

Validity and Reliability of Competency Assessment Implementation (CAI) Instrument Using Rasch Model

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Abstract—This study was conducted to generate empirical evidence on validity and reliability of the item of Competency Assessment Implementation (CAI) Instrument using Rasch Model for polythomous data aided by Winstep software version 3.68. The construct validity was examined by analyzing the point-measure correlation index (PTMEA), infit and outfit MNSQ values; meanwhile the reliability was examined by analyzing item reliability index. A survey technique was used as the major method with the CAI instrument on 156 teachers from vocational schools. The results have shown that the reliability of CAI Instrument items were between 0.80 and 0.98. PTMEA Correlation is in positive values, in which the item is able to distinguish between the ability of the respondent. Statistical data obtained show that out of 154 items, 12 items from the instrument suggested to be omitted. This study is hoped could bring a new direction to the process of data analysis in educational research.

Keywords—Competency Assessment, Reliability, Validity, Item Analysis.

I. INTRODUCTION

MALAYSIA'S Ministry of Education has introduced a method of assessment Competency Based Education (CBE) by using a Modular System. Since the introduction of vocational education in Malaysia, the linear assessment is used to evaluate students' achievement. Starting 2006, CBE will be used to evaluate students who choose the vocational education in secondary school and the curriculum was designed by using modular system [1]. Table I shows differences between conventional assessment and CBE.

Modular approach in this sense requires a competency-based. Competency assessment comes up as an accepted evaluation method which suits present learning theories [4]. CBE in Malaysia using a portfolio as an alternative method in valuing students in progressing their work. As a general definition portfolio includes sample works that the student has done. According to few educators [5], [8], [11] portfolios give opportunity to see the improvement of students produced work regarding time.

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TABLE I
DIFFERENCES BETWEEN CONVENTIONAL ASSESSMENT AND COMPETENCY-BASED ASSESSMENT [12]

| Conventional Assessment (1986-2005) | Competency-Based Assessment (2006 until now) |
|---|---|
| Comprehensive/overall assessment | Assessment based on each unit of the module of the subject - Using Portfolio |
| Norm-referenced test | Criteria on-referenced test |
| System Centred | Student Centred |
| Non-flexible | Flexible |
| Assessment based on learning (to assess the student at the end of the lesson) | Learning assessment (to assess student continuously to enhance the learning) |
| SPMV | SPM and Modular Certificate SPM - Graded |
| SPMV - Graded | Modular Certificate - Competent / Not Yet Competent |

Due to the shift in the assessment paradigm in vocational education, the research to identify the implementation of CBE among the educators in vocational teachers is needed. Therefore, the aim of this study is to explore the empirical evidence in measuring validity and reliability in CAI instrument that have been developed. Key indicators of the quality of a measuring instrument are the reliability and validity of the measures. The process of developing and validating an instrument is in large part focused on reducing error in the measurement process. Reliability estimates evaluate the stability of measures, internal consistency of measurement instruments, and inter rater reliability of scoring student performances. Validity is the extent to which the interpretations of the results of a test are warranted, which depends on the particular use the test is intended to serve.

In recent years, Rasch models and item-response theory (IRT) or latent-trait models have provided an alternative framework for understanding measurement and alternative strategies for judging the quality of a measuring instrument. The Rasch measurement model is an application used in the study of the reliability and validity of CAI Instrument. Results from the item analysis will be used for deleting or modifying the overall test items. Using the Rasch measurement model, the quality of item is based on reliability and the separation of item and person or individuals [9], [10]. Rasch measurement model had performed item analysis and to determine the reliability and validity in the instrument in social science research and health care [6].

II. METHODOLOGY

This study is conducted by using a survey technique with a set of questionnaire. A set of CAI Instrument was developed with adaption from the literature review and documents from examination board. In the early stage, the questionnaire consists of 168 items which divided into three categories of CAI which are input, process and product. To ensure content validity, experts in survey research and in the subject matter were consulted and their input was used to revise and refine the items. After the item has been verified by experts, only 154 items were remained and used for the purpose of this study. Five-point Likert scales were using to evaluate the level of agreement of each item with the lowest number showed disagreement and the higher number for the agreement. A total of 156 teachers from selected vocational schools were participated as a sample. The samples are based on the random selection of teachers who were directly involved in the competency assessment. Data were conducted using SPSS for Windows Version 20.0. The data then was analyzed based on polythomous data Rasch model by using computer application, WINSTEP version 3.68 [3], [7].

