefly pause for reconfiguring the situation. They have to move on and try a different way. The tension, provoked by this new content, is going to push the collective thinking ahead. To be connected to others and the world in this moment of impasse is to be aware of the tensions provoked by the unpredictability. The second contradiction shows the agency|passivity dialectic being activated to enable the continuation of the unfolding activity. Agency here mobilizes the impulse to act toward something that can overcome the impasse in the collective praxis. The component of passivity, in contrast, mobilizes the participants to actively orient themselves to be impressed by the given possibilities. We now return to Denise and the children in the circle.

A conflict emerges with the word "planet." Where should it be fit, in water's or land's category? The first response given by the children generates the conflict: Land's and water's side (turn 20). The teacher focuses children's attention in their experience, "What does the planet have?" (turn 21). The children talk briefly about their vision of the planet that they live on, but in Carol's and Luis's vision the land category is more appropriate. The teacher proceeds provoking the enlargement of their perception: "On the land's side?… Is there water in the planet?" (turn 22) (Fig. 6).

Fig. 6 **a** Carol points the water's side; **b** Bela stands for her idea "Put it in Planet Earth"; **c** Denise puts the card in the middle

19 Professora: Planeta.
19 Teacher: Planet.
20 Carol: Na terra.
Ivan: No mar.
20 Carol: Land's.
Ivan: Sea.
21 Professora: Ich! Planeta! O que o planeta tem?
21 Teacher: Ich! Planet! What does the planet have? ((The children talk about Planet's Earth environment))
22 Professora: No lado da terra?… tem água no planeta?
22 Teacher: In the land's side?… is there water in the planet?
23 Crianças: Não.
23 Children: No.
24 Professora: Não tem água no planeta?
24 Teacher: There is no water in the planet?
25 Crianças: Tem.
25 Children: Yes, there is.
26 Professora: Então, agora, onde eu vou colocar o planeta?
26 Teacher: So, now, where am I going to put the planet? ((she turns the card to the group making it salient. The children yell at the same time: water's… land's… water's…)
27 Jean: No Planeta Terra!
Luis: Terra… terra… terra…
27 Jean: In the Planet Earth!
Luis: Land… land… land…
28 Professora: Então, Carol, o que você acha? Onde eu vou colocar o planeta… olha… olha… tem água no planeta e tem terra no planeta… como a gente pode fazer?
28 Teacher: So, Carol, what do you think? Where am I going to put the planet… look… look…there is water in the planet and land in the planet…how can we do it?
29 Bela: Põe no Planeta Terra.
29 Bela: Put it in the Planet Earth.
30 Professora: E então, vou colocar num lado ou no outro? Onde eu vou colocar?
30 Teacher: And so, am I going to put it on one side or another? Where am I going to put it? ((Children continue saying: land… water…))
31 Bela: Então, você tem que decidir onde você quer colocar.
31 Bela: So, you have to decide where you want to put it.
32 Professora: Então eu que vou ter que decidir?
32 Teacher: So, I have to decide it?
33 Fernando: Na terra.
33 Fernando: In the land's.
34 Professora: Então, eu vou colocar o planeta aqui no meio. Pode ser?
34 Teacher: so, I'm going to put the planet here in the middle Can it be?
35 Ivan: Não.
Bela: Só aqui.
Ivan: Só aqui.
35 Ivan: No.
Bela: Only here. ((pointing to the land's side))
Ivan: Only here ((pointing to the water's side))
36 Professora: E o que eu faço com o lado da água?

36 Teacher: And what can I do with the water's side? ((looking at Bela))
37 Jean: Então, vamos deixar aqui… Já está aqui mesmo!
37 Jean: So, let's keep it here… It is like that, already! ((pointing in the middle))
38 Bela: Vamos por isso assim…
38 Bela: Let's put it in this way…((she takes the card and keep it in her hand))
39 Professora: Então… vamos deixar aqui até a gente saber o que vamos fazer com isso. Eu não vou colar isso hoje.
39 Teacher: So… let's leave it here until we know what to do with it. I'm not going to paste it today ((taking the card and putting it in the middle))

It is noticeable that the teacher now refers to the Planet Earth. In doing it she drives the children to a crossroad: "where am I going to put the planet?" (turn 26). The children's options vary between the land and water category. However, Jean proposes a third category: "The Planet Earth" (turn 27) which Bela supports (turn 29). The teacher hesitates and continues by marking the two heretofore possible positions: land *or* water. The teacher thereby insists on the dichotomous classification that has emerged as the order to be reproduced. Bela realizes that what the teacher attempts to communicate is the idea—presented by Jean and reinforced by herself—is not valid and she says: "So, you have to decide where you want to put it" (turn 31). It is a move to transform the situation. The dispute continues. The teacher then decides to solve the problem by creating "the middle" category and suggests: "I'm going to put the planet here in the middle. Can it be?" (turn 34). The children answer decidedly: No! (turn 35). But Denise has already placed the card in the middle.

