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Bricolage, Métissage, Hybridity, Heterogeneity, Diaspora: Concepts for Thinking Science Education in the 21st Century

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Abstract

The ongoing globalization leads to an increasing scattering of cultural groups into other cultural groups where they the latter continue to be affiliated with one another thereby forming diasporic identities. Diasporic identities emerge from a process of cultural bricolage that leads to cultural métissage and therefore hybridity and heterogeneity. To escape the hegemonies that arise from the ontology of the *same*—which, as I show, undergirds much of educational thought—I ground the notion of diaspora in the ontology of difference. Difference and heterogeneity are the norm, not something less than sameness and purity. This ontology allows framing bricolage, métissage, hybridity, and heterogeneity as *positive* concepts for theorizing the experiences of learning science and identity not only as a consequence of cross-national migrations—Mexicans in the US, Asians and Europeans in Canada, Africans in Europe—but also the experience of native speakers who, in science classrooms, find themselves (temporarily) at home away from home. My exemplary analyses show how the very fact of cultural and linguistic differences within themselves gives rise to the possibility of symbolic violence in science classrooms even to those whose ethos is or is closest to the one at the heart of science.

Zusammenfassung

Die voranschreitende Globalisierung der Weltmärkte, die Unterschiede zwischen Arm und Reich und die damit zusammenhängenden Migrationsbewegungen von Bevölkerungsgruppen konträr zu den Reichtumsdifferenzen und über traditionelle

Länder- und Nationengrenzen hinweg führen zu einer zunehmenden Diffusion von kulturellen Gruppen sowie deren Eindringen in andere ethnische und kulturelle Konfigurationen. Dabei entstehen sogenannte Diaspora-Identitäten – und zwar dann, wenn eine Person aus einer bestimmten Ethnie in eine andere (dominante) kulturelle Umgebung überwechselt. In der Konfrontation der alten und der neuen Kultur bastelt sich (im Sinne des Bricolage-Begriffs von Lévi-Strauss) die Person neue kulturelle Praktiken und Identitäten. Eine Diaspora-Identität ist also das Produkt eines Bricolage-Prozesses, der kulturelle Mischformen, Hybride und Heterogenität hervorbringt. Um Hegemonien zu vermeiden, die mit der Ontologie des Identischen, des Selben, verknüpft sind – die, wie ich zeige, Erziehungskonzepten häufig zugrunde liegen – entwickele ich den Begriff der Diaspora innerhalb einer Ontologie der Differenz, des Unterschiedlichen. Eine solche Ontologie geht von der Annahme aus, dass kein Ding, keine Person, keine Sache und kein Phänomen je selbst-identisch ist – eine Annahme, die man in logischer Form als $A \neq A$ ausdrücken kann. In diesem Fall – und in Gegensatz zur herkömmlichen Logik – ist Unterschied die Norm, und Identität ist das Produkt konstruktiver Prozesse aus Politik und Ideologie. Differenz und Heterogenität sind im Vergleich mit Gleichheit und Purismus nicht minderwertig. Diese Ontologie ermöglicht es mir, Bricolage, Vermischung, Hybridität und Heterogenität als positive Werte zu verstehen, mit denen ich das Erleben von Naturwissenschafts-Lernen sowie auch von Identität theoretisch fassen kann; und das nicht nur im Falle von nationenüberschreitender Arbeitsmigration (von Mexikanern in die USA, von Asiaten und Europäern nach Kanada, von Afrikanern nach Europa), sondern auch im Falle von Schülerinnen und Schülern, die sich im muttersprachlich geführten Naturwissenschafts-Unterricht (temporär) zu Hause und gleichzeitig fern der Heimat vorkommen. Ich konkretisiere meine theoretischen Überlegungen mit einer Vielzahl von Beispielen aus dem Alltagsleben. Ich benutze Sabir, die Lingua-franca-Sprachen (beachte den Plural innerhalb des Singulars!) als Analogie: Sie ist/sind in alten Zeiten von fahrenden Händlern des Mittelmeerraums entwickelt und

gebraucht worden. Diese Metapher dient mir zum Nachdenken darüber, wie neue Sprachen entstehen, um gegebene Probleme zum Ausdruck zu bringen und dafür Lösungen zu suchen. Sabir dient mir als analoge Repräsentation für die Übergangssprachen, die Schülerinnen und Schüler benutzen müssen, wenn sie aus einer vorgängigen Grundsprache heraus eine neue Sprache erlernen, deren Verständnis durch ihre Muttersprache vermittelt ist. Meine Beispiel-Analysen zeigen, wie die Tatsache innerkultureller und innerlinguistischer Differenz zum Problem der symbolischen Gewalt innerhalb des naturwissenschaftlichen Schulunterrichts führen kann – und das selbst dann, wenn die Schülerinnen und Schüler eine ethisch-moralische Grundhaltung besitzen, die mit der der schulischen bzw. naturwissenschaftlichen Kultur sehr nah verwandt ist.

One year after coming to Canada—from Germany where I had received my education—I find myself as a science teacher in a 40-student middle school in an isolated village in northeastern Quebec.[1] On this day in my ninth-grade science class, where I teach the *Integrated Physical Science* course, I show students how to calculate the number of moles in 47 grams of water (Figure 1, left). When I turn around from the chalkboard, I see the students staring at me; a student raises his hand and says, "I don't have a clue about what you just did." Although I am in my first weeks of teaching—and without having come through a teacher education program—I somehow have the rapid insight of inviting the student to the blackboard to show the class and me how to divide 47 by 18. He comes to the board and shows how to do the calculation "correctly": "this is how you do it" (Figure 1, right).

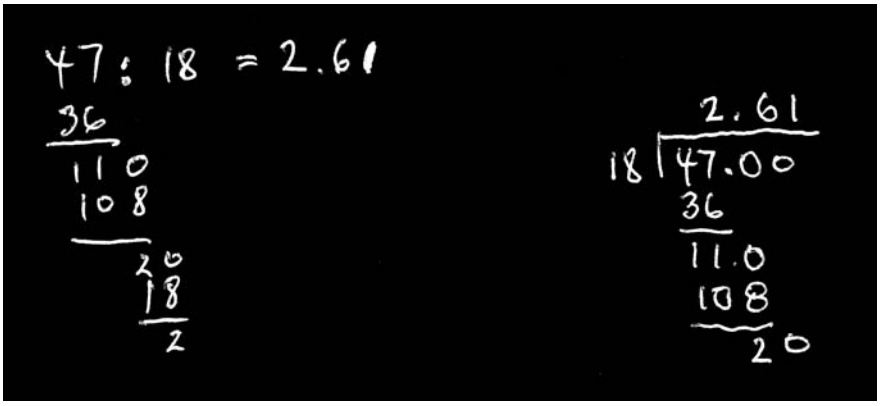

Figure 1. My way of doing a longhand division (left) meets with the incomprehension on the part of the students, one of whom shows how to "correctly" do a longhand division (right).

In this brief episode, I experienced cross-cultural differences in longhand division firsthand; what I had done as a teacher has met the incomprehension of students. To me, the two ways were structurally equivalent. But I realized only later that the difference between the ways of doing longhand division is anchored deeply in the two languages. In German, the required division would have been expressed as "47 [geteilt] durch 18" ("47 [divided] by 18"), and this left-to-right ordering of the numbers and operations is reflected in the way I had represented the division on the blackboard (Figure 1, left). In English, however, more often than not, this division is indicated as "18 [divided] into

47," an order again reflected in the way longhand division is taught and practiced (Figure 1, right). I did not know that day but in the course of teaching science that throughout the early career I would be confronted with such differences, which arose from the differences between the ways of doing and talking science and mathematics as I have learned them growing up in Germany and the ways children are taught here in Canada. In particular with respect to grading, my practices (e.g., "A grades for exceptional performances") conflicted with the going practices and expectations students had, an experience quite common among teachers who have migrated across cultural borders (Hutchison and Bailey 2006).

Over the years, I appropriated the new cultural forms; I became, for example, fluent in both metric and imperial measurement systems still used widely throughout North America. However, I neither forgot the old cultural forms nor nostalgically hang onto them. As a form of cultural bricolage, I move back and forth in the same conversation between cultural forms, for example, metric and imperial measurements; and my "I" has changed in the process as well, as a project of continuous bricolage. As a result of this métissage of cultural practices, I developed an identity—which is always based on the interpretation of what a person does—that is neither German or European (my colleagues and even my family say that I am North American, speaking German with an accent) nor Canadian (where people say that I am German, though I am very different from my siblings).

I later experienced and learned that the diasporic experience does not have to be associated with the migration across an evident cultural boundary familiar to many families today—Mexicans migrating to the US, African nationals migrating to EU countries, Europeans and Asians migrating to North America—but also within a country and its only-apparently common Anglo-Saxon culture. Having lived in different parts of Canada, I have lived the differences existing *within* Anglo-Saxon culture, which, insiders, recognize as distinct across the different regions of my country.

