Authors: Ligozat & Sudriès
TEACHING AND LEARNING AS DIDACTIC JOINT ACTIONS: WHY DOES THE KNOWLEDGE CONTENT MATTER IN ASSESSING THE QUALITY OF TEACHING

Your full names: Florence Ligozat, Marie Sudriès

Affiliated authors with institutions: None

Affiliation: Faculty of Psychology and Educational Sciences, University of Geneva, Switzerland

Current position : Florence Ligozat, Professor in Educational Sciences; Marie Sudriès, PhD Fellow (will not attend the conference)

Title of your paper: **Teaching and Learning as Didactic Joint Actions: Why Does the Knowledge Content Matter in Assessing the Quality of Teaching?**

Abstract (300 words)

Educational research conducted in the scope of Didactics in Europe traditionally consider teaching and learning in relation to the knowledge contents structured in the curriculum. In this paper, we will rely on the Joint action framework in Didactics (JAD) that was developed in the French-speaking research in education to discuss ways of conceptualizing and assessing Teaching Quality within a design-based research type, namely "Didactic Engineering" (DE). Using the JAD framework imply that the assessment of teaching quality (as the value of teaching actions) is dependent of the quality of learning as the result of teaching and learning as a joint process. To assess what can be defined as valuable teaching practice about a specific knowledge content, we suggest an analytical tool relating four generic learning conditions elaborated by Sensevy (2014) to the generic descriptors of the teaching actions used in the JAD framework. We analyse three cycles of implementation of the "matter" physical model in a Float & Sink teaching unit at primary school according two timescales: a mesoscopic level is obtained by building a synoptic table of thematic episodes in teacher-students interaction; and a microscopic level is obtained in coding interactions within each episode with the criteria associated to the JAD descriptors. The results produced by the criteria on the JAD framework at microscale are then related to knowledge content progression (about the construction of the "matter" physical model) found in the mesoscale analysis of the three cycles of implementation of the teaching unit. From this analytical process, we argue that the relation between the two timescales analyses enable to build an intrinsic normativity principle that is based on the nature of knowledge content built within the teacher and students' action, and not (solely) on general / external criteria about what would/could be "good teaching".

Extended summary (1000 words, excluding reference list) Include introduction, theoretical background, methods, aims, preliminary findings/findings, results, theoretical and education significance, relevance to the QUINT ambition and the reference list.

Context and research question

Didactic engineering has a long carrier in the French Didactics of mathematics for understanding of the conditions by which the students get to learn mathematical contents (Artigue et al., 2019). Very briefly said, from (i) a preliminary analysis of the knowledge contents to be taught, DE is featured by (ii) the design of a teaching unit including a series of tasks featuring a potential learning path, then (iii) the implementation of these teaching unit in classrooms and (iv) analyses of the relation between the learning paths designed and the learning process observed in the classrooms (Artigue, 2014). Over the years, this research approach has spread in other subject didactics (e.g, physical and artistic education; see Buyck's abstract in this conference). DE also evolved as a powerful means to involve teachers in elaborating new teaching resources for fulfilling curriculum evolutions, as well as promoting their own professional development (Joffredo-Lebrun & Sensevy, 2018; Ligozat & Marlot,

2016; Sensevy et al., 2013). However, as for most design-based research types, a major challenge in DE is the discussion of the results from the different cycles of implementation in classrooms. If the analytical categories are too general, the contents tend to be lost in the discussion. Conversely, if the categories are too specific to the content built in the teaching unit, then it is not possible to make sense of the teaching process that need to be mastered to target the learning objectives. The purpose of this paper is to explore certain methodological tools for describing and assessing the quality of the teaching practices observed in cycles of implementation of a teaching unit designed by the researchers. *In comparing different cycles, how can we state that a teaching practice (as set of organised actions meant to support the students' learning) is more relevant than another one?* These questions are important to improve the implementation of the next DE cycles and to stabilise the products of DE as usable teaching resources in the end.

