

Interdisciplinarity in Primary Education: Why, What and How?

I would like first of all to thank the organizers of this international gathering for their invitation. For me it is a great pleasure to be here. I would also like to clarify from the outset that my research deals with analysis of teaching practices, essentially at the primary level. In this respect I believe that educating human beings, like building a house, must begin with the foundations, that is, with the first years of studies, rather than with the roof. This is why, 35 years ago, I chose to strive to understand what, how and why teachers do the things they do in classrooms. One must recognize that numerous interesting and valuable studies have been carried out on the issue of interdisciplinarity at the secondary and university levels, as well as in research. But the preoccupation of developing interdisciplinarity at the primary level is uncommon, as if it went without saying or was not really an interesting object of study.

This is why my telephone conversation with Mr. Fadel led me to propose the following content:

- First, which arguments can be used to justify the use of interdisciplinarity in primary education? This question brings up the matter of the aims that are pursued.
- Second, which principles can guide the use of interdisciplinarity in primary education?
- Third, what content should be used in initial education for primary school?
- Fourth, which operational methods should be employed?

Obviously, I can only mention what appear to be priorities to me in terms of these four points.

But before addressing each of these aspects, I would like to begin by presenting two anecdotes that have informed my conceptions of interdisciplinarity and, consequently, my research on the subject.

The first dates to two thousand two, when a reform of initial teacher education was announced during a departmental assembly at the university where I work, in a context where the previous reform had not yet been completed and the new one was to be applied the following year. Several of my colleagues had the reaction, “What are we going to do?” This reaction left an impression on me. During a trip to France the following month, I presented this issue to my colleagues at the universities of Nantes and Toulouse. Their reaction was completely different. They asked, “Why the reform?” “How does it change the training content?” Two months later, I found myself at the Catholic Pontifical University of São Paulo where I had been invited by my colleague Ivani Fazenda. Her reaction and the reaction of her students to whom I had presented the same issue were different; they said: “Would I feel good in this reform?” These were three very different reactions to the same situation.

By analyzing in greater depth the Anglophone North American and Francophone European perspectives—along with a certain Latin American Brazilian perspective—I have been able to identify a series of factors that might explain the existence of distinct logics and their underlying socio-historical rationales. I will explain these different logics based on the second real-life anecdote. In two thousand, as part of an international conference, I had invited thirty

two researchers from various European countries (Belgium, France, Switzerland), North America (Canada, United States) and South America (Argentina, Brazil, Chile). The European participants extensively discussed the relevance of implementing interdisciplinarity, the meaning it should be given, and its impact on the hierarchy of scientific disciplines (the tree of Knowledge). Gordon Vars and Julie Klein from United States then took the floor and wrote on a board to explain, in a few very systematic points, how interdisciplinarity can be operationalized. As for the Brazilians, they put on music and projected slides... Although I wish to avoid over-generalization and caricature, this concrete example taken from direct experience spurred on my reflection, in parallel with a critical analysis of publications originating from these three cultures.

Various observations have allowed me to highlight at least three distinct logics in the field of education. These logics result from socio-historical and cultural factors that cannot be developed here. The Francophone European logic, strongly marked by Cartesianism, Voltaire and the Encyclopedists, is founded on the question of meaning. The epistemological perspective comes first, as also clearly shown by methodological publications. As a result, knowledge is also foremost and has taken up all the space at school, at least until recent decades. The North American logic is based on other ways of thinking. The breaking off in the educational system inherited from the United Kingdom at the end of the 19th century, marked by pragmatism, emphasized the importance of know-how. This phenomenon is well illustrated by methodological publications in education that primarily develop procedures for data collection and treatment. Conversely, Francophone publications tend to concentrate on the epistemological foundations and issues of educational research. In Brazil, in interdisciplinary discourse, it is neither knowledge nor know-how that predominates, but rather a certain form of *savoir-être* or what might be called “personal skills” centered on affective, aesthetic and perhaps playful dimensions.

