

## A CULTURAL-HISTORICAL APPROACH TO TEACHING AND LEARNING: THE THEORY OF OBJECTIFICATION

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### Introduction

The theory of objectification (TO) is embedded in an educational project that is not the same as the one adopted by constructivism or other contemporary theories, such as the French theory of didactical situations (TDS). Indeed, constructivism identifies two general goals of mathematics education: “the construction of increasingly powerful conceptual structures and the development of intellectual autonomy” (Cobb, 1988, p. 100). The TDS, by contrast, is oriented towards the diffusion of mathematical knowledge. The TDS is embedded in a social project whose goal is to make the students acquire a constituted knowledge (Brousseau, 2003). As a result, in the TDS, the emphasis has generally been put on mathematical knowledge and the efficient management of the learning environment. In constructivism, the emphasis has generally been put on the knowing subject—more specifically, in the understanding of the idiosyncratic manners in which students build their own knowledge. In the first case, the underpinning theoretical orientation has been essentially epistemological. In the second case, the theoretical orientation has been psychological. The theory of objectification inscribes itself in a different educational project: it posits the goal of Mathematics Education as a political, societal, historical, and cultural endeavour aimed at the dialectical creation of reflexive and ethical subjects who critically position themselves in historically and culturally constituted mathematical practices, and who ponder new possibilities of action and thinking. As a result, the focus is not on the mathematical content alone; the focus is not only on *knowing* (the dimension of knowledge) but also on *becoming* (the dimension of the subject). To focus on knowing and becoming at the same time, the TO re-defines the concepts of knowledge and learning in a way that is consistent with a cultural-historical approach.

This paper is organized as follows. The next sections present the concept of knowledge and learning in the TO. They pave the way to define, in the subsequent sections, the concepts of processes of objectification and subjectification. After briefly discussing the processes of objectification and subjectification, I move to the concept of joint labour and present a short example from a Grade 4 mathematics classroom.

### Knowledge in the TO

In the TO, knowledge is defined as a historically and culturally constituted system of embodied, sensible, and material processes of action and reflection. Knowledge, as defined here, changes from culture to culture and in the course of time. It is produced in *human activity* and is more than a technology to do something. Knowledge, indeed, is considered to be highly aesthetical, ethical, symbolic, and political. For instance, in the Mazahua community in Mexico (de Hann, 1999), knowledge about planting corn seeds is tied to a cosmological view of the world where days and numbers acquire a specific symbolism that informs human action. Regardless of the culture in which it emerges, knowledge is always immersed in cultural super-symbolic structures. Another example, maybe closer to us, is the

super-symbolic structure of the Occidental modern period that allows us to conceive of the natural and social world in a Galilean way: as something governed by laws that can be read through mathematics (e.g., the way your mortgage is calculated by your bank).

### Learning in the TO

Student-centred constructivist pedagogies define learning as that which results from the students' own actions. In other words, the students are considered to *construct* their own knowledge. In this context, to *construct* a concept is equated to *learning* such concept. As I mentioned before, the intention behind the TO was to move beyond this individualistic stance.

If, from a cultural-historical educational perspective, learning cannot be suitably defined in terms of students' own constructions, how can it be defined? Sociocultural theories have resorted to a series of concepts, such as enculturation (mainly formulated in anthropological research) and internalization (borrowed from Vygotsky's work). I have argued elsewhere (Radford, 2010, 2013) that both concepts are insufficient to come up with an operational definition of learning from an educational perspective. To put it in a nutshell, the concept of enculturation seems to excessively emphasize the idea of social practice, to leave it uncritically touched, and to de-emphasize the individuals —even if they are considered as active participants. Rogoff, for instance, conceives of learning as apprenticeship in a context of guide participation. She says: "The concept of guided participation attempts to keep the roles of the individual and the sociocultural context in focus" (Rogoff, 1990, p. 18). She goes on to say that she uses the analogy of apprenticeship "to focus on how the development of skill involves active learners observing and participating in organized cultural activity with the guidance and challenge of other people" (Rogoff, 1990, p. 19). Learning, however, remains in the end a process whose goal is to *adapt* oneself to social practices. There is little room to investigate the individuals as agentic entities, such as the manners in which the individuals come to position themselves and be positioned in those practices. There is little room to investigate the tensions that arise from the normative dimension of cultures (what Bakhtin (1981) called a centripetal force) and the agentive movements of the individuals (the centrifugal force in Bakhtin's terminology). The same critique holds for Vygotsky's concept of internalization. It is rarely noticed in mathematics education research that Vygotsky's concept of internalization (Врачивание – vraschivanie) appears as a theoretical construct intimately related to Vygotsky's conception of the development of the mind, a conception that the Russian psychologist enunciates in terms of "genetic laws of cultural development." The content of internalization is not learning, but the higher psychological functions (such as memory and perception) and the problem this concept seeks to explain is how the psychological functions evolve. The second of the three laws of cultural development that Vygotsky formulated states that

