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Joint Action Theory in Didactics (JATD)

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Introduction

The Joint Action Theory in Didactics (JATD) has
emerged from the theory of didactic situations
(Brousseau 1997) and the anthropological theory
of the didactic (Chevallard 1992, 2007). By rely-
ing on a comparative approach in didactics
(Ligozat and Schubauer-Leoni 2009), the JATD
has built its specific structure by primarily focus-
ing on the very nature of the communicational
epistemic process through didactic transactions.
The JATD unfolds within a pragmatist epistemol-
ogy (Dewey 2008), which gives a prominent place
to praxis, to the "contingent ongoing accomplish-
ments of organized artful practices of everyday
[didactic] life" (Garfinkel 1984), enacting in this
way what one could term "an actional turn" in
didactics (Sensevy 2011a, b, 2012; Sensevy and
Tiberghien 2015c).

The JATD has been developed in many
research projects in various disciplines. In mathe-
matics education, it notably furnishes a rationale
to the *Arithmetic and Comprehension at Elemen-
tary School* (ACE) program, which aims at pro-
viding an entire mathematics curriculum at
first grade and second grade (Joffredo-Le Brun
et al. 2018; Sensevy et al. 2015, 2018; Fischer
et al. 2018, 2019).

The JATD has been developed on the basis of
the following hypothesis. One cannot understand
the didactic system (a system in which someone
tries to have somebody learn something) without
recognizing the relationships between its three
subsystems (teacher (X), student (Y), the piece
of knowledge at stake (S)) as a whole. It is in the
sense that JATD puts the emphasis on the
"actional turn" in didactics. The JATD institutes
a specific unit of analysis that is called an *episte-
mic joint act*. The linguistic criterion of the
description of such an act is that it is impossible
to describe it without describing at the same time
the teacher's action, the student's action, and the
way the knowledge at stake shape these actions.
This assertion is a very general and anthropolog-
ical one. For example, if a parent holds her hands
out to a young child, who is learning to walk, as an
incentive to make her walk toward these hands,
while the young child tries to take some steps to
reach these hands, this is an epistemic joint act.
One cannot understand – and even describe – each
behavior (parent/teacher or child/student) without
considering the joint process and the knowledge

(walking) that gives its form to the enacted meanings and gestures. In this perspective, in the JATD, *Knowledge* is always seen as a *power of acting*, in a specific situation, within a given institution. When a person knows something, she becomes able to do something what she was previously unable to do.

The Didactic Game

We describe the didactic interactions between the teacher and the students as a game of a particular kind, a *didactic* game. It involves two players, X and Y.

The end of the game consists of X becoming able to achieve a skill, i.e., to enter a particular "state of knowledge," that Y is acquainted with.

Y wins if and only if X wins (enters the aimed state of knowledge), but Y cannot give the winning strategy to X directly.

Y is the teacher (the teaching pole). X is the student (the studying pole). Under this description, the didactic game is a collaborative game, a *joint* game, within a joint action. To identify the very nature of the didactic game, we have to consider it as a *conditional game*, in which the teacher's success is conditioned by the student's success. This structure logically entails a fundamental characteristic of the didactic game. In order to win the game, the teacher cannot act directly. For example, in general, she cannot ask a question to the student and immediately answer this question. The teacher needs a certain kind of "autonomy" from the student. In order to win, Y (the teaching pole) has to lead X (the studying pole) to a certain point, a specific state of knowledge which allows the student to play the "right moves" in the game, which can ensure the teacher that the student has built the right knowledge. At the core of this process, there is a twofold fundamental condition. On one hand, in order to be sure that X has really won, Y must remain tacit on the main knowledge at stake. She cannot unveil this knowledge directly. She has to be *reticent*. On the other hand, the teacher has to talk and to act in order to orient student's action in her learning process. She has to be *expressive*. Actually, she

has to reach a dialectical equilibrium between expression and reticence (Mercier et al. 2000; Sensevy et al. 2012b).

On her side, the student must act *proprio motu*; the teacher's help must not allow her to produce a "good" behavior without calling on the adequate knowledge (Sensevy 2011a, b, 2012; Sensevy and Tiberghien 2015b). This *proprio motu* clause is necessarily related to the equilibrium the teacher manages between reticence and expression. Indeed, the *proprio motu* clause and the teacher's reticence/expression compose the general pattern of the didactic transactions and give them their strongly asymmetrical nature that shapes the didactic relationship.

