

Assessment of mediated interactivity within the scope of the Anthropological Theory of Didactics

Valoración de la interactividad mediada en el ámbito de la Teoría Antropológica de la Didáctica

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Abstract

We present progress made in doctoral thesis «Configuration of the assessment practices of mathematics teachers at university». Preliminary analysis shows the predominance of «summative assessment» of learning, content-centered, aside from the *teaching* and *study activities*, producing poor operative learning outcomes. This didactic phenomenon entails the problem of establishing the conditions and constraints that hinder the development of a more functional kind of assessment that mediates these activities and obtain more *operational learning*. Finally, we construct the concept of *assessment of mediated interactivity* as a contribution to the design and management of didactic and mathematical praxeology.

Keywords: Evaluation of mediated interactivity; Anthropological theory of the didactic; Assessment practices.

Resumen

Presentamos los avances de la tesis doctoral: «Configuración de las prácticas evaluativas de los profesores de matemáticas en la universidad». Los análisis preliminares ponen de manifiesto el predominio de la «evaluación sumativa», centrada en contenidos, al margen de

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las *actividades de enseñar y estudiar*, produciendo aprendizajes poco operativos. Este fenómeno didáctico conduce a plantear el problema de establecer las condiciones y restricciones que dificultan o impiden el desarrollo de una evaluación más funcional, que medie en dichas actividades y logre *aprendizajes más operativos*. Finalmente, construimos el concepto de *evaluación de la interactividad mediada* como aporte al diseño de praxeologías didácticas y matemáticas.

Palabras-clave: Evaluación de la interactividad mediada; Teoría antropológica de lo didáctico; Prácticas de evaluación.

Résumé

Nous présentons des progrès réalisés dans la thèse de doctorat «Configuration des pratiques d'évaluation des professeurs de mathématiques dans l'université». Les analyses préliminaires montrent la prédominance de «l'évaluation sommative» basée sur le contenu, en dehors des *activités d'enseignement et d'étude*, produisant un apprentissage peu opérationnel. Ce phénomène didactique conduit au besoin d'établir quelles sont les conditions et les restrictions qui entravent le développement d'une évaluation plus fonctionnelle et au même temps intervenir dans ces activités pour obtenir un apprentissage plus opérationnel. Enfin, on construit le concept d'évaluation de l'interactivité médiatisée comme contribution à la conception de praxéologies didactiques et mathématiques.

Mots-clés: évaluation de l'interactivité médiatisée; Théorie anthropologique de la didactique; Pratiques d'évaluation

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The assessment of school mathematics is traditionally conceived as a technical and instrumental process whose function is to provide information on learning outcomes according to predetermined objectives and to generate a verdict. Which means, that the dominant assessment is *summative* assessment, considered outside the teaching and study activities, whose function is of measurement and classification. It is to emphasize that this type of assessment corresponds to the currently dominant didactic paradigm that metaphorically is assimilated to the «visiting works as monuments», consisting of pieces of knowledge that are exposed to students, exemplifies their use and is expected that the student master, on their own, the applications of such knowledge to different situations where they are needed, Yves Chevallard (2015) calls this procedure «*monumentalist paradigm*». This paradigm is opposed to the reconstruction of mathematical works starting from questions whose answers are not available to the student, but are necessary to solve a whole class of situations and such answers can be reached with the help of an expert and actions with the peers, this way of proceeding is called «*paradigm questioning the world*».

This nascent paradigm is in correspondence with the definition of the mathematics from a pedagogical point of view, proposed by Guershon Harel (2008) according to which the mathematics would be formed by two subsets: one the «*ways of understanding*» (*WoU*) formed by axioms, formal definitions, theorems, proofs, problems and solutions, that have been the product of mental acts like –infer, deduce, interpret, generalize, etc. – and the subset of «*ways of thinking*» (*WoT*) whose elements are cognitive characteristics of the mental acts they produce those *WoU*. In light of this definition and the research that reveals the mastery of the monumentalist paradigm, it can be said that both the teaching and learning assessment processes *focus on institutional contents –WoU–* and the *WoT* are neglected.

On the other hand, in reviewing the antecedents it is inferred that the dominant «*didactic contract*» (Guy Brousseau, 1986) is characterized by *exempting from the didactic responsibility of the teacher and blaming the student* for the results. In other words, the assessment does not consider the relationship between educational «*mediation*» (César Coll, Rosa Colomina, Javier Onrubia y José Rochera, 1995), the study activity and its results. Consequently, our problem is expressed in the following questions:

✓ What are the *characteristics of the institutional praxeologies that are expressed in the dominant «didactic contract»* in relation to the processes of assessment of the learning of mathematics at the university level?

✓ What *conditions are required and what restrictions hinder or prevent* the assessment in mathematics from mediating the teaching and study activities for the acquisition of learning?

✓ What kind of didactic contract would make possible assessment processes that measure in the activity of teaching, the activity of study and the learning in the systems of education?

These questions make sense if one assumes that external or internal agents influence the school environment; so it is important to carry out the analysis in the hierarchy of *levels of mathematical-didactic co-determination* proposed by Chevallard (2002); in which exist the school mathematical organizations (*MO*) and the corresponding didactic organizations (*DO*).

