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When mathematics meets real objects: how does creativity interact with expertise in problem solving and posing?

Leikin, Roza (ed.) et al., Creativity and giftedness. Interdisciplinary perspectives from mathematics and beyond. Cham: Springer (ISBN 978-3-319-38838-0/hbk; 978-3-319-38840-3/ebook). Advances in Mathematics Education, 75-103 (2017).

Summary: The paper analyzes the results of activities undertaken by Mathematics students enrolled in a pre-service teacher-training program. Students were given the task to describe the way of building a figure from which one could get a box, to identify the geometric properties that allow producing the box, and to propose new models from which new boxes can be obtained. For creativity analysis, a cognitive flexibility framework has been used, within which students' cognitive variety, cognitive novelty, and their capacity to make changes in cognitive framing are analyzed. The analysis of some specific cases led to the conclusion that creativity manifestation is conditioned by a certain level of expertise. In the process of building a solution for a nonstandard problem, expertise and creativity support and mutually develop each other, enabling bridges to the unknown. This interaction leads also to an increase in expertise. Moreover, in order to get individual relevant data, the identification of creativity should take place based on tasks situated in the proximal range of the person's expertise but exceeding his/her actual level of expertise at a time.

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