I experienced difference even within what is apparently one and the same language, which nevertheless inherently gives rise to difference within itself. Thus, one of my physics students explained why he felt as if "struck in the face" not only each time he entered a science classroom but also when he returned home on weekends (we lived in a boarding school):

> If I think about science, I feel like I am drawn away from religion. That really worries me a lot, because I feel like I am being taken away from what I have been a part of, which is religion. If I go toward religion, I feel like I am not giving science a chance at all; and I can't see myself doing that because I am a person of morals.

In this situation, the student went through diasporic experiences both at school and at home, in each place having the sense of being taken away from what he values: at school, taken away from religion, at home, taken away from science. This and similar experiences prepared me to understand diaspora and diasporic identity in the way articulated in this text, as an experience at the very heart of a culture, not necessitating cross-national migration but occurring on a daily basis. Eventually I came to recognize that diaspora is a suitable concept for theorizing school science, a culture in and for itself, where explaining the phenomenon of day and night in terms of the movement of the sun—which "rises in the morning" and "sets in the evening"—comes to be an affront to the legally embodied and administratively enforced culturally (scientifically) correct one-and-only way of explaining this phenomenon.

The purpose of this paper to articulate a concept of diaspora—and the attendant concepts of bricolage, métissage, hybridity, and heterogeneity—suitable for understanding a variety of phenomena related to learning science and science education, including cultural differences following trans-national migration, cultural differences arising from different kinds of knowledge (e.g., traditional ecological vs. western scientific), and science as a culture within and different from other aspects of everyday

life. Confronted with differences, individuals continuously engage in cultural bricolage, taking from here and there to make do, producing not only new, heterogeneous, creolized forms of knowledgeability and practice but also producing hybrid identities in a process of continuous métissage. This métissage occurs in all parts of a society that—such as Canada—values *multi*culturalism and leads to new cultural phenomena: less than 45 percent of Vancouverites speaking English at home and schools in Montreal and Toronto sending informational letters to parents in 20 or more languages. However, rather than celebrating these concepts generally and those of hybridity and heterogeneity specifically and conferring to them special powers, I theorize them as constituting the very essence of *being*. I hold that the idea of purity, which has arisen from Platonic philosophy, is but an untenable ideology that continues to be perpetuated in the very idea of representation and selfsame identity. To understand the power of a dialectical concept of diaspora, I begin by articulating what is used as the tacit norm, the idea of an entity being identical with itself—selfsame identity—and contrast it with cultural (dialectical, postmodern) perspectives that are founded on plural singularity, difference, and non-identical repetition (e.g., Deleuze 1968/1994).

Sameness, Difference, Ipseity

> [P]ure ethics, if there is any, begins with the respectable dignity of the other as the absolute *unlike*, recognized as nonrecognizable, indeed as unrecognizable, beyond all knowledge, all cognition and all recognition: far from being the beginning of pure ethics, the neighbor as like or as resembling, as looking like, spells the end or the ruin of such an ethics, if there is any. (Derrida 2005, p. 60)

In the classical approach, knowing, learning, interacting, identity and other cultural phenomena have been thought in terms of idealist (rather than dialectical) concepts that constituted *the one;* all instances of a concept—though imperfect reproductions or representations—were alike so that *sameness* became the paradigm of thought. The like,

however, as the introductory quote to this section shows is not a good starting point for ethics or ontology; the *like* "spells the end or the ruin" of ontology. This is also the case for thinking concepts such as bricolage, métissage, hybridity, heterogeneity, and diaspora, which, should they have purchasing power at all, need to be thought from a perspective (ontology) where difference (e.g., $A \neq A$) is the norm and absolute self-identity (e.g., $A = A$) is impossible. In the following, I outline the two approaches to thinking—the *same* vs. *difference*—to appropriately ground the use and development of diaspora in science education.

Ideology of the Same

In the classical approach from Plato (e.g., in his *Theaetetus*) to the present day, the presupposed self-identity of the thinker grounds epistemology and ontology. René Descartes captured this self-identity in his formula *cogito, ergo sum* ("I think, therefore I am"), where the thinking "I" in the cogito is presumed to be equal to the "I" of being. Thus, "for Kant as for Descartes, it is the identity of the Self in the 'I think' which grounds the harmony of all the faculties and their agreement on the form of a supposed Same object" (Deleuze 1968/1994, p. 131). The "I think," is the most general principle of representation. It is the most general principle and the source and unity of four faculties that are at the heart of representationalism (including conceptual change and constructivism): I judge, imagine, perceive (recognize), and remember.

It is from this self-identity of the thinker that is derived the sameness of the object (or some aspect of it) and the ways in which it is represented. That is, the concept of representation fundamentally presupposes identity, the self-sameness of things, representations, thought, Self, and so on. Across all their differences, the different representations of one and the same idea or the different phenomena that exhibit an idea have something in common from which the pure, transcendental idea can be abstracted; this pure idea contains nothing related to sensation consisting of form (Kant 1787/1956).

These pure ideas, Kantian transcendental (literally, "beyond the limits [of the senses]") ideas-in-themselves, are found in and denoted by various concrete entities and representations available to the senses and therefore experience.

Even the dialectical philosopher Georg W.F. Hegel (e.g., 1807/1977) did not escape this way of thinking, despite his approach of introducing non-identity to the thinking consciousness: he thought difference in terms of the same, as the negation of an entity. Negativity and the negative therefore do not capture the phenomenon of difference *in* and *for* itself, only its phantom or the epiphenomenon of difference. Because difference derives from the negation of identity—i.e., the subject of consciousness estranging (objectifying) itself by making itself the object of its own thinking—it does not stand on its own but always with respect to sameness, it is a derivative concept. In the following, I concretize these ideas in an example from my studies of inscriptions, the various written and graphical forms literate cultures generally, and the sciences particularly, signify concepts.

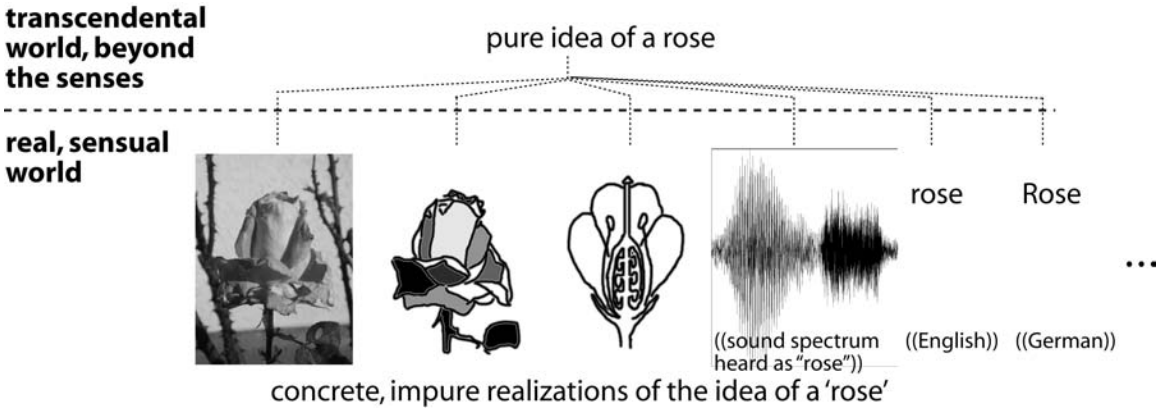

Figure 2. The classical idea of the nature of a concept (Plato, Kant) contrasts a pure idea, the transcendental thing-in-itself, with its concrete realizations, which are impure, shaded representations of the pure.

In the classical approach, the roses we encounter in the world are different instantiations of the same idea of a rose, the rose as a thing-in-itself. Various forms of signs, such as a photograph, drawing, diagram, sound spectrum heard as "rose," the word "rose" written on a piece of paper, and all translations of the word into other languages

are used to denote the same transcendental idea (Figure 2). These different sign forms denote the idea or notion, which allows humans to think independently of their sense experiences, though true understanding presupposes these sense experiences, as already Immanuel Kant recognized.[2] This representationalism, the idea of the *one*, constitutes an ideology and hegemony of the *same*, "homo-hegemony" (Derrida 1998), on which modernity is based. Each presentation is viewed as a different representation of the pure idea; because they are real, concrete, they are also imperfect in some way: any drawn circle has a circumference that is extended rather than having zero thickness, and when investigated using microscopes, they are not perfectly round. But despite their differences, all representations refer us to the same (transcendental) entity, the pure idea. It is evident that from this perspective, translations from one language to another, from one idiom to another, from one representational form to another, are not problems. All sign forms in all languages simply denote *the same* (idea).

