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AI and Video Analysis of Teacher Didactic Action

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Abstract: The need to improve the *quality of teachers' professional skills* is widely recognized nationally and internationally as a priority for systematically addressing the cultural and educational changes required by a continuously transforming society. Both reform initiatives of education and training systems and the promotion of initial and in-service training processes for teachers, aimed at developing professional skills and capacities, move in this direction. In this sense, one of the main objectives of didactic reflection is to seek to understand the *teacher's agency* by investigating the teaching processes underway during the *professional action-practice itself*. In this sense, practice analysis is a training model that involves the presence of a training group (teachers) and various experts who commit themselves to understanding how a particular teaching sequence took place, making use of *video analysis of the didactic action*, enhanced by the use of *new technologies and AI*.

Keywords: Teachers; Agency; Reflective Practices; Artificial Intelligence; Video Analysis.

1. Introduction to AI and Video Analysis of Didactic Action

The context in which teachers operate daily is constantly evolving, encompassing diverse cultures and existential conditions. This demands *calibrated planning* attentive to the individual, focusing not only on knowledge but also on the acquisition of *competencies and capabilities* (Sen, 2000; Nussbaum 2012; Ellerani, 2020; Gulisano, 2019) that enhance methodological-didactic awareness. Since teachers have been recognized as "key people" for institutional and social change, *agency* has been considered a cornerstone of the teacher's professional profile and a goal of professional development programs.

When considering the role of practical experience in developing a teacher's professional action, it's now agreed that the practice itself isn't what matters, but a specific type of practice—one deliberately aimed at achieving clearly understood improvement goals. The most effective methods are therefore those that, «placing "experts" in operational contexts, involve them in cyclical processes of action and reflection, both autonomous and with other subjects from whom they can receive orienting feedback towards an objective» (Calvani, Maltinti & Menichetti, 2015). *Action* is complex, holistic, and difficult to break down and analyze into its components; it can only be observed in its multidimensionality to understand the logics by which it is organized. It's also deeply connected to the person and their perception of the world.

To study action, it's necessary to refer to a series of constituent relationships (De Luigi, 2013, p. 62): *Knowledge and action* are inseparable; theories arise from observations

and immersion in contexts where relationships are identified and later transformed into models; other relationships exist between *action and production* and *action and construction.*

Acting means intervening on a state and modifying it. This action also modifies the subject performing it, as the context responds and continuously induces new transformations in them. While doing places the subject in relation to the world and allows them to introduce new intervention schemes, it is *reflection on action* that favors the capitalization of what has been developed, turning it into conscious experience that is reusable and modifiable.

The focus on the implicit dimensions of knowledge transfer has progressively led to a more accurate investigation of the relationship between the visible act and the underlying reasons. The term "practice" has thus acquired a dual dimension, encompassing gestures, behaviors, and languages on one side, and objectives, implicit strategies, and ideologies on the other. This has led research *on* and *for* training to increasingly concentrate on the teacher and the professional knowledge constructed in action.

In the last twenty years, particularly in the Francophone area (which draws on American pedagogical approaches), there has been a significant focus on the *analysis of "experts'" practices* and the worker's action. *Practice Analysis* is a training model involving a training group and various experts (trainers, researchers, sectoral operators, etc.) who commit to understanding how a particular work sequence occurred, using supports such as video recordings, audio, narratives, and descriptions.

The most common technique is *video analysis*, which offers the advantage of re-observing and analyzing a didactic intervention an almost infinite number of times, independent of space and time, allowing for comparisons among different evaluators.

The fundamental assumption across various theoretical and research treatments is that video helps overcome the limits of human real-time information processing capacity, makes the invisible and imperceptible visible and perceptible, offers scholars new ways to verify hypotheses, encourages new discoveries, and prompts detailed processes of analysis and study. Video, enhanced by new technologies and AI, allows for «the best possible approximation to completeness» and «helps broaden the view» (Goldman, 2009), promoting the intertwining of multiple conceptual directions and viewpoints. *AI tools*, with the necessary caution and supervision, can play a strategic role in the education and training system by: Improving organizational, managerial, training, and learning processes; Speeding up repetitive administrative tasks; Qualifying training experiences in an inclusive and accessible manner, especially in complex contexts requiring specific support for individual student needs.

Furthermore, video offers a link to experience, enabling the analysis of teaching situations in real contexts and fostering fruitful, recursive interaction between theory and practice (MIM, 2025).

Figura 1 - I pilastri alla base del modello di introduzione dell'IA nelle scuole

Figura 2 - I principi fondanti della strategia per l'introduzione dell'IA

Sherin and Van Es (2009) note that the growing prominence of video partly reflects the recent emphasis on adopting *practice-based* training approaches, where teachers have the opportunity to learn through case studies, simulations, and authentic representations of *teaching actions* (their own and others').

Specifically, video provides a permanent record that captures the situation in its complexity and multiple components, allowing the observer to examine and re-examine it multiple times, with different objectives and perspectives. It facilitates a more analytical, precise, and in-depth observation, enabling the complexity of situations and practices to be "decomposed" and attention to be focused on details that might be missed initially, also due to the possibility of pausing and reviewing segments.

Today, the use *of video analysis of didactic activity*—enhanced by *new technologies and AI*—is proposed as an effective exercise for: Training the analytical and observational capacity of "experts." Providing examples of good teaching practices; Stimulating professional reflectivity (Calvani et al., 2015).