Every [psychological] function in the cultural development of the child appears on the stage twice, in two forms—at first as social, then as psychological; at first as a form of cooperation between people, as a group, an intermental category, then as a means of individual behavior, as an intramental category. This is the general law for the construction of all higher mental functions. (Vygotsky, 1998, p. 169)

Vygotsky then states the third law of the cultural development of higher mental functions as follows: “The third law, connected with the second, may be formulated as the law of transition of a [pyschological] function from outside inward” (Vygotsky, 1998, p.170).

From the short overview of the concept of internalization we can pinpoint a few problems with using it as the basis of a definition of learning. First, internalization is a psychological concept—not a pedagogical one. We could try to expand it, and to move its content from the higher psychological functions to the learning of school disciplinary contents, although the task is not evident in itself. And even if we succeed, there are still two problems to be solved.

First, Veresov (1999) —one of the most knowledgeable contemporary Vygotskian scholars—notes the difficulty that the concept of internalization has to escape a dualist external-internal dichotomy that I find crucial to overcome in a redefinition of learning.

Second, much as in the case of learning as apprenticeship, the individual is, in the end, no more than a *replica* of her culture. The agentive dimension that I mentioned before, that dimension where we could see the cultural-historical, political production of the child in all its tensions, is not taken into account. It does not appear in the statement of Vygotsky’s three laws of cultural development of the child.

Let us come back to our previous point, then.

If, from a cultural-historical perspective, the construction and internalization of knowledge do not seem to offer suitable routes to theorize learning from an educational perspective, how can we theorize it? The answer has to be coherent with the adopted concept of knowledge. In the following section I provide the route adopted in the TO.

### **Processes of Objectification**

As suggested earlier, we can conceive of knowledge as culturally and historically constituted systems of thinking and action. Knowledge appears as a cultural-historical generative capacity (a latent capacity to do things and to think in certain ways, e.g., to plant corn seeds, to calculate mortgages, to solve linear equations, etc.). In this view, knowledge as a generative capacity cannot be something like a thing that we can “own” or that we can “possess.” Knowledge is neither a kind of merchandise nor a psychological entity. Rather, it is something that exists in our culture (in the form of knowing how to plant corn seeds, knowing how to calculate mortgages, etc.) that we may (or not) *encounter* in the course of our life (depending on the cultural-historical-political webs of knowledge access ubiquitously operating in our society). Our encounter with culturally and historically constituted systems of thought (e.g., mathematical, scientific, aesthetic, legal, etc.) is what we call *objectification*.

The noun “objectification” tries to convey the idea that the culturally and historically constituted systems of thought that, at our birth, are already there, in our culture, but we have not encountered yet, at first *object* us (that is, they resist or oppose us). They appear as something that is *not* us, as a form of *alterity*. *Object*-ification is our *encounter* with them. And because such an encounter is not something that happens suddenly, instead of objectification *tout court*, we prefer to talk about *processes of objectification*.

More precisely, processes of objectification are those social, collective processes of becoming, progressively and critically, conscious of a culturally and historically constituted system of thought and action—a system that we gradually notice and at the same time endow with meaning. Processes of objectification are those processes of noticing something culturally significant, something that is revealed to the consciousness not passively but by means of corporeal, sensible, affective, emotional, artefactual, and semiotic activity.

In this context, learning is defined as the outcome of processes of objectification. And since systems of thought (mathematical, etc.) are always revealed partially, these processes are always endless—and hence so is learning.

