Local Magnification and Theoretical-Computational Conflicts

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The aim of this research is to understand how conflicts between computational and non-computational representations can contribute to enrich students' concept image of derivative and limit. We consider *theoretical-computational conflict* as any situation where a computational representation for an object is (at least potentially) contradictory with the associated mathematical theory. For example, numerical calculation with machine accuracy cannot be performed in a way which corresponds exactly to mathematical theory of limits.

To perform the investigation, we designed a computer-based Calculus course having the notion of local straightness as a cognitive root for the derivative concept, as suggested by Tall (2000). On this approach, we give emphasis to theoretical computational conflicts, instead of avoiding them, particularly those related with the impossibility of computational representations for limits and infinite processes in general. This course was tested with a first year undergraduate class and a sample of six students was selected for weekly clinical individual interviews, when they are given theoretical-computational conflicts.

Partial results show that students develop different mental strategies to cope with this kind of situation. The experiment also seems to indicate that, in general, students can build up more sophisticated theory and establish richer links between cognitive units to answer questions that emerge from theoretical-computational conflicts.

The full paper can be downloaded from www.dmm.im.ufrj.br/~victor.

References

Tall, D.O. (2000). Biological brain, mathematical mind and computational computers, Plenary presentation for ATCM conference, Chang Mai, Thailand.

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