

## **Examining the STEM-Science Achievement Test (SSAT) Using Rasch Dichotomous Measurement Model**

### **ABSTRACT**

The main purpose of this study is to develop a valid and reliable instrument for measuring the STEM-Science Achievement Test (SSAT) of primary school students in Malaysia. The instrument was developed by researcher with the integration of STEM elements and by referring to the Malaysia National Curriculum Standard. The development focused on six topics in science Year 4 (Y4) primary syllabus; Scientific Skills, Life Processes of Human, Properties of Materials, Measurement, Solar System, and Importance of Technologies in Life, and six topics in science Year 5 (Y5) primary syllabus; Rules and Regulation in Science Lab, Life Processes of Plants, Acid and Alkali, Electricity, Earth and Space Science, and Technology and Sustainable Life. There are 226 of Year 4 and 226 of Year 5 primary school students in Sabah responded to the instrument developed to test their STEM-Science knowledge. Rasch Dichotomous Measurement Model approach was used to evaluate the validity and reliability of the SSAT. The validity (item polarity (PTMEA-CORR), Principal Component Analysis of Residuals (PCAR), Mean Squared (MNSQ) infit and outfit) and the reliability (Cronbach's alpha, item reliability and item separation) were being assessed. The results Rasch Dichotomous Measurement Model analysis show that all scales were unidimensional for objective and subjective items. For objective items, the Cronbach's Alpha is .81 (Y4) and .83 (Y5), Item Reliability is .95 (Y4) and .95 (Y5) whereas Item Separation is 4.21 (Y4) and 4.25 (Y5). For item validity, PTMEA CORR were found positive varies between; .03 to .44 (Y4) and .05 to .47 (Y5) after item deletion has been made. Principal Component Analysis of Residuals (PCAR) showed that raw variance explained by measures in Eigenvalue unit is 9.8 (Y4) and 10.7 (Y5), variance unexplained is 60.0 (Y4) and 58.0 (Y5) and variance unexplained in Contrast 1 is 5.1 (Y4) and 3.7 (Y5) respectively. Standardised Residual Correlation for Year 4 and Year 5 objective items showed satisfactory value for none of item correlation exceed control level of .7. There are 5 items misfit in year 4 and 12 item misfit in year 5 objectives test and items need to be revised. For subjective items, the Cronbach's Alpha is .78 (Y4) and .84 (Y5), item reliability is .91 (Y4) and .93 (Y5) whereas item separation is 3.27 (Y4) and 3.56 (Y5). For item validity, PTMEA CORR were found positive varies between .00 to .50 (Y4) and .01 to .54 (Y5) with no item deletion. Principal Component Analysis of Residuals (PCAR) showed that raw variance explained by measures in Eigenvalue unit is 22.9 (Y4) and 14.1 (Y5), variance unexplained is 96 (Y4) and 70 (Y5) and variance unexplained in Contrast 1 is 4.5 (Y4) and 3.0 (Y5) respectively. Standardised residual correlation for Year 4 and Year 5 subjective items showed satisfactory value for none of item standardised residual correlation exceed control level of .7. The assessment of SSAT has shown that the instrument is a valid and reliable to measure Malaysian primary students' knowledge in STEM-Science.