Moreover, a video recording of one's work can be important for certification, enhancing the documentary quality of a personal skills portfolio. The relationship between people evolves through «communication that deals with electronic, digital, technological tools, thus modifying the interaction processes and the communicative situation between an I and a You, between one subject-person and another» (Mulè, 2017, p. 22).

The pair schema/situation is now fundamental for understanding learning and experience: «there are no schemes without situations, but neither are there situations without schemes, since it is the scheme that identifies a situation as belonging to a certain class of situations» (Magnoler, Pacquola & Tescaro, 2014). Two fundamental and continuously interacting moments are thus identified: action and revisitation of the action.

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

2. Analysis of the Reflective Action of the Agentive Teacher: *Simple Self-Confrontation* or *Cross Self-Confrontation*?

Reflective action is an epistemological construct in which the professional acting in a "reflective manner" positions themselves as a researcher. Thanks to this attitude, they increase knowledge and competence by reflecting *on* the action while it is taking place (*reflection-in-action*). Action is difficult to break down and analyze into its components; it is also strongly connected to the person and their perception of the world.

Highlighting, in this sense, that our knowing is within the action itself, Schön (1993) investigates the knowledge and learning processes underway during the *professional action-practice*, leading to the articulation of a reflective type of action which, precisely starting from the uncertainty and unease connected to it, can itself become a producer of new knowledge.

Reflection, as the experimentation/creation of concepts and a space of subject dislocation capable of activating new forms of thought and new possibilities for being and doing, is defined as an activity through which to produce awareness regarding an action and a profession. This premise allows for the emphasis on the emergence of a fundamental concept: «*the reflective function of the Self* […] and therefore the understanding of meanings» (Fabbri, Grassilli, 2003). To this end, one of the fundamental elements of the agentive teacher is the ability to reflect constantly *before, during, and after the didactic action in "communities of convivial practices"* for the co-construction *of professional learning pathways*.

In this particular context, a strong connection between theory and practice in constant interaction is realized. Circularity between *researching* and *acting* is reproduced in a relationship of exchanges that are implemented through the enhancement of innovative factors. To this end, *reflective processes* take on particular importance, becoming the "bridges" connecting the practical dimension and the theoretical dimension, which can progress through input coming from action. To pursue such articulated and complex goals, it is necessary to rethink traditional educational proposals, and among these, the laboratory strategy is proposed as an essential reference and a privileged means.

Experience constitutes a moment of learning through doing, and «the centrality of acting focuses attention on the product and the process, on the reasons for the decisions and their relevance in relation to the situation» (Brousseau, 1998, p. 55). Simulation allows for the enhancement of retrospective reflective analysis of the activity, expanding the time for the re-visitation of the action. It «activates the subject and the group in the analysis and recovery of the cognitive elements of the activity starting from real traces».

Reflectivity can thus be a moment and an opportunity to professionally re-engage, focusing on the "strong," strategic, and transversal competencies from each work and training experience that can be leveraged to improve one's expertise and professional performance. This is precisely a transversal dimension of professional action characterized by the "reflective return," which is the individual's ability to «monitor their own actions, to motivate the why of certain choices rather than others» (Dato, 2009, p. 97).

Donald Schön, in his now classic *The Reflective Practitioner*, specified that when we talk about professionalism, we are always «referencing a research [...]. Professionals are those workers capable of being "researchers in a practical context," since through their tasks and professional practices, they modify, improve, and construct

knowledge» (Schön, 1999, p. 54). It is no accident that Le Boterf specified that when considering reflectivity, it is essential to interpret it as the analysis of professional practices, as a self-diagnosis of one's own ways of acting and thinking (Le Boterf, 2009).

Here, the exercise of a form of lucid rationality by the subject is at stake, which involves a judgment analysis of the internal and external resources at their disposal and the development of problem-solving strategies.

Consequently, the trainer (or researcher) using the methodology of action or practice analysis employs several techniques:

- *Simple Self-Confrontation* (*auto-confrontation simple*): A single subject compares the traces of their own video-recorded activity.
- *Cross Self-Confrontation* (*auto-confrontation croisée*): Multiple subjects, mediated by the trainer-researcher, compare and analyze the traces of the video-recorded activity. It is in this sense that Goldman (2009, p. XI) speaks of a "community of convivial learning," illustrating how the use of video in the learning sciences allows for the construction of "bridges" between what the researcher observes and seeks to understand, and what others observe and understand.

The theoretical reflections mentioned here lead towards a rethinking of apprenticeship (understood as a moment of alternating training and work) by addressing several challenges: The first concerns shifting the focus not so much to the one who is learning, but to the knowledge with which the apprentice is confronted. The second challenge concerns the design of devices that allow the apprentice to confront the expert's activity, enabling them, even through the simulation of the work, to grasp the professionalizing segments of their own action.

3. Conclusions

To this end, capacitating the teacher's professional development translates into the possibility of making a professional identity mobile—one that is capable of realizing significant learning by investing not only in technical aspects but also in intensely personal ones, involving intellect, emotions, and identity. This is to ensure that every student feels part of an active and *capacitating learning environment*.

The qualification of a teacher, in fact, «is based on the possession of disciplinary and technological-didactic competencies, design and organizational capabilities, but it expresses a professional functioning founded on ethical and affective-relational values with which to live the educational relationship, for a continuous practice of self-analysis, reflectivity, and formative redesign» (Rossi, 2005, p. 65).

According to Durand, training thus becomes «a space that encourages action, that allows the subject to observe, understand, experiment with, and re-examine action, discovering the origins of their own actions» (Durand, Filliettaz, 2009).

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