Assessing Basic Facts Knowledge for Enhanced Teaching and Learning

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The importance of students knowing their mathematics basic facts is not a new phenomenon. Nor is the dilemma of how to measure and assess that knowledge. The aim of this study was to develop an Individual Basic Facts Assessment (IBFA) tool that was practical, reliable, standardised, and valid. It was essential that teachers, students, parents, and researchers valued the tool, the testing process, and the data it elicited.

Design research was employed as a cyclical research method for this study. The first cycle consisted of the initial development of the IBFA tool. The second cycle entailed trialling and refining the IBFA according to quantitative data and reflections from teachers and students. The IBFA was trialled by different schools which included year 3 to 10 students (aged 7 to 15), from rural and urban schools with differing socio-economic levels. The third cycle focussed on students’ achievement outcomes from the teaching and learning interventions implemented by the teachers and students who trialled the IBFA. For analysis purposes, each cycle constituted a case within mixed-method case study.

A social constructivist framework underpins and complements the developmental and iterative nature of this study. Knowledge is the individually and collectively, constructed and shared, ideas and meanings, of people interacting together and with their environment. As such, different people may construct different knowledge, through and from, the IBFA tool in different ways.

The IBFA tool differs to more traditional methods of basic facts testing. Traditionally teachers write or download pen and paper tests and students solve addition, subtraction, multiplication, and division problems within a fixed amount of time. For example, 100 facts within five minutes. Delivered electronically through a Powerpoint slideshow, the IBFA presents individual questions in written and spoken form. Students have four seconds to recall each fact and the test increases in difficulty as it progresses.

The development of the IBFA tool is the first focus of this presentation. The second focus is on the quantitative evidence which has shown the accuracy of students achievement levels ascertained from the IBFA tool and the patterns of, and connections between, individual, group, and class strengths, gaps, and misconceptions within basic facts knowledge. The third focus is the teachers’ and students’ qualitative evidence highlighting how they were better positioned to define their next teaching and learning steps. Evidence suggested that the accuracy of the IBFA led to increased opportunities for targeted teaching and learning.