Therefore, we consider that, in order to investigate *the assessment practices of the mathematics teacher*, it is necessary to model the didactic praxeology of the institution, according to what Marianna Bosch and Josep Gascón (2001) refer that spontaneous praxeology –tasks, techniques, technologies and theories– depends on the subjection of this to other institutions. For which it is significant the analysis of theoretical and empirical data, related to the set of conditions and restrictions that influence the way in which the evaluative practices in

mathematics at university level are derived from praxeology the social, scholastic, pedagogic, disciplinary institutions.

Methodology

Qualitative, descriptive and explanatory. It is about analysing the theoretical and empirical data that emerge from the institutions at the different levels of the codetermination scale indicated by the TAD in order to study the configuration of assessment practices at the university level. We consider four *dimensions*: anthropological, didactic, epistemological and socio-cognitive, which makes it necessary to consider a *system of units of analysis* being the central unit the «*local praxeology*», in the *subject* of the derivative. The *general objective* is to conform a vision that accounts for the conditions and restrictions resulting from the transposition, in relation to the assessment processes in university mathematics.

Contributions to the theory

It is inferred from previous approaches that it is necessary to generate changes at the level of assessment that impact the educational systems. In this sense, there is a call to propose an evaluation that articulates the *teaching activity*, the *study activity* around its objective, the learning, which we have called the *assessment of mediated interactivity* (AMI), whose function would be to *regulate* these two activities, so that more operational learning is achieved. Thus, it is an assessment that generates and feeds a *dialectic* between the *actions of the teacher* -or a more experienced pair- and the *actions of the student*, where the former are aimed at helping the student to fill conceptual gaps or generate *disturbances* that make it necessary the modification of the current knowledge states and the second, on the side of the student's actions, are aimed at achieving success by facing the *medium* and thus affects the actions of the teacher that must be adjusted to the state of knowledge of the students to feed them, *validate and institutionalize* the mathematical works of the participants.

Consequently, the assessment focuses on *interactivity* understood as defined by Coll et al, (1995): «[...] the articulation of the actions of teachers and students [...] around a given task or learning content» (p.204) and, in the nature of the *mediation* exerted on it by *systems of practices and cultural artifacts* that, potentially, they can generate tensions with the *current knowledge systems* of the students that maximize the interaction printing a dynamics to the construction of *zones of proximal development* (Lev Vygotski,1930)-ecotones. The assessment of *mediated interactivity* will take into account the mathematical issues that arise in the organization and management of mathematical and didactic works related to certain *ways of understanding* (WoU) of students -observable action, product of mental acts- and *ways of think* (WoT) -characteristics of the mental acts that are inferred from observations of the WoU that are repeated-, in order to mediate and build, from them, *Zones of Proximal Development* that bring them closer to the institucional's WoT and WoU.

That is, the function of the AIM would be to ensure the effectiveness of the mediation between the teaching activity and the study activity, so that the expected learning is achieved. Thus, the assessment must look at the *interpersonal process* and the *intrapersonal process*. The interpersonal process will depend, ultimately, of the relationship between *mathematical organisations* and *didactic organisations* proposed by the teacher, which must be kept in constant observation. While the intrapersonal process refers to cognitive perturbation or disequilibrium and re-equilibration related to the didactic and a-didactic environment generated around the issues and situations. It is then a matter of evaluating how the environment -material medium, a-didactic and didactic situations- affects the mental acts related to WoT and WoU of the students, depending on the interactivity. That is to say, of «*the forms of organization of the joint activity of the participants*» (Coll et al, p 205)

Expected results

It is expected to provide elements that inform on evaluative practices in the teaching of mathematics in university education, in order to unveil implicit and explicit aspects that regulate these practices from the social, pedagogical, school, disciplinary and personal dimensions.

Therefore, the aim is to fill a vacuum of information in relation to the conditions and restrictions that hinder or prevent the assessment in mathematics from mediating more positively, in the activities of teaching and studying mathematics with the aim that learning is more operative. It is expected then, in light of the findings, to provide theoretical references and empirical evidence that will lead to a better understanding of the role of assessment in educational processes at the university level.

References

- Bosch, M. & Gascón, J. (2001). *Las prácticas docentes del profesor de matemáticas*. (Provisional version of 09/13/01)
- Brousseau, G. (1986). Fondements et méthodes de la didactique des Mathématiques. *Recherches en didactique des mathématiques*, 7(2), 33-115.
- Chevallard, Y. (2002). Organiser l'étude. 3. Ecologie & régulation, *Actes de la XIème École d'Été de Didactique des Mathématiques*. Corps, Août 2001. Grenoble: La pensée sauvage. pp. 41-56.
- Chevallard, Y. (2015). Teaching Mathematics in Tomorrow's Society: A Case for an Oncoming Counter Paradigm. In: *The Proceedings of the 12th International Congress on Mathematical Education*. Seoul (Korea): Springer International Publishing. pp. 173-187.
- Coll, C., Colomina, R., Onrubia, J. & Rochera, J. (1995). Actividad conjunta y habla. In: Fernández, B. & Melero, Z. M. (comp.), *La interacción social en contextos educativos*. Madrid: Siglo XXI. pp. 193-326.
- Harel, G. (2008). What is mathematics? A pedagogical answer to a philosophical question. In: Gold, B. & Simons, R. (Eds.), *Proof and Other Dilemmas: Mathematics and Philosophy*. Washington, DC: Mathematical Association of America. pp. 265-290.
- Vygotski, L. S. (1930). *El desarrollo de los procesos psicológicos superiores*. Barcelona: Crítica, 1996.