III. FINDINGS

The total number of respondents is 156. There were 84 respondents were male (53.8%) and 72 of them were female (46.2%) The total number of Malay vocational teachers was 147 (94.2%), Chinese 3 (1.9%) and others 6 (3.8%). Their ages are between 26 and 55 years old. This finding will be discussed in 3 parts which are reliability and separation index, items validity and variable map.

A. Reliability and Separation Index

Table II shows the value of item reliability and separation index obtained by analyzing the program through Winsteps. From the table it can be seen that all constructs of CAI Instrument showed number that greater than 0.8. These values indicated that every construct is strongly acceptable reliability because the values are all between 0.80 and 0.98 [3]. The value of separation index indicates the separation of item's difficulty level. All CAI Instruments constructs are accepted because the separation index is higher than 2, which consider as acceptable value [2].

B. Items Validity

There are few ways to measure item validity; however for the purpose of this study Point Measure Correlation (PTMEA Correlation), INFIT and OUTFIT mean square (MNSQ) were used. PTMEA correlation value is to test whether all items are moving in one direction with the construct. Tables III to XV display a positive index for PTMEA correlation. Tables III to VII also show Infit MNSQ and Outfit MNSQ value of CAI input items and respondents. Item C6005, C6001, C6002, C7002, C7001 has to be removed because has exceeded the range suggested by [3] the infit MNSQ and Outfit MNSQ of each item and the respondent should be in the range of 0.60 to 1.40 for likert scale. If an individual item is found not to be in the range, then it will be removed.

TABLE II
ITEMS RELIABILITY AND SEPARATION INDEX

| Construct for CAI | Item ID | Item Reliability | Separation Index |
|------------------------------|---------------|------------------|------------------|
| INPUT | C3001-C7018 | 0.96 | 4.62 |
| Teacher knowledge | C3001-C3011 | 0.85 | 2.35 |
| Skills of teachers | C4001-C4011 | 0.94 | 4.11 |
| Teacher attitudes | C5001-C5006 | 0.89 | 2.87 |
| Teacher training | C6001-C6008 | 0.98 | 6.81 |
| Infrastructure | C7001-C7018 | 0.91 | 3.25 |
| PROCESS | D8001-D10013 | 0.94 | 3.88 |
| Pre assessment | D8001-D8012 | 0.91 | 3.24 |
| Assessment process | D9001-D9027 | 0.93 | 3.65 |
| Scoring and keeping evidence | D10001-D10013 | 0.84 | 2.32 |
| PRODUCT | E11001-E15011 | 0.94 | 3.94 |
| Validity | E11001-E11011 | 0.95 | 4.36 |
| Reliability | E12001-E12007 | 0.85 | 2.40 |
| Feasibility | E13001-E13011 | 0.88 | 2.66 |
| Outcome for students | E14001-E14009 | 0.86 | 2.49 |
| Outcome for goal | E15001-E15011 | 0.80 | 2.02 |

TABLE III
CAI INPUT (TEACHER KNOWLEDGE)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 4 | 0.92 | 0.93 | 0.54 | C3004 |
| 2 | 0.94 | 0.94 | 0.52 | C3002 |
| 3 | 1.06 | 1.07 | 0.43 | C3003 |
| 6 | 0.90 | 0.89 | 0.57 | C3006 |
| 5 | 0.92 | 0.92 | 0.54 | C3005 |
| 8 | 0.82 | 0.82 | 0.62 | C3008 |
| 9 | 0.86 | 0.86 | 0.58 | C3009 |
| 11 | 0.95 | 0.90 | 0.55 | C3011 |
| 1 | 0.95 | 0.93 | 0.52 | C3001 |
| 10 | 0.93 | 0.92 | 0.55 | C3010 |
| 7 | 0.91 | 0.90 | 0.55 | C3007 |

