

PEMBINAAN DAN VALIDASI INSTRUMEN PENGUKURAN PROSES MATEMATIK MURID MENGGUNAKAN MODEL RASCH PELBAGAI FASET

Normarina Abd Rahman

*Fakulti Pembangunan Manusia, Universiti Pendidikan Sultan Idris
35900 Tanjung Malim, Perak, Malaysia*

normarina@iab.edu.my

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ABSTRAK

Kajian ini bertujuan membina dan menentusahkan instrumen proses matematik murid (ProM3). Kajian menggunakan model ADDIE melibatkan fasa analisis, reka bentuk, pembangunan, pelaksanaan serta penilaian. Reka bentuk kajian adalah pembinaan dan validasi instrumen melibatkan kaedah tinjauan pada fasa penilaian. Dua instrumen dibangunkan iaitu sampel tugas berbentuk penyelesaian masalah berkaitan topik-topik Matematik tingkatan 1 beserta rubrik. Sejumlah 407 orang murid tingkatan satu daripada tiga kategori sekolah berasrama penuh terlibat sebagai sampel kajian. Respon murid bagi tugas diskor oleh tujuh orang pemeriksa berpandukan rubrik untuk lima dimensi proses matematik iaitu penyelesaian masalah, penaakulan, komunikasi, perwakilan dan perkaitan. Hasil analisis penilaian oleh sembilan orang pakar menunjukkan tugas dan rubrik mempunyai kesahan kandungan yang tinggi, dengan nilai CVR dalam julat 0.80 hingga 1.00. Model Rasch pelbagai faset (MFRM) digunakan bagi menentukan kesahan rubrik ProM3 daripada aspek kebolehan murid, ketegasan pemeriksa (*rater*) dan kesukaran item. Rubrik menunjukkan kesahan konstruk yang baik dengan nilai PTMEA CORR positif (0.32-0.75), dan nilai statistik fit dalam julat yang boleh diterima (0.5-1.5). Analisis unidimensionaliti menunjukkan instrumen dapat menerangkan 50.40% daripada kemahiran proses matematik yang diukur. Skala pemeringkatan juga berfungsi baik dengan saiz selang dalam julat 1.4 hingga 5.0. Sementara itu, ukuran kesukaran item (+1.84--2.33 logit) tertabur sepadan dengan kebolehan murid (+4.75--3.58 logit). Rubrik juga menunjukkan nilai kebolehppercayaan item (0.99) dan persetujuan yang baik antara pemeriksa (48.7%). Peta pemboleh ubah menunjukkan responden terbahagi kepada empat tahap kemahiran proses matematik iaitu Cemerlang (2.46%), Baik (41.77%), Sederhana (52.58%) dan Lemah (3.19%). Min kemahiran proses matematik murid berada pada tahap sederhana (-0.38 logit). Kesimpulannya, instrumen yang dibangunkan mempunyai ciri-ciri psikometrik yang baik bagi mengukur proses matematik murid. Implikasinya, penggunaan instrumen boleh diperluaskan kepada murid-murid sekolah menengah dan boleh dijadikan model bagi mengukur kemahiran yang sama untuk topik-topik yang berlainan.

THE DEVELOPMENT AND VALIDATION OF THE INSTRUMENT MEASURING STUDENTS' MATHEMATICAL PROCESS USING MANY FACET RASCH MODEL

Normarina Abd Rahman

*Fakulti Pembangunan Manusia, Universiti Pendidikan Sultan Idris
35900 Tanjung Malim, Perak, Malaysia*

normarina@iab.edu.my

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ABSTRACT

The aim of this study is to develop and validate student's mathematical process instrument (ProM3). The study used ADDIE's model involves analysis, design, development, implementation and evaluation phase. The study design used was instrument development and validation involves survey method in evaluation phase. Two instruments were developed, which a sample of problem solving task related to Form One mathematics topics along with a rubric. There are 407 Form One students of three categories of fully residential school involved as research samples. Students' responses in tasks were scored by seven raters based on developed rubric towards five dimensions of mathematical process namely connection, representation, communication, reasoning and problem solving. The results of the evaluation analysis by nine experts showed that the task and rubric had high content validity, with CVR values in the range of 0.8 to 1.00. The many facet Rasch model (MFRM) was used to assess the validity of ProM3 rubric in the aspects of students' abilities, raters' severity, and the items' difficulty. Rubric indicates good construct validity with positive value of PTMEA CORR (0.32-0.75), and fit statistics within the acceptable range (0.5-1.5). Dimensionality analysis showed that the instruments explained 50.40% of the mathematical process skills. Rating scale functioned well with 1.4 to 5.0 interval size. Meanwhile the measurement of item's difficulty (+1.84--2.33 logit) correlated with the students' ability (+4.75 --3.58 logit). Rubric also showed good item reliability (0.99) and the inter-rater agreements (48.7%). Variable map showed that the respondents were divided into four levels of mathematical process skills; Excellent group (2.46%), Good (41.77%), Average (52.5%) and Weak (3.19%). The mean value of the students' involved who possess mathematical process skills were at the average level (-0.38 logit). In conclusion, the developed rubric had good psychometric characteristics in measuring students' mathematical process skills. This implicates that the use of the instrument can be extended to secondary school students and can be used as a model to measure the same skills for different topics.