Theoretical background

Starting from the double meaning of "quality" as either the "property" of something, or the "the value" of something, we will explore ways of conceptualising and assessing teaching quality related to the Joint action framework in Didactics (JAD) that was developed in the French-speaking research in education over the past decade (Sensevy, 2011; Ligozat & Schubauer-Leoni, 2010; Amade-Escot & Venturini, 2015, Ligozat et al., 2018).

According to this framework, teaching has two fundamental qualities (as properties) : (1) Teaching is a joint action, in that one cannot understand the teacher's action without understanding its relation to the student's action (and vice versa), and without understanding the nature and the structure of the knowledge content that is the very object of the joint action; (2) Didactic joint actions are asymmetric because the teacher's and the student's relations to knowledge are different. The teacher's action is successful if the student is successful in learning a content, which is meaningful to her and that corresponds to what the teacher planned to teach. Such properties of teaching imply that the assessment of teaching quality (as the value of teaching actions) is dependent of the quality of learning as the result of a joint process. Sensevy (2014) suggested four generic conditions to enable students to understand the core meanings of the knowledge content aimed by the teacher. To assess what can be defined as valuable teaching practice about a specific knowledge content, we suggest relating these conditions to the generic descriptors of the teaching actions used in the JAD framework (Table 1).

Theoretical Units of Analysis	**JAD Descriptors**	**Criteria of the teaching practice**	**Generic Learning Conditions** (Sensevy, 2014, p.582)
- **Situation** experienced by the students (and managed by the teacher)	**Milieu** (what is the material and symbolic environment?) **Task** (what are the instructions?) **Purpose** (what should be achieved?)	- alignment between the milieu and the purpose - student's engagement in the task	(a) Encountering the problem (b) Articulating reasons (c) Practicing Knowledge game (d) Identifying piece of knowledge at stake
Joint construction of meanings	- **Topogenesis** (Moves in teacher's & students' responsibilities in meaning-making) - **Chronogenesis** (Moves in the common-ground construction over time)	- alternation between high and low positioning of the teacher (respectively the students) - continuity between the meanings made by the students and the teacher's uptakes	
Main teaching actions	- **Definition / Regulation** - **Devolution / Institutionalisation**	- management of uncertainty (reduce / increase) by the teacher - management of the student's responsibilities (individual / collective) in the task by the teacher	

Table 1

Method

The video recordings of three cycles of implementation of a teaching unit about Floating and Sinking Objects at primary school in Geneva (grades 1-2, with 5-7 y.o. students) were transcribed. In each cycle, the classroom session leading to the construction of the "matter" model for forecasting which object should float and sink (approx. 40min) are extracted. Since classroom actions are multiple and develop over variable time lapses, studying teaching and learning joint actions requires the articulation of several timescales (Tiberghien & Venturini, 2019, drawing on Lemke, 2000).

- A mesoscopic level is obtained by building a synoptic table of thematic episodes featured by interactional loops [question – arguments – statement] occurring in teacher-students interaction

- A microscopic level is obtained in coding interactions within each episode with the criteria associated to the JAD descriptors (table 1).

The results produced by the criteria on the JAD framework at microscale are then related to knowledge content progression (about the construction of the "matter" physical model) found in the mesoscale analysis of the three cycles of implementation of the teaching unit.

Expected outcomes

The mesoscopic analysis has been carried out and the microscopic analysis is still in progress. However, our first results about the use of the descriptors from the JAD framework tends to unveil different patterns of teaching actions in the three cycles that do not cover the four learning conditions in the same way.

Further investigations are needed about the relation between the criteria on the JAD descriptors (featuring the teaching practices) and the learning conditions for the students. However, we argue that the relation between the two timescales analyses enable to build an intrinsic normativity principle that is based on the nature of knowledge content built within the teacher and students' action, and not (solely) on general / external criteria about what would/could be "good teaching". Comparison between different cycles of implementation should allow to strengthen this intrinsic normativity principle, since all cycles are based on the same teaching unit.

