

LEARNING OF THE SCIENTIFIC APPROACH AT UNIVERSITY : THE CASE OF RESEARCH SITUATIONS FROM PROBLEMS OF DISCRETE MATHEMATICS

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This communication aims to present a module of transversal and optional teaching proposed at the University of Grenoble about combinatorial games and mathematical reasonings. The primary objective is the learning of the scientific approach for non-specialist students in mathematics and in particular, the development of both reasonings and proving process. In this occasion, we will analyze an example of research situation built from a problem of discrete mathematics and proposed in this context. We will then show in what way this situation is a suitable candidate for our learning objectives highlighting some non-specialist students productions which will illustrate our purposes.

“COMBINATORIAL GAMES AND MATHEMATICAL REASONINGS”: A TEACHING MODULE PROPOSED AT THE UNIVERSITY OF GRENOBLE

For about twenty years, the University of Grenoble has been proposing a transversal and optional teaching concerning combinatorial games and reasoning mathematics started by teachers and researchers from the “Math à Modeler” team (<http://mathsamodeler.ujf-grenoble.fr/>). This module is open to non-specialist university students in mathematics of first and second year whose aim is the scientific approach learning (e.g., experimenting, questioning, conjecturing, reasoning and proving) based on problem solving in mathematics. In this context, research situations presented are from problems of discrete mathematics and built from a theoretical model about “Research-Situations in Classroom” (Godot and Grenier, 2004). On this point, an example of situations has besides been proposed in Ouvrier-Bufferet’s paper (2009).

After having succinctly reminded of the organization and assessment modalities of this module, we present the case of a research situation proposed in this context from a contemporary problem in the discrete field : Wang’s Problem better known as the Domino Problem (Wang, 1961). This problem is linked to some problematics about the whole plane or bounded discrete areas tilings and has also been a precursor in many fields like first-order logic, computability and complexity for instance. In this occasion, we propose presenting some epistemological, mathematical and didactical order elements in order to show the potential of the situation built for learning of the scientific approach. In particular, we will highlight some proof strategies (e.g., existence theorem, brute force, induction, enumeration, construction/deconstruction, contradiction) as well as the reasonings and knowledge aimed in this research situation (Da Ronch, Gandit and Gravier, 2020). We will then analyze some students' productions which will confirm our purposes about the potential of this situation to develop a scientific process, and this, even for non-specialist students in mathematics.

References

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