In science education, this approach has theoretical and methodological consequences, as different forms of expression are taken to be reducible to the same thing (idea). Thus, in the following excerpt from an interview concerning astronomical concepts (sun, earth, moon, day, night) the interviewee Mary verbally describes the earth as facing the sunshine and—as a way of correcting herself—the sun. Simultaneously she uses gestures, first raising the left hand while uttering "earth" and then bringing the right hand toward the left as she says "facing the sunshine" (Figure 3).[3]

```
Fragment 1
93  M: ((Looks emptily into the room rather than at interviewer, as if
       looking for something)) =there is the 'point h that=uh (1.53)
       that=u::h (0.17) the s::::: (0.34) the earth ((faces
       interviewer)) will face the 'sunshine (0.25) the sun:
```

Figure 3. Mary produces a gesture whereby her right hand moves toward the palm of the left (raised while uttering "earth") just as she says "will face the sunshine." In representationalism, the two forms of expressions are taken to denote the *same* idea.

From a methodical perspective, gestures have not been the subject of research on conceptions; rather, if gestures are referred to at all, they are described in words.[4] (In fact, science education journals have stipulated the removal of images in my own previous research on the basis of editors' claims that the visible can be reproduced faithfully in verbal form.) That is, the gestural and verbal are thought to be different signifiers having the same idea as their signified. In this approach, therefore, gestures can be reduced to the verbal, because both provide access to the *same* idea. This is not only the same idea *within* the person, here Mary, but also the same idea for the researcher, and therefore, the same idea (thing) as such. *Same idea*, one underlying conception.[5]

This approach gives rise to the problem that difference cannot be thought in itself (or, for that matter, repetition for itself) but always is thought in terms of difference from a presupposed identity. The question whether something is a rose then requires a judgment about how the thing compares with the category (idea) of a rose (and its typical members). The thing *is* a rose if it is identical, similar, or analogous to the category; the

thing is different from a rose if it *does not* satisfy the conditions of identity, similarity, or analogy. "*[D]ifference becomes an object of representation always in relation to a conceived identity, a judged analogy, an imagined opposition or a perceived similitude*" (Deleuze 1968/1994, p. 138). That is, difference is always something negative, non-identity; it is less than identity. The heterogeneous or impure inherently is different from the pure thing-in-itself or idea, different from the empirical thing faithful to the idea, and therefore *not the same*, which is less than perfect. Unless we find a different approach, all the concepts and processes of interest in this paper will be lesser, deficient: the concept of diaspora with its attendant concept of heterogeneity (difference); the uniqueness of each reproduction of cultural forms by nonmembers in the group; the inherent difference *within* cultural forms; and the uniqueness of the processes of bricolage, métissage, and creolization. To think these phenomena, concepts, and processes *in* and *for* themselves, we need to think difference positively, in and for itself. It will allow us to recognize the cultural productions of students and everyday folk as productions in themselves rather than as something lesser than the cultural productions of scientists.

Difference in *and* for *Itself*

> Difference must become the element, the ultimate unity; it must therefore refer to other differences which never identify it but rather differentiate it. (Deleuze 1968/1994, p. 56)

> [F]rom now on, the subject of knowledge can only be someone, like everyone, of *mixed blood*. (Nancy 2003, p. 279)

To think difference in and for itself, as primary, we have to go beyond thinking it in reference to identity. If difference is primary than, in fact, identity can be thought of a special limit case of repetition, never perfectly achievable. Difference is the content of considerable theoretical work in continental, especially French philosophy beginning during the latter part of the twentieth century (e.g., Deleuze 1968/1994). At the heart of

philosophical approaches that begin with difference is the recognition that the universe consists of singularities, but singularities that exist only in and with respect to a plurality of singularities (Nancy 2000). In these approaches, even the Self cannot be understood from within itself but has to be understood in terms of the Other, which leads us to the very presence of the Other at the core of identity and Self (Franck 1981). Métissage, hybridity, and heterogeneity then no longer constitute something special, the virtues of which are used to argue against purity; rather, these terms refer to the norm. This, too, is especially relevant in my discussion of diaspora and diasporic identity, which, viewed from difference, is the norm; any presumed purity, pure concept, or pure identity is an unachievable ideal. In the following, I concretize and show the relevance of these ideas to science education.

Viewed from difference, (scientific) ideas, concepts, and conceptions have a very different internal structure. Thus, an idea (concept, conception) exists only in and as its concrete realization; an idea in general then consists—both at the individual and collective levels—in all its concretely possible realizations (Figure 4). Any repetition of a concrete realization is different from all previous ones (different material instantiation, form), which leads to the inherent openness of ideas (concepts, conceptions). Therefore, even the equation "A = A" as an expression of being, no longer is valid, because the ink and paper of the first impression are different from that of the repetition. Similarly, each time a person realizes an idea (concept, conception), the idea in general changes. The universal, as it exists only in its concrete realizations, is never achieved at once; at any one moment in a culture, it consists of all the concretely realized and unrealized but possible ways that instantiate an idea. Furthermore, each realization is inherently different from all others, though each one is constitutive of the idea in general. In an ontology that begins with the *same* (identity), each realization shares something with all others in the sense that all of them have in common some property, from which a universal category can be derived—the sharing means something common at the

intersection of all realizations. In an ontology of difference, however, each instantiation of the general is unique (singular) but constitutive of the universal (singular plural [Fig.4]), to which it, therefore, has a metonymical relation (part that signifies the whole). The universal, too, therefore is *concrete*.

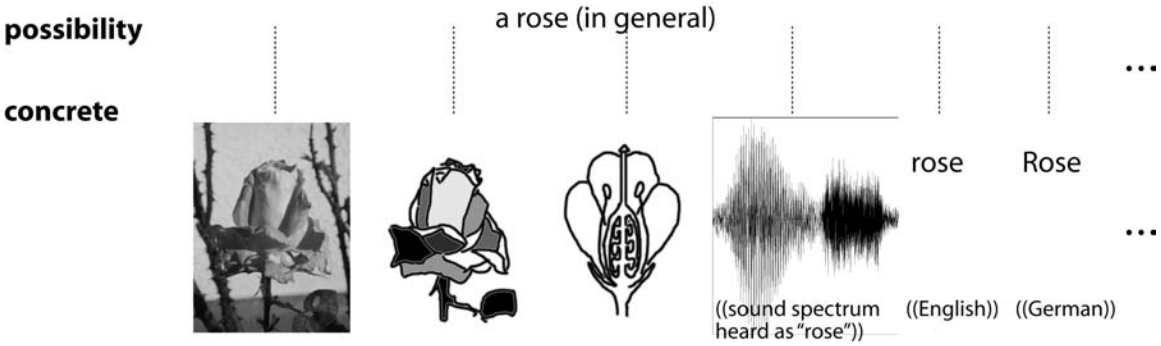

Figure 4. Within a philosophy of difference, a rose in general (the concept of a rose) is a set of possibilities, which are concretely realized in the different signs. The concept of the rose therefore is a multiplicity inherently different.

From this perspective, therefore, no repetition (idea, representation, instance) is any closer to the universal than any other. There is no privilege one group has *inherently* over a concept; the concept in itself is heterogeneous. More importantly, difference exists even at the heart of each instantiation of an idea in that there is always some matter (material) involved that is shaped in some way (form)—e.g., paper, ink, and form instantiate the word "rose."

Thinking in this way has immediate consequences for teaching and learning science in the sense that it sets up the very possibility for change; change is inherent in the (verbal, imagistic, material) repetition of ideas. The question then becomes not one of how to make students change but, because change is inevitable, how to privilege some forms of change over others—if this is indeed what science education (in contrast to schooling) is about. This approach has further consequences, both for research and teaching. First, in the past, those interested in student thinking generally and conceptions more specifically have reduced what students *really* think to words.[6] There are no published research reports in science education, with recent exceptions (e.g., Givry and

Roth 2006), where gestures and visual gestalts have received the same treatment as words. Yet already early during the twentieth century, there have been suggestions that gestures and words, for example, are not interchangeable but each correspond to a general idea that is only one-sidedly expressed by word or gesture (Vygotsky 1986). The idea of a person therefore is inherently heterogeneous consisting of the different, *concrete* possibilities that exist for the person to realize it (in talk, gesture, imagery, oriented perception). Each time a person talks, gestures, or otherwise makes salient a sign or thing, the idea is invoked but, as should be apparent, in a metonymical way because the idea exists only as a plurality of singular presentations and representations (Figure 5). Methodical-methodologically, this has consequences, because no elicitation (interview, test, etc.) can ever aspire to get at a student's ideas (knowledge); each instantiation is but a one-sided expression (some more slanted than others) of the idea as a whole. None of the various concrete instantiations truly can be translated into any of the other. This way of seeing student performances has consequences for teaching generally and for assessment in particular—no assessment whatsoever can claim to be a measure of the person, because however related to some idea, a sentence, a figure, a graphic always *metonymically* indexes the former in a one-sided way, inherently different for different individuals and different for the same individuals over time. (Variation on standardized tests is not a deficit to be ascribed to fallible persons but is inherent in the idea and praxis of repetition.)

