

DESIGNING A LEARNER-FRIENDLY MATHEMATICS INSTRUCTION TO ENHANCE PROBLEM SOLVING PERFORMANCE

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ABSTRACT

Recent pedagogical reforms in South Africa, voiced through the National Curriculum Statement (NCS) and Curriculum and Assessment Policy Statement (CAPS), have increasingly stressed the importance of designing learner-centered instructions to teach problem solving in high school mathematics. A learner-centered instruction assumes that only when learners are active participants will learning be deep, enduring and enjoyable (Walczyk & Ramsey, 2003). Guided by literature, the term 'learner-friendly instruction' is rather opted in this paper. A 'learner-friendly instruction' is conceptualized as being able to enhance quality education and the attainment of envisaged learning outcomes and performance levels, suggesting effects that extend beyond just making instruction deep, enduring and enjoyable. The present study aimed to enhance the attainment of participants' problem solving performance hence a context-based problem solving instruction (CBPSI), which embraced elements of learner-friendliness, was developed. In addition, the effect of CBPSI on participants' problem solving performance was studied.

The target population for the study were Grade 10 mathematics learners from a total of 88 high schools in the Ekurhuleni East district of Gauteng¹, however, a convenient sample of Grade 10 learners (n = 783) from nine high schools was studied. The study employed a quasi-experimental design consisting of a non-equivalent pre-test post-test approach. Four teachers employed conventional problem solving instructions (CPSI) in four control schools while the researcher implemented CBPSI in five experimental schools. To make it more learner-friendly, the design features of CBPSI largely hosted elements of participants' everyday experiences. Consistent with Cognitive Load Theory, CBPSI was also characterized with several worked-out examples given to participants in experimental schools.

The principal instrument for data collection was a standardised Functional Mathematics Achievement Test (FMAT), which was written by both groups at pre- and post-stages of the experiment. The relative effect of each instruction was measured in terms of its reduction in the frequency counts of problem solving errors made before and after intervention. In addition, a self-reporting Cognitive Load Measuring Tool (CLMT) was administered at the end of each test (pre- and post-test) to examine the influence of each instruction on participants' cognitive load during problem solving performance.

The results of the study suggested that CBPSI, which was relatively more learner-friendly, was more effective in addressing participants' problem solving errors than CPSI. The results also showed that the associated cognitive load of problem solving tasks was reduced significantly in the experimental group, where CBPSI was implemented. The reduction in cognitive load was due to participants' ability to relate the problem solving process to their prior knowledge and real-life experience, which included the enhancement of problem solving performance. Although the results of this study highlight the beneficial effects of a learner-friendly mathematics instruction, such as CBPSI, they also provide useful information on how learners prefer to learn.

REFERENCES

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¹ Gauteng is one of the nine provinces of South Africa.