



## Open Research Online

### Citation

San Diego, Jonathan; Aczel, James and Hodgson, Barbara (2004). The effects of technology on making conjectures: linking multiple representations in learning iterations. In: 28th Annual Conference of the International Group for the Psychology of Mathematics Education (PME 28), 14-18 Jul 2004, Bergen, Norway.

### URL

<https://oro.open.ac.uk/7177/>

### License

(CC-BY-NC-ND 4.0) Creative Commons: Attribution-Noncommercial-No Derivative Works 4.0

<https://creativecommons.org/licenses/by-nc-nd/4.0/>

### Policy

This document has been downloaded from Open Research Online, The Open University's repository of research publications. This version is being made available in accordance with Open Research Online policies available from [Open Research Online \(ORO\) Policies](#)

### Versions

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding

# **The effects of technology on making conjectures: linking multiple representations in learning iterations**

Jonathan P. San Diego, James Aczel and Barbara Hodgson  
The Open University, U.K.

Numerous studies have suggested that different technologies have different effects on students' learning of mathematics, particularly in facilitating students' graphing skills and preferences for representations. For example, there are claims that students who prefer algebraic representations can experience discomfort in learning mathematics concepts using computers (Weigand and Weller, 2001; Villarreal, 2000) whilst students using calculators preferred graphical representation (Keller and Hirsch, 1994).

Although, arguably, the teaching of mathematics has traditionally centred more on procedural skills, it is possible that students' understandings, preferences and difficulties in relating different representations might be explained by analysing students' thought processes in terms of the making of conjectures.

Within the topic of iteration, this study investigated how using graphical calculators, and PC-based graphing software changed A-level mathematics students' conjectures in relation to: 1) students' understanding of the concepts of iteration, and their discovery of the properties of particular iterations; 2) students' preferences for representations; and 3) the way the students express their conjectures.

Students were observed tackling iteration questions using graphical calculators, and, later, graphing software. The students' written inferences were collected using two parallel worksheets and were subsequently analysed using a coding scheme developed based on previous studies in the literature, and focusing on students' conjectures as a unit of analysis.

The investigation found similar results to those of previous studies in terms of graphing difficulty, linking different representations and preferences for representations. However, the results also hinted that the computer positively influences students' understanding of iteration and their movement between representations more than the graphical calculator; and this possibility requires further research.

## **References:**

- Keller, B. and Hirsch, C. (1998). Students' preferences for representations of functions. *International Journal of Mathematical Education in Science and Technology*, 29, 1-17.
- Villarreal, M. (2000) Mathematical thinking and intellectual technologies: the visual and the algebraic. *For the learning of mathematics*, 20, 2-7.
- Weigand, G. and Weller, H. (2001). Changes of working styles in a computer algebra environment - the case of functions. *International Journal of Computers for Mathematical Learning*, 6, 87-111.