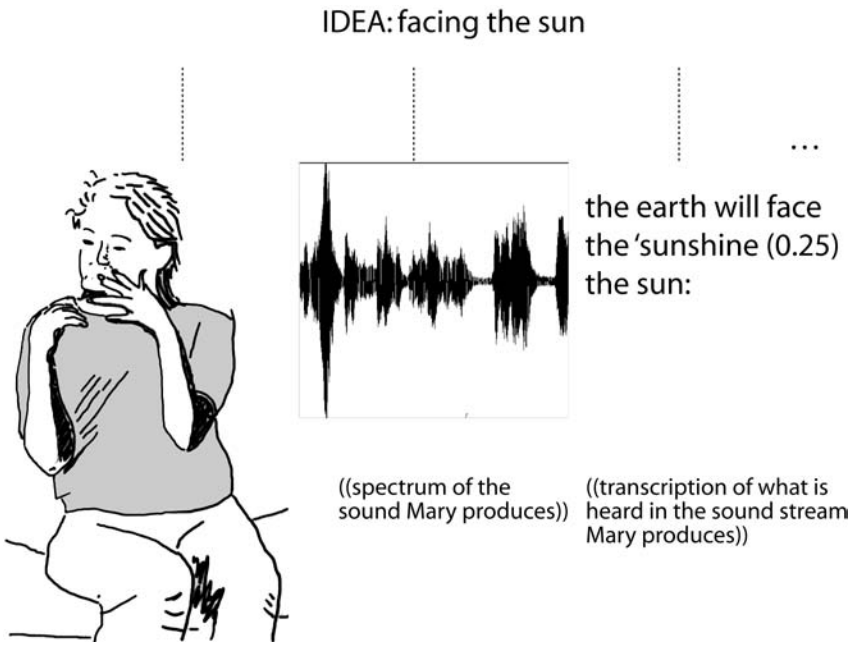

Figure 5. The idea is constituted by the concrete ways in which it can be realized (infinite in number); these ways are different inherently and metonymically refer to the idea that is a plural singular.

This approach has further methodical-methodological consequences, for example, for the analysis and assessment of what a person knows from (classroom, interview) conversations. Thus, rather exhibiting an underlying concept that is impurely articulated in Mary's talk, the transcript fragment features the topic (idea) itself undergoing continuous instantiation through repetition and transformation. This transformation may consist in an elaboration or differentiation (both different from what existed before) or, not depicted here, in a change.

Fragment 2

```
19  M: the sun is moving ]
20     (0.89)
21  I: s:o:: which? [direction (0.62) the sun will moving;
                    [((hand moves back and forth))
       from; (0.36) you know; (.) where <<pp>to]> where?
       ((as in pendulum motion))                ]
22     (0.26)
23  M: from east to west.
24     (0.33)
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```
25  I: uh hu:
26  M: ea:st ta ((gesture in the air, to upper legs to make “drawing”))
27     (2.25)
28     u:::m:: (1.41) east north
29     (0.14)
30  I: [yea]
31  M: [in ] the west an
32  M: and the [south and [the east again
33     (0.43)
34  I: so you say [east (0.22) and moving [tof;
```

Mary states that the sun is moving and, when prompted, initially elaborates the movement as being one from east to west (turn 23). There is a pause, an interviewer interjection that signals that Mary may continue, and then Mary's further differentiation of the sun movement as being from east to north to west and to south prior to returning to the east (turns 26, 28, 31, and 32). The interviewer then repeats—in a different way—the starting point of the movement (turn 34). In this, we see that talk already presupposes the commonality of the idea—even if the interviewer would consider the idea to be wrong, a misconception of the sun movement, she precisely understands this otherness in terms of the deviation from the same. In fact, the interviewer presupposes that her own repetition of what Mary has said, though she uses different words, *is* the same for the purposes at hand. (It is interesting for me theoretically what the interaction participants do to *make* the different presentations the same or on what basis they may presuppose their ideas to be shared.) In the perspective I articulate and take here, the idea in general, is a possibility, a limit case, shared among the members of a community who each concretely realize the idea in different ways; and each realization has a metonymical relation to the idea as a whole. Ideas (scientific concepts) in this approach are not something pure that are improperly used by students and other nonscientists but rather exist only in their plurality, as collective possibility, to be realized differently each time they are repeated.

The very possibility to instantiate a concept scientifically (as "scientific conception") also constitutes the very possibility to instantiate it nonscientifically (as "misconception").

Ipseity (Selfhood)

Difference allows us to think differently the perhaps most important theoretical concept today *identity* or rather, because of the problematic nature of the concept outlined in the previous section, ipseity (selfhood). The concept of selfhood (wrongly signified by "identity") is central in debates concerning monoculture and multiculturalism, community, nationality, citizenship, and more generally, belonging (Derrida 1998). Here selfhood is discussed in terms of the collective to which an individual belongs rather than in terms of an *I* that exists (and therefore is definable) in and for itself.

Classical forms of philosophy, as the first subsection shows, are anchored in the *cogito* ("I think"), which leads to representationalism and the ideology of the same. The attempt to ground human experiences generally in the "I" ends up in the realization that the "I," rather than being something pure, itself is a hybrid, a knotwork, in which the Other (alter ego) is found at the very heart of the Self (ego). Thus, Edmund Husserl, who pushed this form of analysis to its limit while attempting to found a science of the *I* (egology), realized that any given *I* could not identify the behavior of another as angry without adopting an outsider perspective over its own affects. That is, to understand the Self, the I has to take the perspective of an Other; only under this perspective is it possible for the *I* to understand a certain bodily manifestation (high pitch, speech volume, body position and orientation) of someone else as a sign of anger (Franck 1981). This shows that the way in which the *I* self-presents its body is interlaced with a re-presentation, inherently other than Self. The constitution of *my* body immediately constitutes the body of the other in a process of reciprocal (mutual) constitution. This unavoidable knotwork exposes the impossibility of a *pure* presentation: even the Self itself is a hybrid, understanding itself in terms of that which is other than Self, the Other,

always in the process of interlacing and knotworking new (other, the Other's) practices to an already hybridized (i.e., diasporic) identity. If the cogito is the source of knowledge, and if the cogito is a hybrid, then all forms of knowing inherently are hybrid. Hybridity no longer is something special—it *always* is the case, it ought to go without saying.

We now have the tools for thinking about and using concepts such as diaspora, heterogeneity, métissage, hybridization, and bricolage in a *positive* way, not as shortcomings and differences from the ideal, pure states, but in and of themselves, grounded in a unavoidable difference that is pervasive wherever we go and whatever we think.

Diaspora and Sabir

Not so long ago, I proposed viewing science as a second language (Roth 2005). Learning a second language means not merely understanding the translation between one code and another but in fact a different way seeing and describing the world—living in a different world. Being in a science classroom, learning to talk science, therefore can be understood in terms of *diaspora*, where students, having extensive out-of-school experiences and cultural knowledge find themselves in a different world, with different cultural practices and different forms of knowledge—much like migrant workers or immigrants find themselves in different cultures with different values, language, and forms of knowledge. *Diaspora* is a concept, therefore, that allows us to theorize not only the experiences deriving from transnational migration and how these mediate science learning but also the experiences of native students in a culture foreign to the one they experience at home.

Diaspora derives from the ancient Greek term for dispersal (*διασπορ□*). Capitalized, as *Diaspora*, it came to denote the dispersal of the Jews. As *diaspora* (small letter), it now comes to denote the experience of cultural groups generally who have been dispersed or who migrated across national boundaries and now live in enclaves—(illegal)

Mexican migrant workers in the US, Turkish Gastarbeiter ("guest workers") in Germany, people of Arabic descent in France. In these enclaves, individuals are bound together in groups connected via family and friendship ties, morality, ethos, manners, sporting and artistic traditions to some homeland or the idea of a homeland (Brooker 2002). When the homeland and the host country are thought in terms of pure cultures (communities or Discourses), then the appropriation of practices from the host on the part of members of the diaspora constitutes a process of métissage leading to hybrid forms of cultural practice. These hybrid forms, because no longer identical to the pure, lead to deficit characterizations of diasporic culture—such as the one members of the Turkish diaspora in Berlin experience when they are not accepted in Germany (where they are considered guest workers) nor accepted in Turkey, where the are considered *Almanci* (German-like), often speaking *Kanak Sprak*, a creole language spoken and written by working-class German-Turkish youth (Kaya 2001).

In the more recent cultural studies literature, therefore, *diaspora* frequently is decoupled from the actual or desired homeland and is understood instead with respect to dynamic networks of (inherently diverse) communities (Hall 1990). Some education scholars think the meeting of different types of discourses—school, home—in terms of the former definition, a cultural group living within another cultural group. As a result of this coexistence, students are thought to construct and exist in a "third space," the result of a merger between "the 'first space' of people's home, community, and peer networks with the 'second space' of the Discourses they encounter in more formalized institutions such as work, school, or church" (Moje et al. 2004, p. 41). In this situation, the third space constitutes a hybrid space, where the two other pure cultural forms come to be cobbled together, in a process of moment-to-moment hybridization or creolization that does not follow a plan, a cultural bricolage leading to new forms of culture. The outcome of this métissage is impurity that mediates knowledge and identity; but this métissage is

always viewed with respect to *a* Discourse, one or more pure forms of discourse said to be characteristic of disciplinary communities.