TABLE IV
CAI INPUT (SKILL OF TEACHERS)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 12 | 0.89 | 0.89 | 0.56 | C4001 |
| 20 | 0.90 | 0.89 | 0.56 | C4009 |
| 21 | 0.88 | 0.87 | 0.58 | C4010 |
| 17 | 0.90 | 0.88 | 0.56 | C4006 |
| 19 | 0.93 | 0.91 | 0.55 | C4008 |
| 15 | 0.98 | 1.00 | 0.49 | C4004 |
| 16 | 0.90 | 0.88 | 0.57 | C4005 |
| 13 | 0.82 | 0.82 | 0.61 | C4002 |
| 14 | 0.91 | 0.93 | 0.55 | C4003 |
| 18 | 0.91 | 0.89 | 0.56 | C4007 |

TABLE V
CAI INPUT (TEACHER ATTITUDES)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 24 | 1.22 | 1.32 | 0.34 | C5003 |
| 22 | 1.20 | 1.26 | 0.33 | C5001 |
| 23 | 1.17 | 1.28 | 0.35 | C5002 |
| 25 | 1.15 | 1.26 | 0.30 | C5004 |
| 27 | 1.14 | 1.26 | 0.35 | C5006 |
| 26 | 1.25 | 1.30 | 0.24 | C5005 |

TABLE VI
CAI INPUT (TEACHER TRAINING)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 32 | 1.77 | 1.93 | 0.32 | C6005 |
| 28 | 1.41 | 1.41 | 0.39 | C6001 |
| 31 | 1.26 | 1.26 | 0.45 | C6004 |
| 29 | 1.4 | 1.55 | 0.28 | C6002 |
| 30 | 1.23 | 1.22 | 0.43 | C6003 |
| 33 | 1.26 | 1.32 | 0.37 | C6006 |
| 34 | 1.14 | 1.19 | 0.43 | C6007 |
| 35 | 0.96 | 1.01 | 0.49 | C6008 |

TABLE VII
CAI INPUT (INFRASTRUCTURE)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 45 | 1.16 | 1.28 | 0.34 | C7010 |
| 46 | 1.06 | 1.11 | 0.40 | C7011 |
| 47 | 1.11 | 1.17 | 0.37 | C7012 |
| 50 | 1.06 | 1.05 | 0.41 | C7015 |
| 49 | 1.13 | 1.22 | 0.35 | C7014 |
| 48 | 1.04 | 1.13 | 0.41 | C7013 |
| 40 | 1.27 | 1.38 | 0.27 | C7005 |
| 53 | 1.05 | 1.09 | 0.41 | C7018 |
| 37 | 1.23 | 1.45 | 0.28 | C7002 |
| 52 | 0.96 | 0.91 | 0.46 | C7017 |
| 36 | 1.39 | 1.52 | 0.17 | C7001 |
| 51 | 0.91 | 0.91 | 0.48 | C7016 |
| 38 | 1.14 | 1.40 | 0.32 | C7003 |
| 41 | 1.10 | 1.18 | 0.36 | C7006 |
| 42 | 0.92 | 0.89 | 0.44 | C7007 |
| 44 | 1.07 | 1.04 | 0.39 | C7009 |
| 39 | 1.05 | 1.03 | 0.37 | C7004 |

Tables VIII to X show that there are three items in the constructs that should be removed; D8001, D10004, D10002. All the three items had infit items MNSQ values and outfit items MNSQ value outside the range of 0.60 to 1.40.

TABLE VIII
CAI PROCESS (PRE ASSESSMENT)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 54 | 1.42 | 1.59 | 0.39 | D8001 |
| 58 | 0.99 | 0.99 | 0.41 | D8005 |
| 65 | 0.93 | 1.00 | 0.51 | D8012 |
| 64 | 1.06 | 1.13 | 0.46 | D8011 |
| 59 | 1.18 | 1.09 | 0.39 | D8006 |
| 63 | 0.85 | 0.87 | 0.54 | D8010 |
| 56 | 1.15 | 1.13 | 0.36 | D8003 |
| 57 | 1.11 | 1.06 | 0.40 | D8004 |
| 55 | 1.28 | 1.30 | 0.26 | D8002 |
| 61 | 0.83 | 0.86 | 0.53 | D8008 |
| 60 | 0.92 | 0.97 | 0.45 | D8007 |
| 62 | 0.84 | 0.82 | 0.52 | D8009 |

