Barely functional: students' misconceptions of functions and related notation

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Functions are an essential component of mathematics (O'Shea, Breen, & Jaworski, 2016) with Pettersson (2012) categorising them as a threshold concept in mathematics. While formally introduced in junior secondary schools in some countries, studies have shown that the concept of functions is complex, with students often developing a "fragmented view of functions" (Best & Bikner-Ahsbahs, 2017, p. 1). This can lead to problems in the later years of secondary school and also at university (Vinner & Dreyfus, 1989; Zaslavsky, 1997; Carlson, 1998; Nitsch, 2015).

In a large scale study of senior secondary students (n=1000), many struggled with completing tasks where the information was presented using function notation. In one question students were given $f(2)$=10 and $f(6)$=4 and asked to calculate the gradient of the straight line joining these two points. We were surprised by the students' answers.

A scan of the Australian Curriculum indicates that the words "function notation" do not appear anywhere, yet this is assumed knowledge at university. This has led us to wonder about students' prior experiences with the function concept.

In this round table we invite people to discuss students' journeys through the concept of function, and consider the difficulties and roadblocks students can encounter in Years 11 and 12 and at university.

References

Best, M., & Bikner-Ahsbahs, A. (2017). The function concept at the transition to upper secondary school level: tasks for a situation of change. *ZDM, 49*(6), 865-880.

Carlson, M. (1998). A cross-sectional investigation of the development of the function concept. *Research in Collegiate Mathematics Education III, Conference Board of the Mathematical Sciences, Issues in Mathematics Education, 7*(2), 114–162.

Nitsch, R. (2015). *Diagnose von Lernschwierigkeiten im Bereich funktionaler Zusammenhänge. Eine Studie zu typischen Fehlermustern bei Darstellungswechseln*. Wiesbaden: Springer Spektrum.

O'Shea, A., Breen, S. & Jaworski, B. (2016). The Development of a Function Concept Inventory. *International Journal of Research in Undergraduate Mathematics Education, 2*(3), 279-296.

Pettersson, K. (2012). *The threshold concept of a function - a case study of a student's development of her understanding*. Sweden: MADIF-8. Retrieved 13 March 2019 from the World Wide Web: http://www.mai.liu.se/SMDF/madif8/Pettersson.pdf.

Vinner, S., & Dreyfus, T. (1989). Images and definitions for the concept of function. *Journal for Research in Mathematics Education, 20*(4), 356–366.

Zaslavsky, O. (1997). Conceptual obstacles in the learning of quadratic functions. *Focus on Learning Problems in Mathematics, 19*(1), 20–44.