Such a conception, however, is based on the ideology of purity that I earlier denounced, the same ideology that leads to the notion of *representation* and the idea of *one* true scientific knowledge against which all other forms of knowledge are evaluated, asked to be abandoned, and, still worse, to be "eradicated" (see literature on "misconceptions"). Viewed and theorized from a perspective of difference, diaspora is not a special condition, necessitating cultural displacement that leads to the encounter of cultural difference and subsequent métissage of these *differences* into a new, third *unity*. In fact, the problems with the approach of pure cultural practices that come to be hybridized in and forming a third space are apparent as soon as one thinks of a case where the members of a diaspora borrow and use in their bricolage a practice from another diasporic group—Haitians in New York, already the product of creolization, borrowing from Latino/as or Cuban African Americans. Even within a society and culture, there is cultural variance—especially in European countries, for example, one *hears* social class in the very ways someone speaks.

For the present purposes, I propose to use *diaspora* whenever we are not at home, in some home, where we are familiar with how the world works. But whenever we are learning, wherever this is, we are inherently not at home but somewhere else, as in the quintessential white spots on the geographical maps that were of interest to the explorers of all ages. Thus we are in a diaspora whenever we are in a process of learning, where we both appropriate the new but never quite know where we are. Neither the new place nor our root culture are thought in terms of self-identity.

My notion of *diaspora* is grounded in philosophy of difference. As such, associated with difference in itself, diaspora is *the* human condition; without diaspora, no learning is possible. As such, the continual production and reproduction of knowledgeability and identity also are parts of the human condition, which leads us to an understanding of life

generally, and culture and psychology specifically, as dynamic rather than static phenomena. Each time I repeat a practice—while participating or after having seen it—I enact a practice initially foreign to me, but prefigured as possibility realized in my repetition. I am hybridizing my practices and identity, whatever the source, and in so doing, I am further hybridizing my own further possibilities to act and I hybridize the possibilities of others surrounding me (in an age of global villages, globalization, internet, surrounding does not necessarily mean in physical space). Diaspora and the attendant phenomena of métissage (creolization), hybridization, and heterogeneity are constant experiences at the very heart of being itself, tied to the fact that no language (discourse) is one with itself and therefore resists translation within itself. Cross-cultural experiences particularly notice such resistance: "Those who are sensitive to all the stakes of 'creolization,' for example, assess this better than others" (Derrida 1998, p. 9).

Scholars interested in bilingualism, for example, better than others appear to understand heterogeneity and the untranslatable nature of language captured in this double antinomical law of language: "*1. We only ever speak one language—or rather one idiom only. 2. We never speak only one language—or rather there is no pure idiom*" (p. 8). There is no pure idiom (i.e., no *Discourse*), only heterogeneous discursive practices, as diasporic Selfs knotwork the resources they find surrounding them; any idiom is the result of a métissage of the hybridized with the hybridized, so that we only ever speak one idiom, which is a hybrid. More so, the language I speak, which is in each case mine, always is the language of the other, coming *from* the other, designed *for* the other—it therefore is not my language at all. We always live in diasporic situations, producing and reproducing diaspora: life as diaspora.

The linkage between culture and language is an important one, as in the limit, knowing a language and knowing one's way around the world are indistinguishable (Davidson 1986). In diaspora, we appropriate new forms of language and other practices,

increasingly knowing our ways around the world, in fact, augmenting what the world is that we know.

In diaspora, one speaks *Sabir*. The term, deriving from the Spanish *saber*, to know, was a general-purpose language resulting from a métissage (mêlée) of Arabic, French, Spanish, Italian, and Portuguese (and depending on region, mixed with Turkish, Catalan, Greek, or Provençal) spoken in northern Africa and the eastern Mediterranean coast. It is a language—or rather, a continually changing and contingent idiom—spoken by people with different and often mutually unintelligible tongues. (Sabir is less structured than pidgin or creole and more open to further métissage whenever new problems needed to be addressed.) It served the needs of the merchants quite well, who used it to communicate and in using it continuously changed it. These merchants lived in continuous diaspora, always somewhere else, always away from home, but at home with other merchants away from home. There was a continual process of hybridization, and this hybridization was a sign of learning, as it was the result of new practices being picked up and integrated into another heterogeneity. I imagine that to solve the problems that currently emerge from life in a postmodern, globalized world we need—individually and collectively—the competency to create forms of Sabir, special purpose lingua franca.

In arguing for the concept of diaspora, therefore, I do not intend to propose a simplistic perspective, as if the hybridization and heterogeneity it gives rise to were of some value or authenticity to be revealed. Every culture inherently is multicultural "because the gesture of culture is itself a gesture of melee: of confrontation, transformation, deviation, development, recomposition, combination, cobbling together" (Nancy 2003, p. 283). That is, the unity and unicity of culture lies in its plurality. We not only are different from others but ourselves all are hybrids (metis) and the products of hybridization (métissage). But this hybridization ought not be taken as something special: "Hybridization [*métissage*] isn't "some*thing*," and, if the hybrid . . . is some*one*, this isn't due to an essence of hybridization (a contradictory notion), but it is so insofar as the

hybrid gives a punctuation, a singular configuration, to the without-essence of hybridization" (p. 281). Diaspora is culture itself, life as bricolage and métissage, always away from home, but always at home as well.

Diaspora and Science Education

To articulate possible fields in which science educators might want to employ the concepts of diaspora, Sabir, métissage (creolization), hybridity, and heterogeneity, I provide several examples from my own prior research that can be theorized in terms of these concepts. These examples come from my studies of and experience with (a) public controversies involving scientists, citizens, politicians, engineers, doctors, and environmentalists in a Canadian village, (b) language use in French immersion and regular science classrooms in two Canadian schools, and (c) cross-cultural science education.

Scientists, Citizens, and Hybrid Discourses

In a three-year ethnographic study of science in one village community, my students and I also a public controversy over access to communal water, which the residents of one street did not have. Politicians argued against a connection to the water main to avoid land development. They hired scientists to conduct studies on water quality and quantity to show that there was no problem at all or only minor, "aesthetic" problems (e.g., chromium levels corroding water pipes). In public debates, the scientists had to address their audience in ways that are intelligible to their respective others, and in so doing, no longer spoke science in the way they might speak it in the laboratory. Even if we were to make the assumption that there is *one* way in which scientists speak and write while communicating with their fellow scientists, the result would be a form of Sabir. This Sabir included concepts from a variety of fields, including science, politics, medicine, engineering technology, environmentalism, and ethics.

The linguistic métissage at the heart of the debate is evident in the following fragment 2. This is the issue of the debate: the citizens of Senanus Drive are not connected to the watermain and therefore draw water from individual wells, which are biologically or chemically contaminated whenever the groundwater levels are low in the summer and early fall. The mayor and town council attempt to block a connection to the watermain and use the assessment by one scientist consultant as a basis for their decision. In the public meeting from which the fragment has been abstracted, the citizens of the community question a scientist involved. As a result of this questioning, a better understanding of science methodology (evaluation of water quality) and nature of the problems emerges, even though many residents had little or no formal training in science. But in the pursuit of a fundamental concern, their form of interacting with scientists has changed.

Fragment 3

Scientist: I don't know of any well that we tested that had any kind of treatment. We went, we went to the cistern to get the water but we went, we went to where the water came into the cistern from the well. We didn't, uh I think there might have been one well that we tested from the cistern 'cause there was no other way to test it but all the others were uh before the cistern, and before any kind of treatment.

Resident: Are you sure of that?

Scientist: Um: as sure as I can be. We went to the pump house and we asked the owners of the property if– does this outside tap go through any treatment? And we were assured that we were getting water from as close to the well as possible.

Resident: Okay. Well, I'm just saying that there's a chance that you didn't uh it's a very, very good chance=

Scientist: =is that at one property that you're talking about?

Resident: Yes. . . . And we have an in-ground– basically a septic tank.

Science discourse is not pure, cannot be pure even if it existed in a pure state. In a sense, scientists find themselves in diasporic situation, away from their familiar surroundings, and now, in having to address the public, cobble together a new form of

discourse. The head of the area's medical council already has reported biological contaminations as having occurred during at least part of the year; he has repeatedly in the past published water boil advisories. The scientist in the fragment, however, based on his measurement of water quality during the spring, reported that no contamination existed. Here then, the scientist is confronted with the question of a resident about the method used for sampling and how he had assured that the tested water was not treated between source and sampling location. Rather than saying "all water samples were untreated," as one might expect this for a research project in a scientific laboratory, this scientist allows a possible mitigation to have occurred, in contrast to the language he had used in his report on the basis of which the community had refused supplying residents on Senanus Drive with running drinking water. In the course, the account changes. First, he suggests that he had tested the water from cisterns and then he says to have asked the owner. However, the resident asking the questions has had his water tested, but, evidently, he has not known about it, although the scientist claims to have spoken to all residents. That is, the problems with the scientific method—making sure that no mitigation of the water to be tested has occurred—becomes questionable not as a result of what the scientist has written in the report while in his office, but while being in a diasporic situation, in the public, where the participants have to situationally develop a Sabir for being able to talk to and understand one another. To solve the practical problem of access to community water, speaking "Scientese" alone does not address all the other aspects of the situation at hand, which often only become apparent in one of the other idioms available, including those that allow for historical, ethical, economic, environmental, aesthetic, and political perspectives.