References

Amade-Escot, C., & Venturini, P. (2015). Joint Action in Didactics and Classroom Ecology: Comparing Theories using a Case Study in Physical Education. *Interchange*, *46*(4), 413-437. https://doi.org/10.1007/s10780-015-9263-5

Artigue, M. (1994). Didactical engineering as a framework for the conception of teaching products. In R. Bielher, R. W. Scholz, R. Strässer, & B. Winkelmann (Éds.), *Mathematics Didactics as a Scientific Discipline*. Kluwer (Springer).

Artigue, M. (2014). Didactic Engineering in Mathematics Education. In S. Lerman (Éd.), *Encyclopedia of Mathematics Education* (p. 159-162). Springer Netherlands. http://link.springer.com/referenceworkentry/10.1007/978-94-007-4978-8_44

Artigue, M., Bosch, M., Chaachoua, H., Chellougui, F., Chesnais, A., Durand-Guerrier, V., Knipping, C., Maschietto, M., Romo-Vasquez, A., & Trouche, L. (2019). The French didactics tradition in mathematics—Chap. 22. In W. Blum, M. Artigue, M. A. Mariotti, R. Sträßer, & M. van den Heuvel-Panhuizen (Éds.), *European Traditions in Didactics of Mathematics* (p. 11-56). Springer Open. https://www.researchgate.net/publication/331370311_The_French_didactics_tradition_in_mathematics

Joffredo-LeBrun, S. J.-L., Morellato, M., Sensevy, G., & Quilio, S. (2018). Cooperative engineering as a joint action. *European Educational Research Journal*, *17*(1), 187-208. https://doi.org/10.1177/1474904117690006

Lemke, J. L. (2000). Across the scales of time: Artifacts, activities, and meanings in ecosocial systems. *Mind, Culture, and Activity*, *7*(4), 273-290.

Ligozat, F., & Marlot, C. (2016). Un espace interprétatif partagé entre l'enseignant et le didacticien est-il possible ? Développement de séquences d'enseignement scientifique à Genève et en France. In F. Ligozat, M. Charmillot, & A. Muller (Éds.), *La partage des savoirs dans les processus de recherche en éducation* (p. 143-164). De Boeck Supérieur.

Ligozat, F., & Schubauer-Leoni, M. L. (2010). The Joint Action Theory in Didactics: Why Do We Need It in the Case of Teaching and Learning Mathematics? In V. Durand-Guerrier, S. Soury-Lavergne, & F. Arzarello (Éds.), *Proceedings of the 6th. Congress of the European society for Research in*

Mathematics Education (p. 1615-1624). INRP. http://www.inrp.fr/editions/editions-electroniques/cerme6/

Ligozat, F., Lundqvist, E., & Amade-Escot, C. (2018). Analysing the continuity of teaching and learning in classroom actions: When the joint action framework in didactics meets the pragmatist approach to classroom discourses. *European Educational Research Journal*, *17*(1), 147-169. https://doi.org/10.1177/1474904117701923

Sensevy, G. (2011). Overcoming Fragmentation: Towards a Joint Action Theory in Didactics. In B. Hudson & M. A. Meyer (Éds.), *Beyond Fragmentation: Didactics, Learning and Teaching in Europe* (p. 60-76). Barbara Budrich Publishers.

Sensevy, G. (2014). Characterizing teaching effectiveness in the Joint Action Theory in Didactics: An exploratory study in primary school. *Journal of Curriculum Studies*, *46*(5), 577-610. https://doi.org/10.1080/00220272.2014.931466

Sensevy, G., Forest, D., Quilio, S., & Morales, G. (2013). Cooperative Engineering as a Specific Design-Based Research. *ZDM*, *45*(7), 1031-1043. https://doi.org/10.1007/s11858-013-0532-4

Tiberghien, A., & Venturini, P. (2019). Characterisation of the Didactic Contract Using the Video of the Classroom as Primary Data. In L. Xu, G. Aranda, W. Widjaja, & D. Clarke (Éds.), *Video-based research in education: Cross-disciplinary perspectives* (p. 158-175). Routledge.