### Processes of Subjectification

Now, learning, as defined previously, includes an emotional and affective component. While *a priori* no educational theory would contend otherwise—or so I would like to believe—the emotional and affective components are not necessarily organic parts of most educational theories' account of learning. This is not the case of the TO. In the TO, emotions, for instance, are not seen as an additional component of thinking. On the contrary, following Vygotsky's insight, we consider emotions as an omnipresent part of thinking. In this line of thought, emotions are not relics of our phylogenetic past to be mastered in order to think properly. Emotions are ontological constituents of us, humans, as part of nature. Affect, that is, the capacity of being affected by things in our surroundings, on the other hand, is also part of our human makeup. The educational implication is that instead of being a purely mental endeavour, learning mathematics involves emotions and affects in manners that affect us profoundly as human beings. This is why classrooms do not produce knowledge only; they produce subjectivities as well.

In order to investigate the production of subjectivities in the classroom we resort to the construct of *processes of subjectification*: the processes where, co-producing themselves against the backdrop of culture and history, teachers and students *come into presence*.

To come into presence refers to the idea of the student as someone who, through classroom activity, comes to *occupy a space* in the social world and to *be a perspective* in it. To come into presence is a *dialectical* movement between culture and the individual. The dialectical nature of this movement brings us to conceive of the individuals as entities in flux—entities who are continuously co-producing themselves against the background of history and find in their culture the raw material of their own existence. Both the individual and culture are coterminous entities in perpetual change, one continuously becoming the other and the other the one. In this dialectical movement, students as well as teachers are considered as subjectivities in the making, openness towards the world. Teachers and students are conceptualized as unfinished and continuously evolving projects of life, in search of themselves, engaged together in the same endeavour where they suffer, struggle, and find enjoyment and fulfillment together.

## Activity as Tätigkeit/deyatel'nost'

In the TO, what makes learning possible is human, sensuous, practical *activity*. Processes of objectification and subjectification occur in sensuous, practical activity. But the activity to which I am referring here has a definite sense that is very different from the usual conceptions that reduce activity to a series of actions that an individual performs in the attainment of his or her goal. The latter line of thinking reduces activity to a functional and *technical* conception: activity amounts to the deeds and doings of the individuals. Activity in the theory of objectification does not merely mean to do something. Activity (Tätigkeit in German and deyatel'nost' in Russian) refers to a *dynamic system* geared to the satisfaction of collective needs. This is why activity as Tätigkeit/deyatel'nost' should not be confounded with activity as Aktivität/aktivnost'; that is, as being simply busy with something (Roth and Radford 2011). Activity as Tätigkeit/deyatel'nost' is a social form of joint endeavour through which individuals produce their means of subsistence while producing themselves as humans. It "comprises notions of self-expression, rational development, and aesthetic enjoyment" (Donham 1999, p. 55). More precisely, Activity as Tätigkeit/deyatel'nost' is a *form of life*. To avoid confusion with other meanings, in the theory of objectification, activity as Tätigkeit/deyatel'nost' is termed *joint labour*.

### Joint labour

Joint labour is the chief ontological category of the theory of objectification. Its central role derives from a dialectical materialist anthropological conception of the human. Following Spinoza (1989), humans are considered to be *part of nature*: they are *natural beings*. Like all other natural living beings, humans are *beings of need* who find their satisfaction in objects *outside* of themselves.

To meet their needs (needs of survival and also artistic, spiritual, and other needs created by/in society), humans engage themselves actively in the world. They *produce*. What they produce to fulfill their needs occurs in a *social* process that is, at the same time, the process of the individuals' inscription in the social world and the production of their own existence. The name of this process is what in the previous section I have termed *joint labour*. Sensuous, material joint labour is considered the ultimate field of aesthetic experience, subjectivity, and cognition. Joint labour as the central category of the TO asserts the fundamental ontological and epistemological role of matter, body, movement, action, rhythm, passion, and sensation in what it is to be human.

One important consequence of this theoretical stance is that the individual cannot be conceived of as a substantial entity, produced from within, as articulated by both the rationalist and the empiricist humanist trends of the Enlightenment that informs most contemporary educational theories. In the TO, the individual is a cultural-historical entity that goes beyond the skin; it is *relational* through and through. It is profoundly linked to an ensemble of material and immaterial relationships with other parts of nature—including social relationships—and is based on culturally and historically constituted conditions of life.