Learning Games, the Double Dialectics Reticence-Expression/Contract-Milieu, the Equilibration Process

We call *learning game* (Sensevy et al. 2005) the didactic game we model by using the concepts of didactic contract and didactic milieu (Brousseau 1997; Sensevy 2011a, b, 2012; Sensevy and Tiberghien 2015a). Consider this example: at primary school, students have to reproduce a puzzle by enlarging it, in such a way that a segment which measures 4 cm on the model will measure 7 cm on the reproduction (Brousseau 1997). The pieces of this puzzle constitute the first *milieu* that the students face for this "enlargement problem." The didactic contract refers to the strategic system the student uses in order to work out the problem at stake. This strategic system has been shaped and embodied mainly in the previous joint didactic action. One can see it as an already-there knowledge, embedded in an embodied collective past. In our example, it is an "additive" contract, in that students try to add three to every dimension of the puzzle. The milieu refers to the set of symbolic forms that the didactic experience progressively transforms in an epistemic symbolic system. In our example, the fact that the puzzle pieces are not compatible is an incentive to refute the additive strategy. This refutation is a first step to replace the additive conception by a multiplicative one that will unite the different symbolic

forms (the pieces of the puzzle, the numbers used to describe them, the enlargement necessity, etc.) in an "enlargement milieu" which will rest on proportional reasoning.

Modeling the teaching process by using the concept of learning game enables the researcher to identify the teacher's game on the student's game. When teaching a piece of knowledge, the teacher may rely on the contract properties that characterize students' already-there knowledge (by having the students recognize the previous taught knowledge necessary to deal with the problem at stake) or on the milieu structure (by orienting the students so that they experience some epistemic features of this milieu, in our example, firstly the fact that the puzzle pieces do not fit together). She has to do that while navigating between reticence and expression processes. The teacher thus has to manage a double dialectics, which shapes her strategic system (Sensevy 2011c). She has to find the right balance (i) between the already-there meanings which constitute the didactic contract and the structure of the problem at stake, the milieu problem, that the JATD consider to be the first didactical dialectics (contract/milieu) and (ii) between saying/showing and being tacit/hiding that the JATD consider to be the second didactical dialectics (reticence/expression). Indeed, these dialectics are deeply interwoven, in that expression, as well reticence, can be produced toward contract or milieu meanings. For example, the teacher can act toward the already-there knowledge (by saying, e.g., "do you think you have to do an addition?") or toward the symbolic forms of the milieu (by saying, e.g., "please consider the way the pieces do not fit together"). The JATD consider such a joint work as a didactic equilibration process, in which teacher's signs (whatever linguistic or embodied) as they are deciphered and understood by the students – and reciprocally, in the semiosis process – play a prominent role in the success of the didactic activity (Sensevy et al. 2008, 2015a; Sensevy and Forest 2011). It is this research of the right equilibrium that enables students to build a dense and relevant knowledge. The notion of *epistemic game* addresses what is a "dense and relevant knowledge."

Epistemic Games

In a nutshell, the notion of learning game is a way of modeling what the teacher and the student jointly do in order for the student to learn *something*. The notion of *epistemic game* is a way of modeling this *something*, i.e., what has to be learned.

Speaking of epistemic game rather than of "knowledge," or "subject content," is a way of actualizing the JATD's actional turn. An epistemic game is a model of what we can call a knowledge practice (the practice of a mathematician, a fiction writer, an historian, etc.), the knowledge achieved by who one may call a *practical connoisseur*. We argue that these knowledge practices have to be carefully scrutinized in a comprehensive way that may express their fundamental principles, rules, and strategies. For example, if one intends to some extent to have students as mathematicians, one has to model this practice (that of the mathematician) so that the teachers may monitor students' activity in a relevant way by relying on this model. An epistemic game is thereby a model, which attempts to grasp the fundamental dynamic structure of a knowledge practice, the way a practical connoisseur enacts this knowledge practice. This model can help the designers of a curriculum in the didactic transposition process. Inquiring on the authentic knowledge practice accomplished by a practical connoisseur, and eliciting the model which enables to understand her skills and crafts, is a way to meet the deepness and the roots of the culture the teacher has to transmit.

Cooperative Engineering

In order to contribute to the elaboration of new forms of schooling, the JATD aims at theorizing a specific process of didactic engineering (Artigue 2015), *cooperative engineering* (Sensevy et al. 2013; Sensevy 2019), in which teachers and researchers jointly act to build teaching-learning sequences grounded on learning games nurtured by specific epistemic games. Cooperative engineering asks for a new methodological paradigm, in which empirical facts and evidence are built

through emblematic examples (kind of exemplars, as theorized by Kuhn (1974)). This paradigm entails a new kind of epistemology in JATD, what can be considered as an epistemology of paradigmatical analogy (Sensevy 2019), in which the progress of knowledge relies on the building, studying, and refining of emblematic examples of practice that serve as frames or reference to the scientific inquiry.

Cross-References

▶ Anthropological Theory of the Didactic
▶ Cooperative Engineering
▶ Cultural Anthropological Approaches in Mathematics Education
▶ Design Research and Didactic Engineering in Mathematics Education
▶ Didactic Contract in Mathematics Education
▶ Didactic Situations in Mathematics Education
▶ Didactic Transposition in Mathematics Education
▶ Didactical Phenomenology (Freudenthal)
▶ Theory of Didactic Situations

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