As a result it is important to recognize the existence of different interpretations of interdisciplinarity; these interpretations result from distinct social and cultural contexts. To me, these three paradigms of meaning, practicality and affectivity appear complementary and should link together to ensure the implementation of interdisciplinary approaches in teaching practices in all professional practice, and especially in the field of primary education and therefore teaching practices. To put it otherwise, interdisciplinarity requires, in French *la raison, la main et le cœur*, in Spanish *la razón, la mano y el corazón* and, in English the mind, the hand and the heart. What follows in terms of my understanding of interdisciplinarity in education is consequently based on a strong interrelation between cognitive (or epistemological) dimensions, practical (or pragmatic) dimensions, and ontological dimensions which, in my view, are fundamental components of human beings and should be central to the educational process.

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Let us now turn to the first point, namely the motivations that might justify the use of interdisciplinarity in primary education. In other words, which aims can be pursued through interdisciplinarity in primary education?

Of course, it is important to underscore the complexity of the natural, human and social reality in which we live. This perspective has long been presented and discussed, among others by Edgard Morin. I will therefore only briefly mention this argument, which is one of the most important in justifying interdisciplinarity. But in the context of children's education, I would like to take a look at other arguments that directly connect with teaching-learning processes. These arguments are based on the fact that learning at school takes place in a specific context, in a closed classroom, that is, within a system of interactions between students and between students and teachers. I would therefore purposely like to examine aspects that are often neglected when discussing interdisciplinarity in general.

It is important to recall, first, that a student between 6 and 12 years old does not study out of a love for the disciplines, but instead, one might say, out of a love for their teacher. More specifically, although I could not develop here the entire set of arguments that originally stemmed from dialectic Hegelian thinking and that has been developed on by so many researchers, including Lacan, the student strives to capture the desire to know that he or she decodes in the eyes, attitudes and discourse of the teacher. The student's behavior in class is then dictated not by the need to know, but originally by social, intellectual and affective relationships that he/she develops with the teacher with the intent of obtaining recognition of value as a human being. The teacher's role is therefore capital. An interdisciplinary approach then assumes an important function of facilitation, insofar as it takes into account the following.

First of all, interdisciplinarity requires the introduction of teaching-learning situations that are meaningful for students. The situation must be contextualized, and such a contextualization must necessarily be multi-dimensional, and thereby interdisciplinary.

Yet for many students, distinguishing between everyday life and school life is problematic. Researchers such as Bernard Rey of the Université libre de Bruxelles have observed misunderstandings that arise when students are confronted with a proposed situation. Let us take a real-life example: When Bernard Rey, who had been invited to a classroom, asked students how to take the train to go home, the route to take, the distance, the duration of the trip (which required the use of mathematical and geographical knowledge), a student immediately answered him that he shouldn't worry, that his father was not working that day and would be pleased to drive him to the station on time. Joël Bisault, of the École normale supérieure de Cachan à Paris, has likewise underlined problems of interpretation in school assignments among primary students by showing that some adopt a "domestic point of view." There is a real trap that students can become engaged in exclusively relational, affective, domestic, and other readings of the situation if the contextualization remains superficial and incomplete. I will come back to the importance of contextualization when discussing the fourth point. Suffice it to say that if the contextualization is not sufficiently developed, there is a risk that students will differently interpret the instructions and tasks given by their teachers, because they will not decode the academic task within the situation. The issue is with the student's task, as opposed to the child's task, that is expected of them, because they may perceive only the visible (external) facet of the task to complete. They might also be unable to assign meaning to

the situation or the task itself (the internal context) and lose interest and motivation in the expected work; in short, they “disconnect.” Indeed, this is one of the factors leading to a lack of interest in school and dropout at the secondary level.

Second, because of the need to use varied disciplinary knowledge, interdisciplinarity promotes the use of what Jean-Louis Martinand has termed “basic social practices.” The works of Pierre Pastré—and a number of other researchers—on “professional didactics” in France have pointed to both the conceptual structure of a situation and the central place of effective practical knowledge, as well as the importance of social practices and more especially pragmatic concepts that are indispensable to organize action. Vygotsky for his part already drew a connection between everyday concepts and processes of scientific conceptualization. All of these works emphasize action as a point of departure, but also as a point of arrival. Indeed, education must focus on the need to apprehend a “capable” subject, one who is able to say “I can” or “I cannot,” and not only an epistemic and knowing subject who masters knowledge and can only say “I know” or “I do not.” Interdisciplinarity promotes this conception of an inseparable link between cognition and functional action.