TABLE IX
CAI PROCESS (ASSESSMENT PROCESS)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|-------|
| 75 | 0.91 | 0.92 | 0.55 | D9010 |
| 69 | 0.94 | 0.99 | 0.51 | D9004 |
| 67 | 0.9 | 0.92 | 0.51 | D9002 |
| 68 | 0.87 | 0.88 | 0.54 | D9003 |
| 86 | 1.14 | 1.21 | 0.41 | D9021 |
| 73 | 1.05 | 1.16 | 0.47 | D9008 |
| 74 | 1.22 | 1.35 | 0.40 | D9009 |
| 66 | 1.00 | 0.98 | 0.47 | D9001 |
| 72 | 0.87 | 0.88 | 0.53 | D9007 |
| 84 | 0.78 | 0.78 | 0.61 | D9019 |
| 78 | 0.90 | 0.97 | 0.52 | D9013 |
| 83 | 0.78 | 0.72 | 0.57 | D9018 |
| 90 | 0.85 | 0.8 | 0.57 | D9025 |
| 85 | 1.01 | 1.09 | 0.48 | D9020 |
| 91 | 1.05 | 1.16 | 0.40 | D9026 |
| 70 | 0.80 | 0.78 | 0.58 | D9005 |
| 81 | 0.79 | 0.79 | 0.58 | D9016 |
| 77 | 0.85 | 0.85 | 0.55 | D9012 |
| 71 | 0.79 | 0.80 | 0.59 | D9006 |
| 82 | 0.75 | 0.73 | 0.62 | D9017 |
| 87 | 0.96 | 0.95 | 0.49 | D9022 |
| 80 | 0.78 | 0.81 | 0.59 | D9015 |
| 89 | 0.87 | 0.85 | 0.53 | D9024 |
| 79 | 0.93 | 0.99 | 0.48 | D9014 |
| 92 | 1.02 | 1.03 | 0.43 | D9027 |
| 88 | 0.88 | 0.91 | 0.49 | D9023 |
| 76 | 0.81 | 0.77 | 0.58 | D9011 |

TABLE X
CAI PROCESS (SCORING AND KEEPING EVIDENCE)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 96 | 1.4 | 1.58 | 0.36 | D10004 |
| 94 | 1.29 | 1.59 | 0.36 | D40002 |
| 100 | 0.93 | 0.94 | 0.52 | D10008 |
| 99 | 0.91 | 0.97 | 0.48 | D10007 |
| 104 | 1.04 | 1.12 | 0.43 | D10012 |
| 97 | 0.97 | 0.94 | 0.45 | D10005 |
| 105 | 1.01 | 1.01 | 0.42 | D10013 |
| 102 | 0.79 | 0.70 | 0.56 | D10010 |
| 98 | 0.85 | 0.83 | 0.53 | D10006 |
| 101 | 0.83 | 0.74 | 0.56 | D10009 |
| 95 | 0.83 | 0.76 | 0.52 | D10003 |
| 93 | 0.92 | 0.89 | 0.45 | D10001 |
| 103 | 0.93 | 0.84 | 0.47 | D10011 |

Tables XI to XV show that items E11005, E11007, E11006, E15009 has been removed in the competency assessment implementation (CAI) because the infit items MNSQ values and outfit items MNSQ value outside the range of 0.60 to 1.40.

TABLE XI
CAI PRODUCT (VALIDITY)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 110 | 1.54 | 1.83 | 0.29 | E11005 |
| 112 | 1.43 | 1.62 | 0.35 | E11007 |
| 111 | 1.25 | 1.51 | 0.4 | E11006 |
| 109 | 1.14 | 1.18 | 0.42 | E11004 |
| 114 | 1.00 | 1.06 | 0.46 | E11009 |
| 116 | 0.95 | 0.91 | 0.49 | E11011 |
| 113 | 0.98 | 1.10 | 0.42 | E11008 |
| 115 | 1.03 | 1.05 | 0.41 | E11010 |
| 107 | 0.90 | 0.86 | 0.45 | E11002 |
| 106 | 0.98 | 0.96 | 0.39 | E11001 |
| 108 | 0.93 | 0.95 | 0.44 | E11003 |