It turns out that in the public, forms of Sabir on the topic of interest to scientists and science educators already are the norm. For example, in the same village community, not far from Senanus Drive, my students and I witnessed an open-house event organized by an environmentalist group in the area concerned with the ecological health of the local

watershed. The open house constituted an opportunity for many participant organizations and individuals to feature static displays or run participatory events. There were displays on the history of the watershed, watershed ecology, and stewardship activities; displays by middle- and secondary-school students; displays from other watershed groups on the peninsula; First-Nations art, featuring the Project's logo-in-progress; information from conservation organizations and local nurseries; representatives from the federal government; presentation of stewardship certificates to the first group of stewards by the mayor of the village. Through the diversity of presentations at the open-house event, scientific terms such as "watershed" become associated with, and therefore mediated by, political and historical (and other) discourses, resulting in a Sabir (hybrid discourse) that contains elements of local importance and scientific relevance (Irwin, Dale, and Smith 1996). The watershed as concept existed in and through the multiple ways of concretely realizing it in a diversity of (inherently heterogeneous) discourses, existing in the way I depicted it for a rose (Figure 3).

Talking Science and the Possibility for Change and Learning

Diaspora, finding oneself away from the familiar resources that characterize the home, provides for the possibility of learning by incorporating other (different) discursive and material practices into those one already knowledgeably deploys. Given that the existing practices already constitute a heterogeneous assembly, new ways of doing and saying that further hybridize heterogeneity, emerge even at the heart of an existing way of doing and saying something: diaspora itself is diasporic. In the following I provide two cases that make salient how diaspora, finding oneself in an unfamiliar context, constitutes an opportunity for cobbling together new ways of talking and writing science to existing ways, and therefore, how finding oneself in a diasporic situation constitutes the very possibility of an for learning. The first situation is complex and the diasporic situation is more apparent: in an immersion classroom, the instructional language for the mostly

English-speaking students is French. The second situation is from a twelfth-grade qualitative physics course, where students appropriate new ways of talking (English) to existing ones as they attempt to construct a map from a pile of concept words printed on paper slips.

Case 1: Diaspora of Diasporas—Science in Language Immersion

These higher-than-average achieving seventh-grade students in a British Columbia elementary school are mainly English speakers but some speak another language at home; many already expressed a dislike for science prior to this hands-on unit, in part mediated by the lecture-style approach throughout their school experience. They therefore find themselves in a double diaspora: talking science in French. In this science course, students design their own machines to learn about the physical principles underlying simple machines. In so doing, they cope with the fact of the double displacement by cobbling together linguistic resources to make do. The result is a Sabir, a lingua franca for doing engineering design in a situation where neither engineering and design discourses nor the official language French are familiar to the speakers. Thus, the language they speak and write has a grammar that is more like that of English, most of the words are French, though often pronounced/spelled in non-French ways, sometimes replaced by homophones, nouns with non-French and even changing gender, spiked with English words and pronunciations. Concrete things are signified and enter the conversations as ça ("this") and nearly everything is a "truc" (thing). In the following, I excerpt from the work of one group of five students, two boys and three girls.

After preparing initial sketches to precede their discussion to come up with a design, each student describes the machine that they decided to build in a logbook ("carnet de bord"). Thea describes that the design her group has settled on deals with weights and their equilibration (Figure 6). My university colleagues in second language instruction, coming from a perspective of the same—there is one correct French language, the one authorized by the *Academie Française*—expressed exasperation about the scores of

errors and about the problems these errors signal with respect to the idea of French immersion. Thea, as all her peers, made after nearly eight years in French immersion classes. She uses, for example, (near) homophones ("chandail" [sweater] instead of "chandelle" [candle]); "fils" [pronounced fis] *son* instead of "fil" [pronounced fil] *thread*; "les" [pronounced as lë] *they* instead of "laisse" [pronounced as less] *let*), forges new words from English ("can de pop"); there are inappropriate uses of gender ("le" instead of "la" machine; "une" fil instead of "un" fil); there are missing accents, sometimes changing the sense of the word ("a" means *have*, "à" means *at, to*;); and there are spelling errors galore ("troux" instead of "trous"; "peise" instead of "pèse"; or "a peut-près" instead of "à-peu-près").

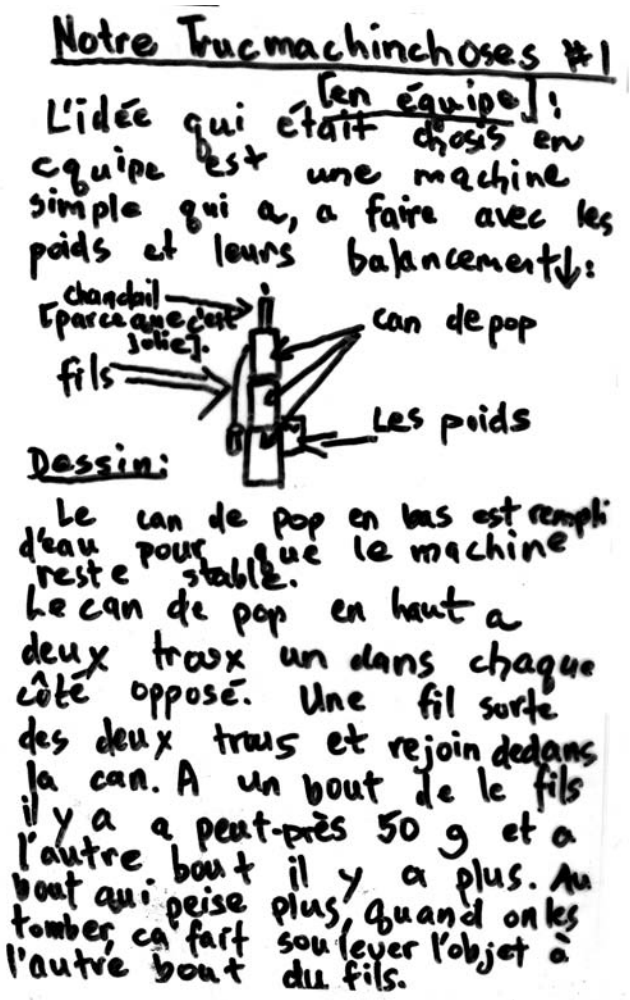

Figure 6. Description of a machine based on a tower from three pop cans and thread (“fils”), with a counterweight (“les poids”) heavier than the object to be lifted. A candle (“chandail” [sweater]) is used because “it’s nice” (c’est jolie).

In their conversations that accompany their design and construction work, students, too, speak a form of Sabir rather than the science and French traditional, purist teachers and university educators wish them to speak. In the following excerpt, Laura explains to the previously absent Rhoderica, the design they have come up with over (cans are background) and about (cans are topic) two pop cans (Figure 7). In addition to the admixture of English (bold) to French within a largely English grammar, there are also gestures both students use to illustrate the placement of the threads and how the weights will move.

Fragment 4

01 T: laura [questce que tu fais la?]
((Laura, what you do there?))

02 L: [entre le cord tu fais ça.] ((shows where the thread is placed over the pop can tower: Fig. 7, Fig. 8)) non, non je juste montre à Rhoderica. le corde sort ici, cest attaché à le chose pesant. (0.68) et puis; (0.52) et puis de poids que tu mette ici, ça va **down**?= ((both hands gesture “down” moving down the sides of the tower)
((between the cord you do this. No, no, I just show to Rhoderica. the cord exits here, its attached to this weighty thing. and then and then the weight you put here, it goes down.))

03 R: =mais ‘comment que tu vas; (0.32) le tourner ((repeated gesture of moving something over the tower of cans)) (.) sur le **cans.** comment est-ce que tu vas prendre?
((but how are you going to; turn it, over the cans. how are you going to take it?))

04 L: prendre [quoi?]
((take what?))

05 R: [‘**how] will you get your object that you wanna get**?

06 (1.38)

07 L: OH, ça va, ça vais grave.
((OH, its okay, it (you) go serious))

Figure 7. Laura (left) and Rhoderica (right) talk about their design of a "crane" involving three Pepsi cans, string, and counterweights.