But precisely because primary students struggle to distinguish between their everyday life and school life, between common sense learning and scientific learning, I believe it is necessary to use the springboard of teaching-learning processes that involve situations anchored in reality. These situations allow students to invest themselves based on their life experiences, so that they can inter-subjectively debate their different conceptions, and then, with the teacher’s help, progress toward the use of scientific approaches. Although I cannot develop on this concept here, I would like to posit that knowledge is not located in the individual’s head, it is not individual property, but rather a dialogical and intersubjective process established in the classroom. This notion is consistent with the conceptions of social constructionism advanced by Gergen. However, even if, in everyday life, students communicate, construct knowledge, solve problems, and carry out experiments, these different processes are thought to come down to common sense. Yet school should be a place where they make the transition from these processes acquired in everyday life to scientific approaches that involve a critical and well-considered objectivization of actions that are carried out systematically and explicitly: communicating, conceptualizing, problem-solving, and experimenting. To address only this last approach, a distinction must be made between giving an opinion and conducting experiment. This is why trial and error, and empirical efforts at understanding, are a point of departure that must be moved beyond from an integrative perspective.

Allow me to give a real-life example that illustrates the need to anchor teaching-learning processes in the realities of primary students. When I was invited by a teacher to a classroom in order to do a science activity, I proposed to the students, based on the program objectives at the time, to design an object that could move while producing noise, to draw it, describe it and explain its production and how it worked (thereby using science, technology, drawing and French). The students worked in teams and one of them helped out most of these teams. However, before entering the classroom, the teacher had told me that the student who was helping all the others was the most difficult, the least cooperative; that was why he was seated at the back of the class. When I congratulated the student, who was one of the most pleas-

ant and helpful during the entire activity, for his valuable help and the quality of guidance he gave to other students, I also asked him how he had built up these skills. He answered that his father was an engineer and that he liked to imitate him. Interdisciplinarity offers the possibility of giving meaning to learning activities.

A third contribution of interdisciplinarity in primary education has to do with the need for complementarity and overlap in scientific approaches. Rather than naïvely or unconsciously—or neglectfully—employing only problem solving, interdisciplinarity, among other things via a situation, a problem- or project-based approach, can support the development of integrating learning processes. It is able to do so through the use of several approaches required by the necessary complementarity of diverse disciplinary outlooks, namely conceptualization, problem-solving, communicational, experimental, and other approaches. It also offers a way to emphasize both the fact that problematization is central in a teaching/learning process, and that scientific approaches are cognitive processes that must in themselves be an object of learning.

Fourth, and this point connects with the question of metacognition and the self-regulation of learning, interdisciplinarity is only genuinely meaningful if metacognitive processes are allowed and introduced by the teacher, and if they are applied by the students. What has been observed in everyday life is that teachers teach knowledge, sometimes by making links between different school disciplines, but they forget or neglect the metacognitive processes that are indispensable to ensure effective learning. While they are often led to ask students whether they enjoy an activity, and hence call upon affective dimensions, they forget the cognitive and procedural dimensions. Indeed, only rarely does one hear a teacher asking the students, “What have we just learned?” “How did we arrive at this knowledge?” “What pathway, what steps have we taken?” “What difficulties did we come up against?” “How did we resolve these difficulties?” etc. Students’ initial representations need to be collected and held onto so that they can be referred to during the culminating activity.

The following example clearly illustrates this absence of a metacognitive process: in a class during last year of primary school, a teacher gave students an aerial photograph of their village. Several students immediately said that the picture was of Quebec. I will not describe all the activities held by the teacher, including a field trip to the village with direct observation, graphic representations, the production of texts, etc. Following these activities, the same students said, “We knew it all along, it’s our village!” thereby forgetting their initial representations, which had not been collected. Moreover, the teacher had not given the students an opportunity to apply the metacognitive processes that would have allowed them to integrate both the procedural processes by which they had constructed the new knowledge and the knowledge itself. As a result nothing could guarantee the acquisition of this knowledge and the capacity to reinvest it in the future.

