Infusion of polya and digital Bar model: an algebraic thinking Module for seventh graders

ABSTRACT

Algebraic Thinking Skills (ATS) are one of the skills that students need to master in order to solve nonroutine problems. These skills are also necessary as a foundation for students preparing to enter university studies and fields of work that require logical and analytical thinking. However, Malaysian students' performance in solving algebraic problems still needs to be satisfactory, according to the TIMSS 2019 and PISA 2018 reports. Therefore, the Algebraic Thinking Skills Module (ATSM) was developed to cultivate ATS through three constructs, namely i) arithmetic generalization, ii) functions, and iii) modelling. The ATSM was developed using the heuristic method by infusing the Polya and digital bars model. The bar model illustrates a rectangle representing known and unknown quantities and the relationship between quantities. The digital bar model refers to the free application of the bar model at https://mathsbot.com/ manipulatives/bar. An ATS test was developed and administered as a pre-and post-test on 120 seventh graders from rural schools in Sabah. The paired sample t-test results showed a significant difference in the mean scores between the pre-test and post-test after the intervention using the ATSM. This shows that the ATSM can improve ATS through the infusion of the Polya and digital bars model. The ATSM is able to help rural schools to shape algebraic thinkers and digitally savvy students.