Joint labour as the chief ontological and epistemological category of the theory of objectification leads us to consider classroom activity as the unit of analysis. Yet, the role of

language, signs, artefacts, and the body is not dismissed in the processes of knowing and becoming. In the TO, language, signs, artefacts, and the sentient body are understood not as mediators but as *part* of the individuals' activity. And since thinking and activity are considered here as intertwined (Vygotsky in Zavershneva, 2010), language, signs, artefacts, and the body are also considered as part of thinking. They are part of the *material texture* of the individuals' thinking.

At a practical level, the concept of joint labour allows one to conceive of classroom teaching and learning not as two separate activities, one carried out by the teacher (the teacher's activity) and another one carried out by the student (the student's activity), but as a single and same activity: the same teachers-and-students' joint labour. The teacher does not appear as a possessor of knowledge who is delivering or transmitting knowledge to the students or as someone scaffolding strategies to the students. Nor do the students appear as passive subjects receiving knowledge. In the classroom activities that we seek to promote in our work with teachers and students, the teacher and the students *labour together* towards the production of a *common work* — e.g., the sensuous appearance in the classroom of a co-variational algebraic way of thinking about sequences. It is in the production of this *common work* that the students are conceived of as encountering, and becoming gradually aware of, culturally and historically constituted forms of mathematics thinking.

### An example of teaching-learning algebra

I would like to refer here to an example that comes from a Grade 4 class (9-10-year-old students) where the students were dealing with a sequence generalization problem. The problem was based on the following story:

For his birthday, Marc receives a piggy bank with one dollar. He saves two dollars each week. At the end of the first week he has three dollars, at the end of the second week he has five dollars, and so on.

The teacher provided the students with bingo chips of two colours (blue and red) and numbered plastic goblets intended to represent Week 1, Week 2, etc., and invited the students to model the saving process until Week 5. Then, drawing on the model, the teacher invited the students to find the amount of money saved at the end of Weeks 10, 15, and 25.

With some help, the students produced the model shown in Figure 1. After some discussion, the students came up with a “doubling strategy”: they found the number of bingo chips in Week 5, doubled this amount and removed 1 bingo chip:

1. Krysta: So, we should do . . . That (*see Pic 1 in Fig. 1*) times two. So 11 . . .
2. Albert: 11 plus 11 . . . 22.
3. Krysta: 22 . . .
4. Albert: Well, wait . . . No. It would be 11 plus 10 because . . . (*Pointing to the blue bingo chip*) We always start with the . . . [blue chip] (*see Pic 2 in Fig. 1*).

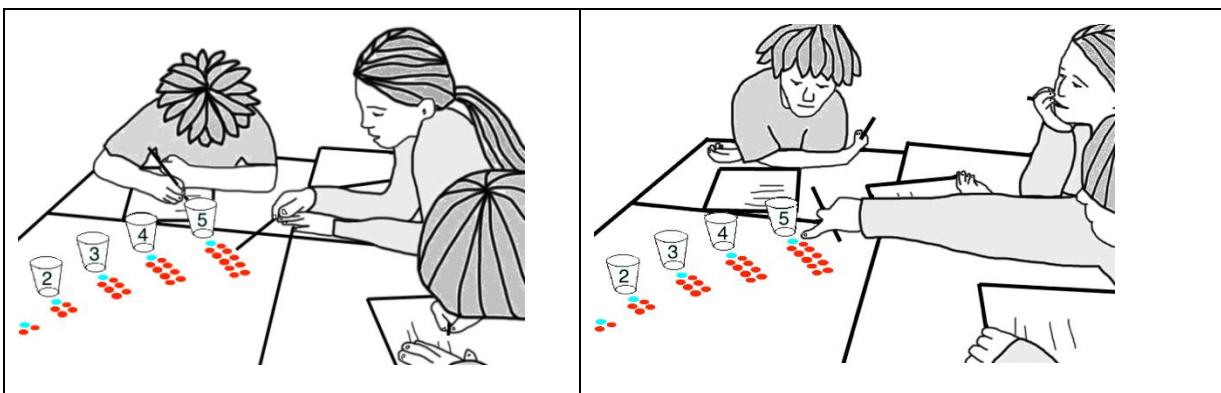


Figure 1. Left, Krista pointing to the bingo chips in front of Week 5. Right, Albert pointing to the blue bingo chip