Last but not least, a fifth contribution is that interdisciplinarity posits the establishment of a mutual dependency, without predominance or neglect of any kind, between school disciplines. A posture such as this, which is at once epistemological, social and political, leads to another reading of the components of a curriculum that is based on a search for each disci-

pline's specialty (its place and function on the cognitive and social levels) and the complementarity required of its contents in order to grasp and communicate natural, human and social reality, and to engage with it. This posture also generates a critical position toward the hierarchy of school disciplines and its resulting function of social selection.

In the few points I have just presented to justify the use of interdisciplinarity in primary education and to present a few of its aims, you have surely been able to observe that I called upon the mind, the hand, and the heart, that is to say, the cognitive, pragmatic and ontological dimensions.

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I have discussed the first point at length. I will now address the second point more succinctly: Which principles can guide the use of interdisciplinarity in primary education? I would like to suggest four principles:

The first is that there can be no interdisciplinarity without disciplinarity, that is, a formalized cognitive content, and without its related instrumental and procedural methods. Although this might be construed as stating the obvious, it is worth recalling that reflection on interdisciplinarity is only meaningful in a disciplinary context and it presupposes at least two reference disciplines as well as the presence of reciprocal action.

Second, it is important to distinguish between at least four distinct operational angles to interdisciplinarity, which can be scientific, academic, professional or practical.

- Practical interdisciplinarity has to do with practical, technical or procedural knowledge used in everyday life, but also in relational occupations, such as those of nurses, doctors, teachers, social workers, and the like. This form of interdisciplinarity clearly stands apart from other operational fields of interdisciplinarity in that it is essentially founded on experience that is acquired or has been acquired by individuals (experiential knowledge) in various fields or everyday situations. It also distinguishes itself by its instrumental nature geared toward problem-solving and situations that arise in managing daily life. As a result, it appears as natural as the prose of Molière's famous would-be noble Monsieur Jourdain. A mechanic repairing a car, a housekeeper maintaining a house in order, a speculator "playing" the stock market, and a bus driver driving his public vehicle all use procedural knowledge, experiential knowledge and more or less routine and conscious practices from various horizons, including disciplinary, technical and professional ones. Making mayonnaise requires egg yolk, salt, mustard, olive oil, and a whisk. The person preparing mayonnaise does not need to know chemistry; the mayonnaise will be good only if it "takes," in other words if the right chemical reaction occurs.
- Academic interdisciplinarity, which I am addressing here, aims to educate social players by putting in place the most suitable conditions to prompt and maintain the development of integrating processes and the appropriation of knowledge as cognitive products among students, which requires an organization of school knowledge on the curricular, "didactic" (in-

structional) and pedagogical levels. This form of interdisciplinarity, which is focused on the school disciplines rather than on scientific disciplines at the primary and secondary levels, is associated with education that takes as its reference the learning subject. It is characterized by a search for complementary links and relationships between school disciplines.

- Professional interdisciplinarity for its part requires going beyond the usual characteristics of interdisciplinarity. Any vocational training requires the integration of a set of processes and knowledge directed toward the development of professional skills required by the occupation in question. Because the aim of training is to master a professional action, it is not enough to be able to establish links between scientific disciplines; things need to move to another level that goes beyond disciplinary and interdisciplinary education by integrating them: this is the level characterizing the vocational project that underlies training and gives it legitimacy; it is that of the development of the required professional skills, that of the training of a “capable” individual. This training requires the use of not only disciplinary knowledge, but also knowledge that could be described as adisciplinary: these are social practices of reference of which I have already spoken, and which are dissociated from professional actions and interact with theoretical knowledge in a dynamic, nonlinear and non-hierarchical way, to finalize the professional action. For my part, I describe this type of interdisciplinarity as circumdisciplinarity (from the Latin *circum*, “around”, adverbial accusative of *circus*, “circle”) because it encompasses experiential practices and knowledge. Professional “didactic” research dealing with train drivers, nuclear power plant operators, upholsterers, teachers and individuals belonging to other occupations clearly shows the importance of this experiential knowledge in everyday practice, from routines and incorporated skills to tricks, shortcuts, and so on.
- Scientific interdisciplinarity deals with the scientific disciplines and aims to produce new knowledge and to meet social needs by establishing links between the branches of the scientific system and by drawing upon various disciplines. Rather than targeting only the establishment of complementary links, as in the case of academic interdisciplinarity, it also exists to try to bridge the cognitive gap observed between two or more scientific disciplines, which among other things results in the emergence of new scientific disciplines.