TABLE XII
CAI PRODUCT (RELIABILITY)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 117 | 0.98 | 0.97 | 0.43 | E12001 |
| 120 | 0.86 | 0.85 | 0.54 | E12004 |
| 122 | 1.07 | 1.14 | 0.49 | E12006 |
| 119 | 0.96 | 0.96 | 0.43 | E12003 |
| 118 | 1.11 | 1.09 | 0.34 | E12002 |
| 123 | 0.77 | 0.73 | 0.62 | E12007 |
| 121 | 0.84 | 0.83 | 0.57 | E12005 |
| 115 | 1.03 | 1.05 | 0.41 | E11010 |
| 107 | 0.9 | 0.86 | 0.45 | E11002 |
| 106 | 0.98 | 0.96 | 0.39 | E11001 |
| 108 | 0.93 | 0.95 | 0.44 | E11003 |

TABLE XIII
CAI PRODUCT (FEASIBILITY)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 125 | 0.95 | 0.99 | 0.51 | E13002 |
| 133 | 1.09 | 1.24 | 0.39 | E13010 |
| 127 | 0.91 | 0.98 | 0.51 | E13004 |
| 124 | 0.83 | 0.82 | 0.59 | E13001 |
| 130 | 0.91 | 1.00 | 0.49 | E13007 |
| 132 | 1.08 | 1.19 | 0.41 | E13009 |
| 134 | 0.98 | 1.08 | 0.44 | E13011 |
| 131 | 0.97 | 1.07 | 0.47 | E13008 |
| 128 | 0.84 | 0.85 | 0.55 | E13005 |
| 129 | 0.75 | 0.72 | 0.63 | E13006 |
| 126 | 0.83 | 0.82 | 0.54 | E13003 |

TABLE XIV
CAI PRODUCT (OUTCOME FOR STUDENTS)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 140 | 0.92 | 0.90 | 0.50 | E14006 |
| 142 | 0.94 | 0.95 | 0.49 | E14008 |
| 138 | 0.95 | 0.88 | 0.48 | E14004 |
| 139 | 0.90 | 0.82 | 0.51 | E14005 |
| 143 | 0.90 | 0.89 | 0.53 | E14009 |
| 141 | 0.90 | 0.92 | 0.52 | E14007 |
| 135 | 0.96 | 0.90 | 0.49 | E14001 |
| 137 | 0.99 | 0.95 | 0.45 | E14003 |
| 136 | 0.99 | 0.96 | 0.45 | E14002 |

TABLE XV
CAI PRODUCT (OUTCOME FOR GOAL)

| ENTRY NUMBER | INFIT MNSQ | OUTFIT MNSQ | PTMEA CORRELATION | ITEM |
|--------------|------------|-------------|-------------------|--------|
| 144 | 0.98 | 1.08 | 0.51 | E15001 |
| 154 | 0.90 | 0.95 | 0.53 | E15011 |
| 153 | 0.89 | 0.93 | 0.51 | E15010 |
| 152 | 1.70 | 2.06 | 0.04 | E15009 |
| 151 | 0.85 | 0.85 | 0.56 | E15008 |
| 150 | 0.82 | 0.81 | 0.58 | E15007 |
| 148 | 0.82 | 0.83 | 0.61 | E15005 |
| 149 | 0.88 | 0.91 | 0.53 | E15006 |
| 145 | 0.82 | 0.89 | 0.58 | E15002 |
| 146 | 0.86 | 0.85 | 0.57 | E15003 |
| 147 | 0.74 | 0.71 | 0.66 | E15004 |

C. Variable Map

Fig. 1 shows the hierarchy of person ability and item difficulty in a straight line for CAI input. It is found that all item are scattered and heading towards various level sample ability. Person position with high ability (very much agreeable) stays at the top scale while person with low ability (less agreeable) stays at the lower part of the scale. The most difficult item C6005 (32) stays at the scale while simplest item C7007 (42) stays at lower part of the scale.

