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Validity and Reliability of an E-Portfolio Indicators Instrument for Malaysian Skills Certification (MSC)

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ABSTRACT

The development of the E-portfolio system requires indicators or characteristics that are appropriate for meeting the needs of the education system. This pioneering study is to validate and check the reliability of E-portfolio indicators for Malaysian Skills Certification (MSC). The instrument comprised 72 items and was circulated to 40 MSC educators at the Industrial Training Institute (ILP) Kuala Lumpur. This instrument was developed to measure four main constructs, namely i) records of prior attainment, ii) the virtual learning space, iii) competency assessment, and iv) the operating system. The Rasch Model approach was used to check the instrument's validity and reliability. The Rasch Model was used because it can measure respondent and item reliability and it yields data that are more reliable than data collected using only Cronbach's Alpha. The Winsteps Version 3.69.1.11 software was used for the inspection of the items' function from the aspects of reliability and seclusion in terms of item-respondents, polarity and item suitability to measure the constructs and the standardised residual correlation. In the final analysis, 18 indicators were removed as they did not suit the inspection criteria, while 54 corresponding indicators were used to measure the four constructs of the MSC E-portfolio system.

Keywords: Construct reliability, E-portfolio, item polarity, item suitability, Malaysian Skills Certification (MSC), Rasch Model, standardised residual correlation

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INTRODUCTION

E-portfolios seems to act only as a repository of artefacts without connecting to a real learning process. As a result, although the resulting e-portfolio can provide convenience and comfort to users because of the use of technology, it does

not achieve the real use of e-portfolios. If an institution chooses to use e-portfolios in teaching and learning, it is important to understand and define the characteristics of the e-portfolio first to meet the needs of individual institutions and user requirements. Further consideration should be given to the design process and the use of e-portfolio is consumer characteristics E-portfolio system, the potential of e-portfolios, technology features and capabilities and usability of e-portfolios (Jafari, 2004).

In the Malaysian Skills Certification system, the portfolio is used as a document to assess level of knowledge and student achievement. The traditional paper-based system limits the portfolio to being a mere artefact because the printed portfolio is static and limited in its capacity to share information with others. It is also difficult to process and evaluate and updating material is difficult (Miller, Oliver, & Lilly, 2011; Smyth, Horton, Studdert, Griffin, & Symonds, 2011; Stefani, Mason, & Pegler, 2007). The e-portfolio responds to the recommendations of the Ministry of Education (2011) to strengthen the vocational education delivery system by making it more relevant to current developments.

Several studies related to the implementation of the e-portfolio in vocational education have been carried out (Miller et al., 2011; Handa, Arame, Goda, Naganuma, & Gondo, 2011; Rodriguez-Donaire, García, & Olmo, 2010). The overall results showed that the concept of the e-portfolio forwarded by each researcher was different and the development of the e-portfolio requires an appropriate framework to meet the needs of the education system. Nevertheless, these concepts have been reviewed and adapted for application in the context of the Malaysian Skills Certification (MSC) system. Generally, researchers have concluded that the e-portfolio should contain four sections, namely track records, virtual learning space, competency assessment and operating system. This paper introduces indicators for an e-portfolio for use for MSC. The e-portfolio was analysed for validity and reliability using the Rasch Measurement Model in a pilot study. Using the Rasch Measurement Model provides deeper analysis that would be possible using the Cronbach's Alpha value alone.

Data Analysis Based on Rasch Measurement Model

According to Bond and Fox (2006), one of the ways to determine the validity and reliability of an instrument is to use the Rasch Measurement Model. Using this model involves performing several tests designed: (i) to test the reliability and index sorting items; (ii) to detect polarity items that measure constructs; (iii) to test the suitability of the items (item fit); (iv) to determine the items' correlation of residual standardisation; (v) to determine item difficulty and the ability of respondents; (vi) to detect the presence of differential item functioning (dIF functioning-differential item) of the instrument; (vii) to determine the structure of the category

scale measurement functionality; and (viii) to identify unidimensionality constructs.

In this study, the Rasch Measurement Model approach was used only to determine the validity and reliability of the instrument that was developed by the researchers. Four testing instruments were applied in this study: (i) to determine the reliability and isolation item; (ii) to detect polarity items that measure constructs based on the Point Correlation Measure (PTMEA CORR); (iii) to determine the fit of the constructs; and (iv) to determine the correlation value of the items dependent on standardised residuals. The Rasch Measurement Model was also used to analyse the data to determine the difference between two variables and to measure correlation.

Objective

The objective of this study was to test the reliability of the instruments that were developed by the researchers for use for the Malaysian Skills Certification system and to detect any weaknesses of the instruments by examining the functional items of reliability and separation based on responses, polarity, fitness of the items and the correlation value of standardised residuals.