To examine interdisciplinarity in primary school therefore requires that we conceive it in its specificity, as a tool that serves teaching/learning processes in young students.

A third guiding principle is that interdisciplinarity is not based on a cumulative perspective, just as a house is more than just a pile of bricks, to paraphrase a metaphor from Poincaré. Indeed, interdisciplinarity is incompatible with the tendency to believe that a mere physical rapprochement between people such as researchers, teachers, health professionals, etc.—thanks to the creation of a team of individuals from different disciplinary backgrounds—would be enough to confer interdisciplinarity on a research activity or professional intervention, including an educational one. It is just as incompatible, in education and training, with an “additive” vision of disciplines and content. The fact that students may be taking a course in one or more other disciplines does not make their education interdisciplinary. Nor does a field trip to a farm, and the subsequent use of this theme to produce activities in French,

mathematics, science, arts, etc., make the approach interdisciplinary. In this case we are dealing with pseudo-interdisciplinarity that is in fact pluridisciplinary in nature.

The fourth and final principle I would like to mention, and perhaps the most important in my view, is that interdisciplinarity in education belongs to the means, rather than the ends. The aim of interdisciplinarity is the integration of learning processes and the integration of the resulting knowledge. The purpose of using interdisciplinarity is to promote the mobilization of knowledge and processes to ensure the realization and success of an action, in other words, to promote and facilitate students' integration of integrating processes and integrated knowledge, as well as their mobilization and application in real-life situations. It therefore requires the establishment of integrative approaches by the teacher, and not the imposing of an integrated curriculum where the integrating process itself has already been established from outside, from above, by the designers of the curriculum, textbooks or activities.

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The third point I wish to address is, What content should be used in initial training for primary education? I will not come back to the aspects related to the first two points that I have just dealt with. Instead, I would like to draw attention to a condition that appears essential to me. Because the interdisciplinary perspective is conceived with a view to action, as I previously mentioned, a close link should be established between the cognitive dimensions and the instrumental and procedural dimensions. Primary education is all too often perceived merely as a time to learn to read, write and count. This is only partially true, in my view, and especially insofar as this learning cannot be boiled down to the acquisition of mere technical mechanisms. It is composed of tools, but it also serves as a vehicle for social norms, values, and a cultural heritage. And it must be invested with these elements.

Moreover, in contrast with an imposing and downward form of education that dictates to the students what they must learn and believe, a cumulative instruction of compartmentalized knowledge, or dogmatic education that prescribes the real, it would be more appropriate to adopt an open approach. Learning should be focused on the development of reflective processes, critical thinking, the capacity to stand back and consider that there may be several answers and several avenues to reach them. Instruction is likewise not the only objective of education in schools. Indeed, schools must also socialize the child, and this socialization can no longer be conceived in the sense of social reproduction, as conceived, for example, by Durkheim. Socialization at school today means not only making children familiar with the world's cultural heritage, but also giving them access and introducing them to modern tools such as computers and the Internet. Socializing primary students also implies placing them in situations where they must develop cooperation with others, assume responsibilities, and construct an autonomy that goes beyond individual decisions to act, and brings them to consider the impact of their choices on other students.

Interdisciplinary learning situations, especially in the context of projects that involve giving students challenges, are able to promote and support such orientations that bind together

knowledge (instruction), instrumental and procedural methods (technical means and measures to produce knowledge), and socialization (social relationships).