Jean and Bela realize that there is a third category that includes both land and water. The data suggest at least, two reasons for the children to come up with this third category. First, the word "land," which in Portuguese is the same word that denominates the Planet Earth, could have mediated the children's attention to think about this option "Put it in the Planet Earth" (turn 29). That is, put "it" (the card that contains the word planet) in the place (a new category) that encompasses land and water: the Planet Earth. Second, in referring to the Planet Earth, the teacher comments on the planet ("What does the planet have?" [turn 21], "is there water in the planet?" [turn 22]) thereby drawing children's perception and recognition that there are water and land on the Planet Earth. Hence, the option emerges to create a category that might solve the problem, involving the two sub-categories, showing a sophisticated way to achieve the outcome.

Conversely, the teacher's option is to create a third category, which means, "no-water" and "no-land." "So, I'm going to put the planet here in the middle. Can it be?" (turn 34). This third category, created by the teacher, does not include the others, that is, land and water. Because of the variety of the cards that she has yet at hand (the moon, the stars, and the sun), one may infer that, perhaps, she brings out a category in which some of those cards could be included. Presumably, from her perspective, the category created by the children (the Planet Earth) will not be able to encompass those concepts. Although the children have mobilized a certain degree of agency in the current collective praxis, that is, a certain power to act to contest the teacher "No!… only here (land's side)… only here (water's side)" (turn 35), it is not sufficient to override the teacher's action: "So, you (the teacher) have to decide where you want to put it" (turn 31) "So, let's keep it here… it's like that, already!" (turn 37). The resource, at this instant, provides participants with the opportunity to create two different schemas, which means that the children's and teacher's perspectives are distinct.

To create the two different categories, the teacher and the children actively take a passive position. The emergence of a new way of arranging the resources is given when participants allow themselves (i.e., activated agency) to be in a place where they can see the situation in the most varied ways. This agency|passivity dialectic allows them to collectively elaborate and develop new schemas—the two different categories—even though the categories are not the same for the teacher and the children. The pause—during which participants reorient to look for new possibilities to design the curriculum—is necessary for arriving at a satisfactory outcome, therefore changing the available structures. Through transactions participative thinking now opens up new possibilities for the entire group (Roth et al. 2008). The children participate in an authentic instant of creation in which they evolve new possibilities to comprehend their environment. They engage in a dialogical relation in which the new categories emerge in a process of group's discussion. In so doing, they increase the possibilities of learning and collectively produce new structures in a social context.

The creation of the third category, the "middle category," expands participants' room to maneuver. In the final instance, we witness the teacher engaging in the flow of movement of pursuing a possible outcome, which means, at the same time guiding and being guided by the children.

40 Professora: Nuvens.
40 Teacher: Clouds.
41 Ivan: Na água.
Carol: Na terra.
41 Ivan: Water's.
Carol: Land's.
42 Professora: Na terra ou na água?
42 Teacher: In the land's or in the water's? ((Ivan confirms: water's, Carol: land's)).
43 Jose: No meio também.
43 Jose: Also in the middle.
44 Professora: No meio? Por que no meio?
44 Teacher: In the middle? Why in the middle?
45 Jose: Porque a gente não sabe onde vai por.
45 Jose: Because we don't know where we can put it. ((Denise put the card in the middle))
46 Professora: O sol… o sol é na terra?
46 Teacher: The sun … the sun is in the land? ((some of the children says "in the land… in the land… at this point all of the children are participating))
47 Jose: Não, é no céu.
47 Jose: No, it is in the sky.
48 Professora: Então, posso por no meio?