The teacher came to see the students' work and engaged in the conversation:

5. Teacher: (*Trying to make noticeable to the students the co-variational structure*) What do you remark about Week 5 (*She shows the glass corresponding to Week 5*) and (*Pointing to the red bingo chips says*) the number of bingo chips? (*Making the same actions*) The fourth week and the number of bingo chips?
6. Albert: (*Hesitantly and at the same time interested says*) It's always twice . . .
7. Teacher: (*Repeating*) It's always twice.

The mathematical variables started being noticed. They started becoming objects of consciousness. However, their co-variational algebraic nature remained unnoticed. Joint labour reaches here a tension that derives from the contradictory ways in which the terms of the sequence have been so far perceived (an arithmetical one, based on doubling, and an algebraic one, based on a co-variational approach to the problem). This contradiction is not a flaw of a didactical design: it is the very motor that keeps the activity unfolding. To encounter algebraic thinking as featured in the teacher's didactical project, the teacher and the students have to keep working together and to try to make the algebraic approach to appear in the classroom and to become an object of the students' consciousness. Its appearance is a bit like the appearance of Beethoven's 7<sup>th</sup> symphony: for it to become an object of consciousness it has to aurally appear in a hall concert. Since mathematics is simultaneously visual, tactile, aural, material, artefactual, gestural, and kinesthetic, it can only come into life here through the sensuous and artefactual joint labour of the teachers and the students.

After some discussion and failed attempts at making noticeable the algebraic structure of the bingo chips' visual arrangement, the teacher came back to an analysis of Week 5:

8. Teacher: (*Taking with her hand again the goblet of Week 5*) What did you do here?
9. Albert: (*Takes a long breath and hits the desk with the pen, while the teacher holds the goblet of Week 5; see Pic 1*) OK.
10. Teacher: (*Still holding the goblet, speaks softly*) 5 . . .

11. Albert (*In sync with the teacher's gesture that points next to the red chips, see Pic 2*) Times 2 . . .
12. Krysta: (*Who has followed the discussion*) Times 2 equal . . .
13. Teacher: (*Pointing at the blue bingo chip, see Pic 3*) Plus 1.
14. Albert: (*Almost at the same time*) Plus 1.
15. Teacher: (*Now pointing to an empty space where Week 10 would be, see Pic 4*) 10?
16. Albert (*The teacher points silently at the place where the red bingo chips should be, Pic 5*) Times 2.
17. Krysta: (*At the same time*) Times 2.
18. Teacher: (*Points silently at the place where the blue bingo chip should be, see Pic 6*)
19. Krysta: Plus 1.
20. Albert: (*Looking at the teacher*) Minus 1?, times 2, minus 1?, plus 1?