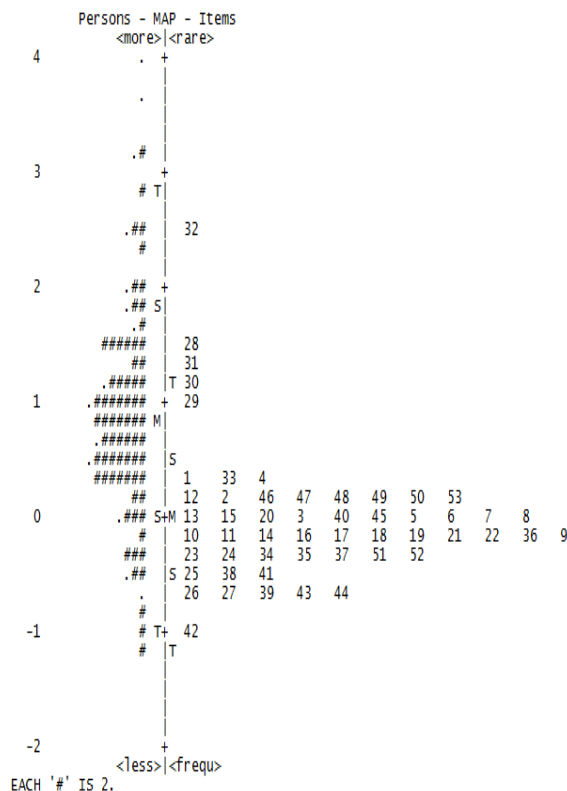


Fig. 1 Variable map for CAI input

Fig. 2 shows the hierarchy of person ability and item difficulty in a straight line for CAI process. It is found that all item are scattered and heading towards various level sample

ability. Person position with high ability (very much agreeable) stays at the top scale while person with low ability (less agreeable) stays at the lower part of the scale. The most difficult item D8001 (54) stays at the scale while simplest item D10011, D8002, D9001, D8008, D8009, D9023, D10001 and D10003 (103, 55, 60, 61, 62, 88, 93, 95) stays at lower part of the scale.

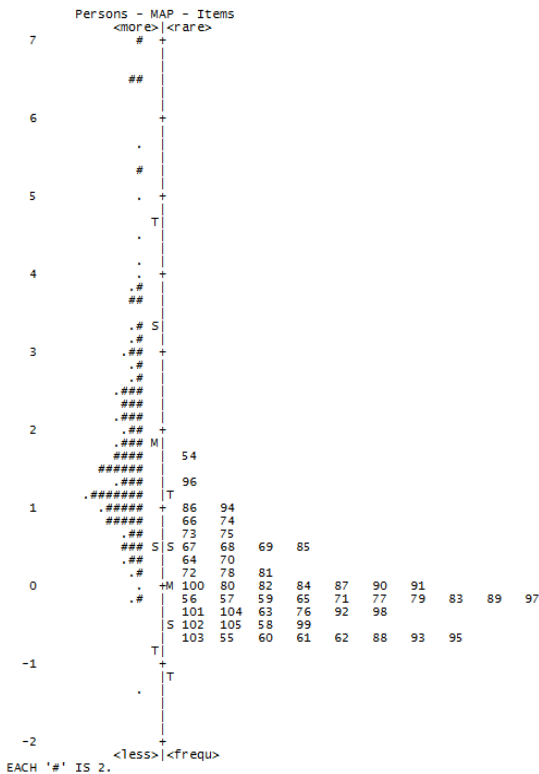


Fig. 2 Variable map for CAI process

Fig. 3 shows the hierarchy of person ability and item difficulty in a straight line for CAI product. It is found that all items are scattered and heading towards various level sample ability. Person position with high ability (very much agreeable) stays at the top scale while person with low ability (less agreeable) stays at the lower part of the scale. The most difficult item E11005 and E11007 (110, 112) stays at the scale while simplest item E11002 (107) stays at lower part of the scale.