Fig. 7 **a** Denise puts the card "sun" in the middle and some children yell "no!"; **b** Denise puts the card in the category of land and children yell "no!"; **c** she puts in the water's but the children yell "no" again; **d** Carol says "in the middle" and the teacher puts the card in the middle

48 Teacher: So, do I put it in the middle? ((Denise puts the paper in the middle))
49 Crianças: Não.
49 Children: No. ((yelling))
50 Professora: Não? Então, onde eu ponho?
50 Teacher: No? So, where do I put it? ((the teacher takes the card off))
51 Ivan: Aqui…
Luis: Aqui…
Bela: Aqui…
51 Ivan: Here…((pointing to the land))
Luis: Here… ((pointing to the land))
Bela: Here… ((pointing to the water))
52 Jose: Na água não tem sol… na água não tem sol…
52 Jose: In the water there is no sun… in the water there is no sun…
53 Professora: Então, eu ponho na terra?
53 Teacher: So, should I put it in the land? ((She puts the card in the land's. Some children yells: No!))
54 Ivan: Aqui, professora…
54 Ivan: Here, teacher… ((pointing to water's))
55 Carol: Põe no meio.
55 Carol: Put it in the middle. ((pointing to the middle. The teacher puts the card in the middle))

In some way, the children understand the "middle category" as a non-identical category. It is a place where they can express their doubt: "Because we don't know where we can put it," says Jose (turn 45). So, everything that does not fit into the land or water categories goes to the middle. The cloud, the sun, the moon, and the snow go, too, in middle category.

The levels of participation increase and the children begin to express themselves by yelling and disputing where each new term should be placed. They are entirely immersed in the task, which is especially the case for Carol, Ivan, Jose, and Bela who are arguing over their respective ideas. At some point we can see all the children together (turn 46). Fernando and David, who heretofore have remained outside the circle reading a book, are now participating. Carlos leaves his place under an adjacent table and approaches the circle. Even Jaime who has remained silent all this time now contributes to the discussion.

The teacher is alongside, reinforcing children's ideas and thereby letting them know that they may contribute, making space for them to expand their room to maneuver. By letting herself be guided by the children, Denise reverses the traditional position, that the teacher is in power, and she initiates a new form of the relationship, in which power, thinking, and knowing are evenly distributed. At this moment, we can see that she is not concerned with leading the children to a place that someone outside the circle (e.g., a scientist or science educator) considers right and judges accordingly. On the contrary, she exhibits a concern for the children's explorations and for their learning potential. Thus, she places herself in children's hands and opens space for the emergence of the curriculum.

In this excerpt, we witness that knowledge is not something that has to arise in the teacher's or children's mind, but that is a possible synthesis that they can evolve using the available resources. The children, in their own way, explore the resources and the different ways in which they might achieve a satisfactory result to the undertaken task.

Throughout this movement, Denise accomplishes her purpose of engaging young children in doing the complex work of designing the curriculum-to-come by ordering a considerable number of concepts. After that day, they will choose one of the three emerging topics to be studied in depth, which means that they will go to the next step: enacting the designed child-centered curriculum that has emerged from the enactment of a child-centered curriculum. Our subsequent research will show that the children's levels of engagement in investigating the topics will be considerable, and we believe that this is the case since the topic is meaningful to them having been the result of their own planning efforts.

Touching and being touched by children's words

In this study we use an agency|structure dialectic to articulate the process in which a topic of science curriculum emerges from *participative thinking* involving children and their teacher. Participative thinking means being conscious of the world and transforming it based on the understanding associated with this consciousness (Bakhtin 1993). Consciousness, as the etymology of the word suggests (Lat. *con-*, with, together + *sciēre*, to know), always is shared, participative knowledge. That is, participative thinking concerns both the material world, as given in and to consciousness, and others, how they understand this world from their perspective. We present the fact that the teacher does not have the outcome of the task planned beforehand; hence, she engages in an authentic dialog with the children. The nature of the dialog derives from the fact that the participants are interrogating their reality without the need for a predetermined path to follow. The trajectory of this enacted curriculum therefore is that of a gardenpath laid in walking. For this reason, the enacted curriculum has a strong transformative potential (Kirch 2007), because it focuses as much on the production of ideas and structures as it focuses on reproducing culture. Using the concepts of agency|passivity and resources|schemas we describe the movement that occur within, and are produced by, a group consisting of young children and their teacher. We point out that through by means of a dialogical relation, teacher and children have the power to conduct the activity at hand. Learning in such a situation can be seen as a process of pursuing the unknown, searching for solutions while children and teacher rearrange the resources and create new schemas to evolve a categorization that permits them to organize their own objectified ideas in a new structure.

The analyzes of the episodes presented here allow us to understand children and teacher's engagement illustrating their effort to understand not only their surrounding but also themselves. Throughout the analyzes, we articulate the episodes in terms of a theory that conceptualizes social events as a continuous transformation of the agency|passivity dialectic, from which new resources emerge, which in turn transform extant possibilities and augment future realizations of agency. The term *emergence* denotes the fact that we cannot anticipate results and future states. An emergent phenomenon is always a practically indeterminate result with multiples possible outcomes. In this scenario, we are agential and passive. As agents, teacher and students express and count on all the experience that they have accumulated historically and culturally. On one hand, the teacher brings to the class her culturally structured and personally evolved adult world that she inhabits. On the other hand, the children bring the freshness of their young and unknown lives.

