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The co-emergence of machine techniques, paper-and-pencil techniques, and theoretical reflection: a study of CAS use in secondary School algebra.

Summary: This paper addresses the dialectical relation between theoretical thinking and technique, as they co-emerge in a combined computer algebra (CAS) and paper-and-pencil environment. The theoretical framework in this ongoing study consists of the instrumental approach to tool use and an adaptation of Chevallard’s anthropological theory. The main aim is to unravel the subtle intertwining of students’ theoretical thinking and the techniques they use in both media, within the process of instrumental genesis. Two grade 10 teaching experiments are described, the first one on equivalence, equality and equation, and the second one on generalizing and proving within factoring. Even though the two topics are quite different, findings indicate the importance of the co-emergence of theory and technique in both cases. Some further extensions of the theoretical framework are suggested, focusing on the relation between paper-and-pencil techniques and computer algebra techniques, and on the issue of language and discourse in the learning process.

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