COVARIATION REASONING IN OPTIMIZATION TASKS

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This paper presents the results of a research study obtained from the implementation of a sequence of mathematical modelling activities focused on optimization. The experimentation was carried out with students recently graduated from high school in Mexico (17- to 18-year-olds). The resolution processes, as well as the diversity of models generated collaboratively, evidenced different forms of covariational reasoning used to determine the "most efficient" answers to the optimization problems posed.

It is possible to generate a variety of interesting contexts to involve students in the modelling of phenomena and situations that require finding an optimal value, which is done by recognizing patterns and covariation relationships between variables. This paper presents the forms of covariational reasoning manifested by a group of students, who were split up into collaborative teams, during the resolution process of modelling activities focused on optimization.

The tasks were designed from the perspective of models and modelling (Lesh & Doerr, 2003). The goal was to motivate students to repeatedly express, test, and refine their own ways of thinking through the creation of reusable conceptual tools. Students will be able to use their previous knowledge and develop new ideas/strategies by identifying optimal paths in a rectangular prism and designing cylindrical deposits with a minimum area while meeting certain restrictions. The forms of reasoning observed during implementation were analysed in light of Thompson and Carlson (2017) covariational reasoning framework. In this theory, covariational reasoning is the ability to visualize, coordinate and represent the changing nature of two variables which vary at the same time. The results obtained during this research show six different forms of covariational reasoning employed by the students, as well as how these forms of reasoning are mobilized according to the experienced scenarios.

References

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