The task in which Denise and the group of pupils engage as part of the episodes we feature here is complex, especially for the young children. The present episodes show that circle talk has developmental capacity in that it allows children to mobilize resources and

in so doing transforms (expands) their agency. Our analyzes show that instead of just accepting what was just said by a child, Denise asks for clarification, instigating students to articulate more of their thoughts, going further in her capability of communication. The teacher's interest in the students' words is authentic in the sense that the children's history is taken to be meaningful for the task at hand. In taking the children's words as something valuable, Denise shows them that if they want to share their experience with the group they have to articulate them in ways that are accessible by everyone. In other words, Denise asks the students to contextualize their experiences for the audience, and opens a space for them to improve their communicative competencies (and gain respect from the group). Besides, the group understands the value of the discourse and pays attention to each person who makes an utterance, even though, at a first glance, what others have to say may not make much sense. They share the value of being listened to and being understood, that is, of *participative thinking*. Thus, we show that from the beginning, the teacher has considered the potential in the children to create a history of the group, and to promote development and motivation in both children and teacher.

In this context, the teacher takes into account what 5-year-old children have to offer in, for, and to their participation: Denise neither underestimates nor overestimates children's words. During their transactions, we can see the entire maneuver that she has to do to have the children's attention. In so doing, she attends to their point of view and at the same time does not impose her own, though she makes it available. The outcome represents the result of what the group does at this moment. When teachers and young children engage in design curriculum collectively, they share the responsibility for directing the activity in a way that both, the teacher and the children foster points of development.

To let the curriculum emerge, Denise and the children have worked in categorizing ideas related to the Planet Earth's environment. It is a cultural event in which all members to the situation take part. The three categories that they came up with, the "water," the "land," and "the middle category," are not relegated to the teacher's or the children's minds, but are publicly and therefore objectively available to everyone present and to vicarious observers (e.g., those watching the recording). Whatever this group achieved is far from naive. At the end of the day, they have in their hands a poster board with three categories in which one of them is a "non-identical category" where everything that does not fit in the others can be placed in there (Fig. 7). It is a positive achievement because the children do not behave in a random way; instead, they look for sense at each particular instant and make an effort to mobilize the available resources.

In the last episode, the card "sun" brings forth a negotiation among children, when they say: "here, teacher ((pointing to the water)) here ((pointing to the land)) put it in the middle." At this moment, we see that children's ideas springs forth and become categorizations. This instant of *participative thinking* shows us that the activity of categorizing children's world is only possible within a cultural approach. In some ways, each child in this classroom has had the opportunity to receive resources from the others (children, teacher and artifacts) that allow him/her to develop his/her own ideas. At the same time, each one of them has produced resources for the entire group to work with (Roth et al. 2008), including the teacher, who thereby has had an opportunity to learn to teach in the ways that the curriculum reformers creating this school had envisioned.

At this point, we ask ourselves: What were the conditions that permit the emergence of the curriculum? First of all, the teacher structures the task with the children providing a starting point that opens a possibility to build a meaningful field in which the entire group can work. At any instant she abstains from presenting to the student. However, this structure is flexible enough so that children can reconfigure it any moment. A second

condition is the recognition of children's culture as the base to establish any kind of activity with children at this age. As the teacher is one of the participants of the group, the children's and the teacher's cultures and rationalities are enabled to mutually transform, hybridize, and creolize one another. A third condition places the teacher in a situation of uncertainty. Neither the teacher nor the children have a script beforehand for what the lesson will be. The lesson becomes a process and the outcomes that may result from a process that is itself allowed to emerge and change in a dialogical process where all moments, materials, people, and idea are allowed to express themselves and communicate with one another. Thus, they negotiated each moment to achieve an outcome that they can be satisfied with after the fact. Consequently, they (a) are open minded enough to participate in such event, (b) ask themselves about how to use the possibilities available to face the tensions that arise on this path, and (c) make an effort to push the task ahead. In so doing, they are, at one and the same time, acting on the resources (the artifacts and the group itself) and being affected by them. The outcome, the planned-curriculum-to-come, is the result of this collective work.