In this excerpt, as throughout the course, students cope with the strange situation of speaking in a foreign language about a new (strange) topic by pragmatically forging an idiom that meets their needs—communicating to get their simple machine planned and built. This idiom, where gestures play an important part, is rather resistant to misunderstanding between the students, although the transcriber (whose mother tongue is French) has difficulties *hearing* (let alone understanding) what students say and what they mean. English words (bold in turns 2, 3, 5) spike the largely French text, and when communicative trouble appears to exist, a student might utter a sentence or two in her main language (turn 05). As with the written text, traditional second language instructors were aghast when hearing what the students said and how they spoke; and science educators may have problems with what they may deem a rather "simplistic" rather than scientific design, which basically is that of a teeter-totter.

From the diaspora perspective developed here, the situation does not look desperate at all, as in the way my second-language colleagues describe it. Rather, understanding that they are in a diasporic situation, I understand and theorize the transcript fragment and the written product (Figure 7) as being from a group of individuals doing what they have been asked to do, designing a machine, and using any resources at hand to get the job done. Rather than worrying about doing and speaking perfectly the first time—which, if they were to wait, would never happen—they actively use and reproduce a Sabir, a lingua

franca understood by all participants for the purpose at hand. In fact, *any* reading and speaking *presupposes* the competencies that the reading and speaking are to develop—and this is the case to the same degree for my students as it is for the readers of philosophical works that Jean-Luc Nancy (2001) is writing about: "In order to be read, any philosophy has, as such, always required the presupposition of its concepts" (p. 15). But how will students develop competencies in any one of the root languages (discourses), which are root languages even when their heterogeneity is granted? The next subsection provides an example for how Sabir develops and, in the process, becomes more like one of the desired source languages.

Case 2: Diaspora in the Native Tongue

Even if the students speak only one language, there are (virtually) infinite possibilities of saying something in yet another way.[7] This is precisely why diaspora is powerful concept, because it provides us with a tool for theorizing continuous transformation and change in every single (speech) act, which transforms the expressive possibilities at hand, and thereby set up the very possibility for learning. Early on in my career as a researcher, I discovered that there is a lot of flux in the way students talk about some science topic (e.g., Roth and Roychoudhury 1992). At that time I did not really understand this constant flux of language given the reigning conceptions and conceptual change paradigm, which offered itself particularly because I was interested in concept mapping, and given my own softening adherence to an individualistic psychology. (It is because of my struggle theorizing the muddled forms of language that could not be associated with one or the other [alternative] conception that my interests moved to language and linguistics.) In one of the groups I taught and observed, Ken, Miles, and Ralph constructed a concept map with terms taken from a physics book chapter on the particle–wave dualism. Ken and Miles are native English speakers; at the time of the excerpt, Ralph was a recent immigrant to Canada from Germany.

At one point in their collaborative concept mapping task, Ken points to QUANTUM and PHOTON and says, while pointing to a group of terms (Figure 8.a), "They ((points to QUANTUM and PHOTON)) are the same, no-no, I am saying if we are going downward, this is going down, that's one, that's another theory, and that ((points to PHOTON)) is under quantum." The videotape shows me suggesting a little later that there are more waves than light. Ken says, pointing to the configuration in front of him (Figure 8.b), "That's why we have it ((points to WAVE)) on top." He actively integrates the relationship between QUANTUM and WAVE for a third time in the context of finding a place for COMPLEMENTARITY, "But then, were does this ((points to COMPLEMENTARITY)) one come in, should we scrawl this across? ((points toward QUANTUM and WAVE [Figure 8.c])) The complementarity has to go somewhere!"

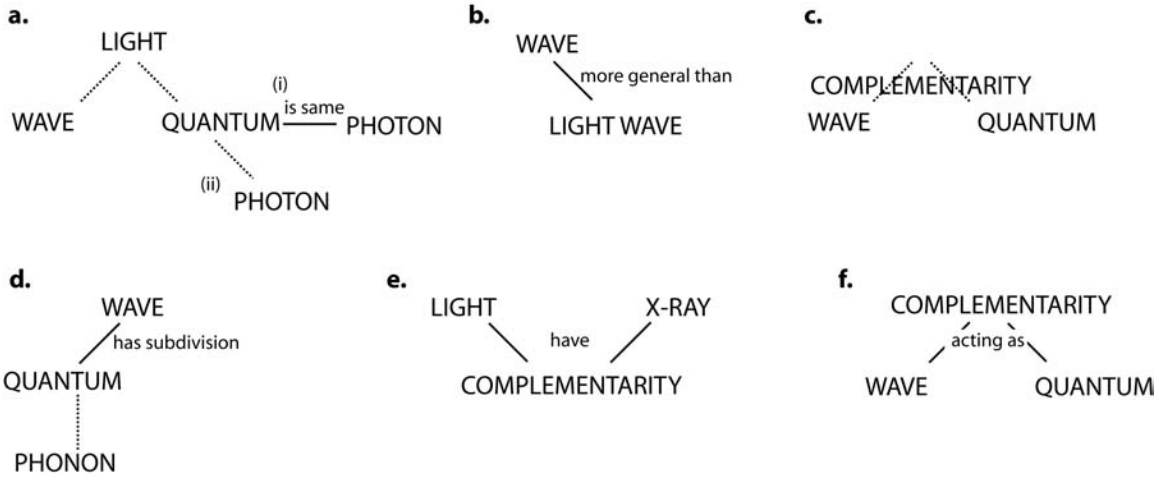

Figure 8. In the course of constructing the concept map, Ken continually borrowed from the language of others (peers, teacher, textbooks) to cobble together a hierarchical organization of a group of terms.

Still a little later in the lesson, Ken explicitly refers to Ralph and me as the sources for his new organization (Figure 8.d) and way of talking: "But because you're giving us that example with phonons, than that's like Ralph was saying, waves also have a lower detailed description within itself and that's why it should be above quantum. Because quantum is only a subdivision of waves." Ken articulates the relationship between

complementarity and wave/light on two more occasions (Figure 8.e, f): "Oh, ((points to X-RAY and LIGHT)) have complementarity" and "Yeah, right, ((points to COMPLEMENTARITY)) acting as ((points to WAVE then QUANTUM)).

In this situation, Ken refers to Ralph and me as the sources of his way of talking. Throughout the session, however, there are repeated references to the fact that he or someone else has borrowed a way of talking from one or the other source. Thus, my transcript contains utterances such as "He's [teacher] saying we should pop light on top and have complementarity," "Einstein says it has discrete energy," "But Planck gave a certain energy to that quantum, because he said its h times f," "But he [Planck] used quanta and then just Einstein said its a photon," "But this one ((points to textbook)) talks about the wave."

Fragment 5

Ralph: It shouldn't be here; it ((points to COMPLEMENTARITY)) should be under waves.

Miles: Ralph, because you could put wave there, and you could put it there, but it doesn't need to be here, you have light as a heading and we don't loose a thing in the concept map. But we have it when we don't put wave here. We are totally left without half our–

Ken: We could say, *dealing* with the subject matters of light and X-rays, and then go into further detail actually. When you think about it, light is a detail of wave, but wave is also a particular aspect of light. 'Cause remember, light isn't just waves, now that they're saying that there is quantum physics, so that's just a detailed explicit expression of light waves and X-rays.

As part of this fragment, Ken proposes what they *could* say instead of the other ways that they have been using to relate the subject matters of light and X-rays. Here, out of the conversation and because of the inherent and infinite possibility for saying something in yet another way, talking about these phenomena in a consistent way emerges while students decide and as the result of their decision that some ways of talking are preferable over others or that some ways of talking are more consistent with some author, authority, or source. *New* ways of how one can say something are, inherently, not part of previous

ways, though the fact that they can be proposed indicates that the innovation itself is a possibility. In a way, to the heterogeneous idiom they are using, students appropriate new forms of talking, further hybridizing the existing Sabir, an idiom under continuous flux, a flux that characterizes learning. In the process of change, they have to use some form of Sabir even if it does not map on one or the other conception some science educators identify, unless we presuppose that students' language flips from being incompatible with the way scientists speak to being compatible, which may require a major semantic and syntactic restructuring. This, however, is not likely to occur; it is in any case not what we observe in everyday practice—as the research in alcoholics anonymous (AA) groups shows, for example, it may take months or even years until a new member can produce a life narrative in the legitimate and legitimized AA way (Lave and Wenger 1991). Rather, ways of talking change over time and in the process of participating in conversations where some ways turn out to be favored over others. When there is a multileveled community of practice, where the number of newcomers is small compared to the size of the community, then there are many occasions where new members can practice and there are many others who may correct, assist, or structure the production of narratives that novices produce.