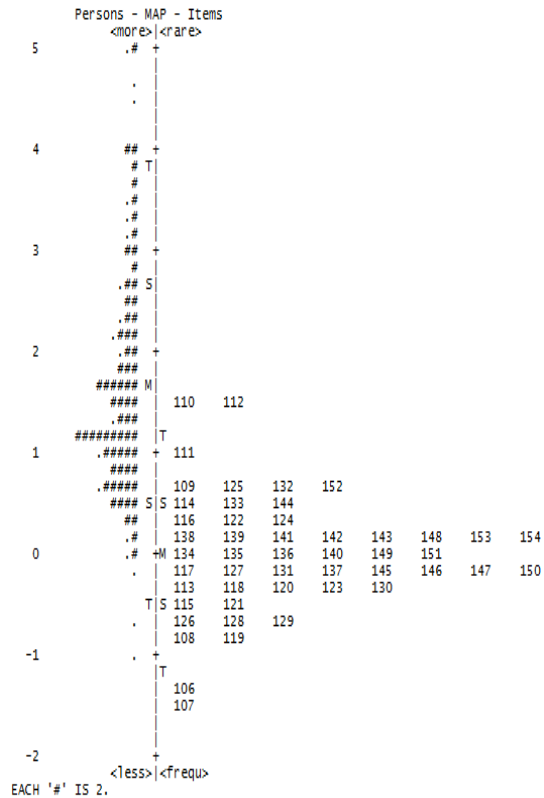


Fig. 3 Variable map for CAI product

IV. CONCLUSION

Item analysis is found as the best method for determining the quality of developed test items. Rasch measurement model was used to analyze each item in order to measure the validity and reliability of competency assessment implementation (CAI) instrument. The Rasch model is effective as can be seen through the use of valid items to define the construct, a clear definition of the measurable constructs and consistent with theoretical expectations and the ability of the items that are consistent with the purposes of measurement. The findings have suggested all the possibilities designed to examine the suitability of the items in the CAI instrument. The item reliability is high which indicates the item is stable. Separation index for the level of difficulty exceeded the value of 2 which is strongly accepted. Twelve items with infit MNSQ and outfit MNSQ items which are out of acceptable range 0.6-1.4 for CAI input, CAI process and CAI product had been removed. This resulted to only 142 items which remained after the Rasch analysis. Further study is recommended to focus at differences based on GDIF items to remove the bias item based on gender and course.

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REFERENCES

- [1] Ahmad Tajudin Jab(2007), Technical and Vocational Curriculum Development. Kuala Lumpur: Department of Technical Education. Ministry of Education.
- [2] Azrilah Abdul Aziz, Azlinah Mohamed, NoorHabibah Arshad, Sohaimi Zakaria, Azami Zaharin, Hamza Ahmad Ghulman & Mohd Saidfuddin Masodi. (2008). Application of Rasch Model in validating the construct of measurement instrument. *International Journal of Education and Information Technologies*, 2(2), 105-112.
- [3] Bond T.G and Fox C.M, (2007), Applying The Rasch Model: Fundamental Measurement in Human Science. London: Lawrence Erlbaum Associates.
- [4] Higgins, R., Hartley, P., and Skelton, A. (2002), The Conscientious Consumer: Re Considering The Role of Assessment Feedback on Student Learning, *Studies in Higher Education*, 27(1), 382-400.
- [5] Katz, A. M., and Gangnon, B., A. (2000), Portfolio Assessment Integrating Goals and Objectives With Learner Outcomes. *Assessment* 12(1).
- [6] Kimberlin, C. L. and Winterstein, A. G. (2008), Validity and Reliability of Measurement Instruments Used in Research. *Am J Health-SystPharm*. 65(2276-2284).
- [7] Linacre J.M. (2003), Winsteps Computer Program Version 3.48. Chicago: www.winsteps.com (10 Sept. 2009).
- [8] Pitts, J. et al. (2002). Enhancing Reliability in Portfolio Assessment: Discussion Between Assessors Medical Teacher 24 (2), 197-201.
- [9] Richardson R. C. (2008), The Development and validation of a personality instrument to increase collaboration, *Educational Research and Review*, 3(4), 121-127.
- [10] Schumacker R.E. (2005), Item Response Theory. Applied Measurement Associates.
- [11] Tigelaar et al. (2005), Quality Issues in Judging Portfolios: Implications for Organizing Teaching Portfolio Assessment Procedures. *Studies in Higher Education*. 30(5), Number: 595-610.
- [12] Technical & Vocational Curriculum Development Department, 2007 & Examination Board, Ministry of Education Malaysia, 2008