Throughout the collective approach that Denise uses, the entire group is enabled to learn from this experience. The participants engage in an authentic dialog, exercising the power of learning. They engage in dialog guided by agency|passivity dialectic that, in this case, plays an important role allowing the teacher and the children to explore tensions and to evolve new solutions for these tensions. As they take turns, permitting each other to be in charge, the situation flows smoothly. Both teacher and children are open to listen to and to be touched by the artifacts and the words created by others.

In this case, the children have the opportunity to learn the value of their own ideas, creating schemas that allow them to work with the resources that they have at hand. They develop their agency as much as their passivity, sometimes in charge of the activity, sometimes driven by it. In this movement they expand their comprehension of the environs and of themselves. They learn from this experience, to be listened, to be respected, and to be responsible for what they are doing. They argue in support of their ideas, creating arguments for their decisions: "put it (the card with the word cloud) in the middle, says Jose, because we don't know where to put it." Finally, they are enabled to learn, at the very beginning of their lives, that being a student is not a matter of staying apathetic, doing whatever the teacher asks them to do, but is a matter of activating agency|passivity to rearrange the resources that they will find available in the educational system.

The teacher, in turn, has the opportunity to learn to be in touch with the materials, by her and by children's word and behavior. Through this event she learns to approach children's cultural world, inasmuch she learns to appreciate the potentiality that arises from their actions. She also engages in a position of staying aside, enabling children to act and empowering their perspective. In this process, she fosters her own professional development.

Finally, as researchers we have much to learn from these children and their teacher. Here, we understand learning as arising from a dialectic of participation in social contexts, that is, a process that arises in lived experience, a process in which knowing is coming to us. The method of approaching reality and of analyzing the data hand us powerful tools to understand the educational phenomenon under study on a deeper level. Instead of talking about early childhood education in superficial ways we point out the complexity of a social (societal-political) practice that is possible even with the youngest of children. In bringing the dialectic of agency|passivity || resource|schema to this context, we explore in this paper the tensions and also go along with this group following each moment in which they design curriculum together.

Coda

In this study we follow a group of children and their teacher in a process of designing curriculum and we show what is required to achieve such a complex activity. Mobilizing an agency|structure dialectic we point out that learning is a process in which the group invests in searching for solutions while the participants create schemas and rearrange resources to evolve new structures. Our narrative allows us to comprehend that this educational form is possible when the teacher has the sensibility and the ability of listening, following, and sustaining children's ideas while they are thinking and expressing their way of making sense of their surroundings. In this process, they acquire an awareness of their possibilities of participation in the group. The trajectory of this activity constitutes a movement in which agency|structure plays a role pushing the situation continuously into unknown territory. In our perspective, the question is not one of using agency or passivity, as if they take turns, but concomitantly, to manage the resources and to create schemas. Thus, the dialectic of agency|structure is at the heart of a dialectical conception of participation. As we follow the participants engaged in the depicted events, we witness the effort that is necessary to make the structure appears as a result of a series of negotiations, in which children, teacher, and artifacts mediate transaction amongst them.

Following this group of children and their teacher we also come to understand the nature of good pedagogical practices in early childhood education. First, we see that the extent of the power of the designing curriculum practice with young children depends on the ability of the teacher to take children's culture as a starting point and to promote a favorable environment to enable children's participation. For arriving at that point, the teacher has to believe that children's ways of perceiving the environment has value, which means, she needs to have confidence in them in the same way that they have to have confidence in her guidance.

Second, in our work with Denise we found that her consciousness along this trajectory has been a process that unfolded together with the lessons. Nevertheless, success might not happen if the teacher does not allow herself to be in a position of listening to the children, empowering them. In this study, the dialectic of agency|passivity || schema|resources plays a crucial role in the teacher's and children's development. This way of dealing with the curriculum therefore has the potential to create new types of performances of being a professional in early childhood education.

Third, classrooms inevitably contain a variety of voices, demands, and needs that have to be taken into account and managed to achieve satisfactory outcomes for the entire group. As we show here, Denise has to deal with different interests and promote diverse ways of communicating to achieve the purpose of designing this topic of curriculum with the children.

Finally, the events in this classroom help us understand the discussion in the field of early childhood education because they provide evidence that the children can indeed participate in curriculum design. As we see in the excerpts available here, the featured lesson provides children with the experience of *participative thinking,* which further enable and develop their participation within the group. Following the trajectory of an instant of science curriculum design involving young children and their teacher, we unfold in this study the process undertaken by the group as they sense and make sense of their material, social, and symbolic worlds. The effort and the way of participating in activities allow us to think of learning and knowing as a process that take place in and through concrete social practice.

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