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George Preferred Learning Fraction Concepts with Physical Rather than Virtual Manipulatives

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The use of both virtual manipulatives (VM) and physical manipulatives (PM) in teaching mathematics is explicitly encouraged in various studies to support students to understand mathematics concepts easily. However, there have been a few studies on whether children equally prefer VM and PM to learn mathematics. Studies (e.g., Hunt et al., 2011; Moyer et al., 2002) showed VM were an innovative and useful way to enhance mathematics teaching. On the other hand, there is a line of thought that states VM should follow, not precede, the use of concrete manipulatives. This case study aims to describe the learning characteristics of a child and evaluate his preferences for using PM and VM to solve fraction problems. The participant in this study was a fourth-grade child. The child was given similar problems to solve using PM and VM. Data sources were observations and interviewing the child during and after the tasks were completed. The results showed that the child engaged and preferred solving fraction problems using PM more than VM. The child stated that PM helped him quickly understand the relationship between various representations of fractions and model them using manipulatives. The VM did not help him solve the problems. In this study, George preferred and was more engaged when solving fraction problems using PM than when using the VM. This finding highlights the need for further studies on VM use in teaching mathematics worthy of determining its impact on students' learning and understanding of mathematical concepts.

The results of this case study contribute to the body of literature in several ways. First, they replicate previous findings on the positive effect of using manipulatives in learning mathematics concepts (e.g., Day & Hurrell, 2017; Hunt et al., 2011). Second, the present findings suggest teachers should be selective when using PM and VM in their classrooms. Teachers should consider children's preferences and their pedagogical advantages in using these forms of manipulatives. In a well planned teaching setting, both physical and virtual manipulatives can encourage students to make their knowledge explicit and help to build concrete mathematical knowledge. Finally, the study provides insight into using PM over VM to teach fraction concepts and skills. Perhaps some concepts are supported better with one of the two manipulatives.

It is recommended that the study be replicated over a larger sample for generalisations.

References

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