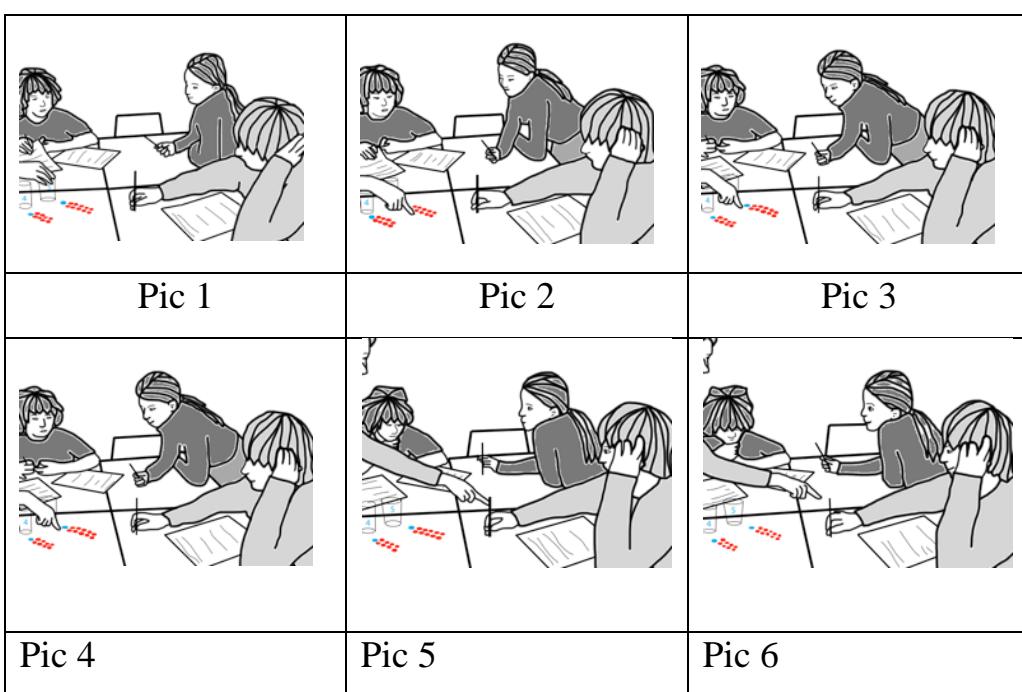


Figure 2. Joint labour and the appearance of an algebraic approach to solve the problem

This excerpt is an example of the teacher and students' joint labour —a spatial-temporal dynamic system that is created by the students and the teacher as they engage in the pursuit of the object of their joint labour (encountering an algebraic system of thinking). It features a social process that is at the same time a process of objectification (as the students are encountering something culturally relevant) and subjectification (as the students are coming into presence and positioning and being positioned in a mathematical practice).

Of course, the students are not familiar with it and as a result cannot recognize it yet. To encounter it, and to be able to recognize it, is the object of their joint labour. But how can one pursue something we don't know? Learning is the disclosure of that which so far was *desire*.

Joint labour is made up of the energy that the teacher and the students discharge, energy that is sensible and sensual, material and ideational, discursive and gestural, and that is a fluid carrier of half-confessed and half-understood desires, intentions and motives. Wrapped in this energy, the teacher moves her hand silently to indicate with an indexical gesture the imaginary position of the blue chip (see Pic 6) and Albert says "Minus 1? Times 2 Minus 1? More 1?" attesting to the fact that the co-variational algebraic manner by which to see the variables is becoming intelligible to his consciousness. At this point of the activity/energy/joint work, Albert's encounter with key aspects of algebraic knowledge is taking place. Albert still has to perceive better the nuances of the algebraic variables and how they relate to each other. It did not take long. During the general discussion, which started right after the end of the previous excerpt, the teacher invited Albert to explain how to find out the number of bingo chips in Week 4. He said: "4 times 2 . . . plus 1, 4 times 2 plus 1 equals . . . 9."

### The ethical dimension

In (Radford, 2014) I have argued that the classroom activity of the child-centred and transmissive pedagogies end up in alienation. The idea of classroom activity as joint labour provides us with an alternative to envision new cultural-historical non-alienating forms of teaching and learning. To go further, we need to redefine the two axes that organize all classroom activity: the axe of the *forms of classroom knowledge production*, and the axe of the *forms of human collaboration*.

In the TO, the forms of classroom knowledge production are driven by collective endeavours informed by history and culture where the teacher and the students work together to reach deep levels of mathematical conceptualization. Knowledge is not constructed or transmitted but *encountered* through collective sensuous processes of objectification. The forms of human collaboration are informed by a *communitarian ethic* (Radford, 2014) that is coherent with the educational project that subsumes the theory of objectification mentioned at the beginning of this paper, namely the dialectical creation of reflexive and ethical subjects who critically position themselves in historically and culturally constituted mathematical practices, and who ponder new possibilities of action and thinking.

The ethical forms of human collaboration are motivated by a general attitude toward the world and serve to configure the teachers' and students' joint labour in the classroom. These critical and communitarian ethical forms of relating to others blur the borders that separate the teachers from the students. Teachers and students labour in concert as one. The classroom appears as a public space of debates in which the students are encouraged to show openness toward others, responsibility, solidarity, care, and critical awareness. The classroom indeed appears as a space where teachers and students come into presence. That is to say, the classroom appears as a space of encounters, dissidence, and subversion, where teachers and

students become individuals who are more than in the world—they are individuals with a vested interest in one another and in their joint enterprise; individuals who intervene, transform, dream, apprehend, suffer, and hope *together*.

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