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The fourth and final point deals with the question of which operational measures should be used. Although each educational model has its merits and its limitations, as is the case for example with models of cognitive heterostructuring, which are based on dominant action by the teacher, or models of cognitive self-structuring, which are varied and all ultimately place the responsibility for learning squarely on the shoulders of the students, I favor a model of interstructuring based on dialogue and exchanges, in which the teacher acts as a mediator for students' interaction with the learning content. This meeting point between the teacher's action and the student's learning process is realized within a teaching-learning situation containing the content we have already discussed.

I will only briefly consider here one of the conditions that appear necessary to me on an operational level. This condition has to do with the situation at the heart of the teaching-learning process. This situation is first of all located in physical space, the classroom, which should be configured in such a way as to promote teamwork and exchanges. Second, it is located in temporal space, in other words in an evolving dynamic of intersubjective relationship that modify and transform it. Third, it is located in a space of meaning and representations, in that its content is meaningful on the social, epistemological and ontological levels. Fourth, the situation is also located in a transitional space, in which, through problem situations and instrumental and procedural methods, students' learning approaches confront one another. Fifth, it is also situated in a transactional space in that the meeting point between the teacher's action and the student's action requires a set of transactions between students between the students and the teacher, in other words negotiations that are actualized through a system of interactions.

Sixth, the situation is located in a space of contextualization on four interrelated levels. The first two concern the internal context, that of the learning content and the intra-interactional context—which is in turn composed of a “focal event” associated with the elements that students focus on, and the context or “frame” that characterizes the field of action, in other words the situation in which the focal event takes place. The two other contextual levels relate to the context outside the academic institution where the students are located. This context, which is at once general, relative to society, and local, relative to the setting of the school, cannot be neglected since it influences the interactions that are actualized within the teaching-learning situation. This external context is also composite and multidimensional, since it is made up of social, cultural, political, economic, ideological, religious, institutional, language-related, and other factors.

By addressing this question of the teaching-learning situation, I would simply like to underline, firstly, the complexity of the teacher's task, whose effectiveness cannot be guaranteed by the use of any one recipe. Secondly, since I am concerned, as I hope we all are, with stu-

dent success, it seems to me that the interdisciplinary approach at the primary level needs to take into account these four levels of contextualization.

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To conclude, I would like to recall that interdisciplinarity in primary school cannot by any means become an end in itself. Indeed, the aim it pursues is students' development of cognitive integrating processes and the cognitive integration of their learning. Understood in this way, academic interdisciplinarity can be defined as follows: it is the action of putting two or more school disciplines into relation on the curricular, didactic and pedagogical levels, leading to the establishment of links of complementarity or cooperation, interpenetration or reciprocal actions from various standpoints (aims, objects of study, concepts and notions, learning approaches, technical abilities, etc.). These interactions aim to promote the integration of learning processes and knowledge among students. In teaching-learning practices, the teacher's role is to establish the conditions judged to be the best, the most appropriate, to promote and support student learning processes. To draw on interdisciplinarity at school is to introduce conditions that are normally favorable to students' implementation of integrating processes by calling upon various and interrelated disciplinary angles. For, indeed, it is not the teacher who must do the integrating, but the students. In primary school, the interdisciplinary perspective therefore requires an open relationship between cognitive and practical dimensions, but this relationship must also introduce the affective dimension that I mentioned at the beginning of this communication.

I must observe that today, the interdisciplinary approach is more often conceived in education and the Francophone world as a stopgap measure, in the sense put forward by Huber in ninety-two: "interdisciplinary studies must have their place as a supplement or even a corrective measure for education and training based on the disciplines." Interdisciplinarity offsets the weaknesses of disciplinary teaching, on the level of the construction of social and biophysical reality as well as that of the meaning that students seek in their learning, and the motor, intellectual and affective engagement they may find in it. The resistance is still very strong and pluridisciplinarity and interdisciplinarity are very frequently confused. Yet schools should instead advocate youth education that strives to produce human beings who are "capable" because they "know," and who are also sensitive to human realities.

Once more, the mind, the hand and the heart!

Thank you.