Diaspora in and of Schooling

Diaspora is a concept that also allows us to study and theorize a variety of school experience on the part of students of all ages. Around the globe, people are "on the move"; in Canada, for example, immigrants arrive daily through formal immigration processes or as refugees. The children attend schools in Montreal, Toronto, or Vancouver, where they find themselves among others who have to speak the language of the school (English or French) but who speak to each other in any one of their mother tongues or, more likely, in some hybridized idiom appropriate to the situation at hand. In Montreal—where Quebec law 101 forces all immigrant students to attend francophone

schools—many students therefore speak at a minimum three languages, the one at home, French at school, and English in the streets and neighborhoods. In addition, they are asked by their schools to engage in the various disciplinary discourses conceived of not as hybrids but as the *One*, which is supposed to supplant all the other idioms students speak. Possibly, students hybridize these languages as needed (as my wife and I do), speak each one of these hybrid languages with an accent (as I do), and with proficiencies that turn their mother's tongue into the second or third language (as in my case). How does living a diasporic life mediate diasporic identity? In my own case, those born in Canada, Germany, and France frequently constitute me as *other*, a *hybrid,* and this otherness and hybridity certainly remarkable in my scholarly activities and products. What might the, to many science educators familiar expression "forming a science identity" mean in such a context? What might it mean to form an identity, period?

The diaspora concept allows us to understand and theorize symbolic violence that African American or aboriginal (First Nations and Hawaiian in North America, aboriginals in Australia, Maori in New Zealand) students, for example, face in schools that at their heart embody a White middle-class ethos. The violence does not come from the fact that they are different—difference exists inside White middle-class culture—but from the fact that enactments of their (inherently hybridized) cultural forms are repressed, punished, thereby leading to the (tacit, acknowledged) experience of oppression. More so, within White middle-class culture, legitimized, legitimating, and legitimate scientific discourses in particular—as scientists and science educators define them in their curriculum and Standards documents—are constituted and considered as superior to any hybrid discourse. Although science educators often give lip service to acknowledging the (cultural) preschool and out-of-school experiences of students, they do so on the presupposition that it is a lesser form of knowing than the one to be inculcated.

One characteristic difference between the ethos of the school and that of African American or aboriginal cultures is the experience of time, temporality, and narrative

forms. Thus, the typical participation structures in White middle-class culture—one speaker at a time, individual students reciting before the group with answers subject to public scrutiny—have led to lower responsiveness among aboriginal (Hawaiian and American Indian) students; structured settings have led to lower verbal productivity rates among African American students than unstructured settings (Au 1980). More so, Hawaiian children, for example, also engage to higher degree in joint performance whereas White middle-class culture values individual achievement. When reading lessons where structured such that they came closer to the talk story a major speech event of Hawaiian culture, the reading achievements of a group of Hawaiian children increased. That is, although they went to school on some Hawaiian island, these Hawaiian children spent much of their day in a form of diaspora, where their own hybridity was constantly suppressed and oppressed.

From personal experience teaching graduate courses involving students from First Nations bands, I know that it is nearly impossible for many of them to contribute in seminars if the turn-taking routines are those of the Anglo-Saxon culture. That is, First Nations students told me that if the pauses between speakers are too short—and anything below ten seconds is too short in their experience—then they do not perceive sufficient (temporal) space for entering the conversation. These students told me about the experiences of violence in their university seminars, which exclude them from having their say. I also know from personal experience that participation patterns in French conversations involve a lot of overlapping speech: it is not unusual to see televised discussions involving politicians, artists, or writers where three or four individuals speak at the same time for extended periods of time, which would be impossible here on the Canadian West Coast. I experience these participation patterns as a form of violence, as I am excluded from understanding individual speakers.

Coda

> Let us define "ethical intention" as *aiming at the "good life" with and for others, in just institutions*. (Ricœur 1992, p. 172)

Grounding the diaspora concept in an ontology of difference allows us to theorize the way in which students from a range of cultural and home settings come to cobble together and hybridize practices to achieve whatever their goals are. These may not be the goals of schools, or be related to the school goals in various ways across individuals and groups. The concept of diaspora developed here further makes salient the fact that there is no *one* middle-class culture opposed to *one* home culture, but encourages us to specify the hybridity of practices within and across individuals and groups. Culture, identity and even the processes of making culture and identity inherently are heterogeneous, marked by hybridity and métissage.

There is another reason why we need a concept such as diaspora, related to my interest in developing forms of science literacy that are more critical appropriation and reflection on science. An ethical life generally and ethical actions specifically require practical wisdom for practical problems. As my example from the village dispute over access to the water main shows, real-world problems (those outside a test tube) are so far ranging and complex that they require the métissage of resources from ranges of domains heretofore isolated within disciplines. The natural sciences in particular have the tendency to produce ideal objects that cover over or consign to forgetting their historical and subjective origin—*precisely* because of their iterable nature (from taking representations as the same). This is the source and birthplace of an irrationalism "on the inside of reason itself, the danger of a certain perverse and amnesic use of reason that stems . . . from the specialization of multiple knowledges, indeed of regional ontologies" (Derrida 2005, p. 128). Diaspora and the métissage it gives rise to precisely are the conditions that run counter to *any* regional ontology. They give rise to a philosophy-of-

wisdom in which the already heterogeneous discourses, practices, and concerns of music, literature, drama, politics, science, religion, and philosophy are cobbled together, mixed, and hybridized in the pursuit of the pressing issues at hand. Practical wisdom consists of inventing just behavior suited to the particular, that is, it consists in simultaneously determining the rule and the case by comprehending the situation in its singularity (Ricœur 1992). Just behavior does not require further specialization and regional ontologies—there is no need for *all* or *everyone* to become specialized in any one of the different forms of knowledge. Rather, we need individuals who can live a diasporic life and identity, employing the resources at hand to find solutions to problems that exceed the grasp of any single regional ontology.

Modern societies face plenty of problems that require the collaboration of specialists, each of whom will only have partial insights, each of whom will with some excess experience a situation of diaspora, away from their native discourses, amidst people with similar interests but differing discourses. How does one talk in such situations? How does one, for example, solve the problematic issues that genetic engineering raises? Some scientists want to go ahead with their research come hell and high water. Ethicists, however, do not think that scientists themselves should be in a position to make all the decisions. Politicians get involved and draw up laws to constrain what can be done with respect to reproductive cloning, therapeutic cloning, or recombinant DNA technology. Lawyers and judges interpret the law, inherently dealing with heterogeneous topics. Health care providers have to consider the costs and evaluate whether the system can bear them. Those persons whose needs might possibly be solved with genetic technology, too, ought to be involved in the debates rather than being simply told by others, "specialists," what they may be able to desire and get done. Single discourses will not do, only different special-purpose forms of Sabir, evolving with the issues at hand—in the ways markets evolved with the Sabir in the Mediterranean—have the capacity to deal with the complexity and heterogeneity of the issues under debate. What we need therefore are

future generations who have the knowledgeability to live and create diasporic identities, developing forms of Sabir as they go. Some individuals will learn more restricted idioms, special purposes discourses suitable for working in a science laboratory, a hospital, or in an engineering firm. In any case, when these individuals leave problems of the order of the test tube and make it into the public forum, then their already hybrid discourses only can exist as constitutive admixtures of a more general, more universal Sabir. This Sabir constitutes not a third space, because all the root languages and cultures are heterogeneous. Sabir constitutes a first space continuously folding itself onto and into itself, continuously producing further heterogeneity in processes of métissage and creolization that themselves are heterogeneous from the outset.

As I am preparing a first draft to send it to colleagues for comments and criticism, I am confronted with the reality of the following incompossibility, which is the upshot from the very argument presented here: (a) My way of thinking the proposed concepts cannot be usurped by and integrated into existing ways of science education; (b) my way of thinking the proposed concepts will be usurped by and integrated into existing ways of science education. It is precisely the form of writing/thinking I propose here that will allow readers to make the gestalt switch between an ontology of *the same* and an *ontology* of difference that I am attempting to communicate with this text. The transition, if it occurs, will precisely take the form of a Sabir, in which new forms of talking/writing are hybridized into existing forms of talking/writing, thereby leading to continued change (progress?) in science education.

Notes

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[1] In this school, I also taught mathematics, physical education for boys, fine arts, and personal development.

[2] Kant subordinated pure theoretical thinking to practical thinking, which is the most inclusive form of thinking.

[3] The following transcription conventions have been used. ((Looks)) – transcriber's comments are enclosed in double parentheses; (0.34) – time in seconds; that=uh – equal sign denotes latching; u::h – each colon indicates a 0.1 second extension of the phoneme; hh – outbreath, each "h" corresponding to about 0.1 seconds; OH – capitalized items are produced louder than normal; ,?;. – punctuation indicates movement of pitch toward end of unit, slightly and strongly rising, slightly and strongly falling, respectively; `'comment` – rising pitch; [quoi],[how] – bracketed items in consecutive lines constitute overlapping speech.
[4] I distinguish method and methodical, pertaining to what I have done, from methodology and methodological, pertaining to a theory of method.
[5] There are exceptions, though, where some psycholinguists assume that gestures and speech may index two different conceptions, and these may be contradictory, especially just prior to and during development (e.g., Alibali and Goldin-Meadow 1993).
[6] This approach, particular to Western culture, has been the object of literary criticism, for example, in Jacques Derrida's concept of phallogocentrism.
[7] Semioticians refer to this phenomenon as *unlimited semiosis*.

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