METHODOLOGY

The study was conducted using the quantitative approach. An instrument for use in the Malaysian Skills Certification (MSC) system by the researchers was distributed to survey respondents in a pilot study. The respondents were 40 MSC instructors from the Industrial Training Institute (ILP) Kuala Lumpur. Johanson and Brooks (2010) suggested a minimum of 30 subjects to measure validity and reliability of instruments meant to advance research or examine development scale. The results of the survey were analysed using the software Winsteps Version 3.69.1.11 using the Rasch Measurement Model. The e-portfolio indicator instrument consisted of 72 items that comprised four main constructs namely, historical records, virtual learning space, competency assessment and operating system.

RESULTS

Using the Rasch Measurement Model, the researchers examined the functional aspect of: (i) the reliability and isolation item related to the respondents; (ii) the polarity of items to measure the constructs based on the PTMEA CORR; (iii) the fit of items; and (iv) the correlation value of the items dependent on standardised residuals.

Reliability and Separation Item

To determine the reliability of the instrument, the statistical analysis based on the Rasch Measurement Model was used with respect to reliability and the isolation item. The Cronbach's Alpha (α) obtained was 0.95 (see Table 1). According to Bond and Fox (2006), a Cronbach's Alpha (α) value that is between 0.9 and 1.0 shows the instruments are good and effective and have a high level of consistency, validating them for use in actual research.

Table 1
Reliability value (Cronbach's Alpha)

Person Raw Score-to-Measure Correlation = 1.00
Cronbach's Alpha (Kr-20) Person Raw Score Reliability = 0.95

Reliability and isolation of the items were also analysed. Table 2 shows the reliability and the isolation item; reliability obtained was 0.94, while the value of the item was 4.02 isolation, rounded off to 4.0. Based on the reliability, the value of 0.94 is good and can be accepted (Bond & Fox, 2006). The item value of 4.02 isolation was also good. According to Linacre (2004), a good index for separation is more than 2.0.

Table 2
Reliability and separation of items

	Raw core	Count	Model Measure	Infit Error	Outfit MNSQ	ZSTD	MNSQ	ZSTD
Mean		40.0	50.00	2.11	0.93	-0.5	0.95	-0.4
S.D.	25.5	0.0	9.39	0.07	1.11	1.7	1.11	1.7
Max.	181.0	40.0	88.93	2.17	9.90	9.9	9.90	9.9
Min.	52.0	40.0	40.78	1.89	0.30	-2.4	0.36	-2.3
Real RMSE	2.27	ADJ.SD	9.11	Separation	4.02	item	Reliability	0.94
Model RMSE	2.11	ADJ.SD	9.15	Separation	4.34	item	Reliability	0.95

Table 3 shows that the reliability of the respondents was 0.95 and the isolation of the respondents was 4.15, making the reliability of the respondents very high and, therefore, good, while separation also indicated a good value.

Table 3
Reliability and separation of person

	Raw core	Count	Model Measure	Infit Error	Outfit MNSQ	ZSTD	MNSQ	ZSTD
Mean	282.4	71.0	51.07	1.59	1.02	-0.1	1.03	0.0
S.D.	29.7	0	7.38	0.10	0.44	2.5	0.45	2.5
Max.	330.0	71.0	63.44	1.71	2.39	6.1	2.37	6.1
Min.	207.0	71.0	33.94	1.39	0.29	-5.8	0.30	-5.7
Real RMSE	1.73	ADJ.SD	7.18	Separation	4.15	item	Reliability	0.95
Model RMSE	1.59	ADJ.SD	7.21	Separation	4.53	item	Reliability	0.95

Polarity of Item through PTMEA Value CORR

Examination of the Point Correlation Measure (PTMEA CORR) was carried out to detect polarity of the items. According to Bond and Fox (2006), if the PTMEA CORR value is positive, the item measures the constructs but if the value is negative, it should be corrected or eliminated because the item does not measure the construct or is too difficult for the respondents to answer. Two items received a negative value in the CORR PTMEA, as illustrated in Table 4 (Items PT3 and PT5). However, only one item was dropped i.e. Item PT3. Item PT5 was amended based on suggestions by experts and the objectives of the research.

Table 4
Correlation measure point value for removed items

Entry Number	Raw Score	Count	Measure	Error	Infit		Outfit		PTMEA CORR	Items
					MNSQ	ZSTD	MNSQ	ZSTD		
3	180	40	41.17	1.99	9.90	9.9	9.90	9.9	-0.08	APEL3
5	52	40	88.93	2.15	0.69	-1.3	0.73	-1.1	-0.03	APEL5

Item Suitability (Fit) to Measure Constructs

The constructs were measured using the outfit index Mean-Square (MNSQ). A good and acceptable value for this should be in the range between 0.6 and 1.4 (Bond & Fox, 2006). An MNSQ value of more than 1.4 means the item was misleading, while a value less than 0.6 indicates that an item was too easy or not expected by respondents (Linacre, 2004). Table 5 shows that 18 items were not in the specified range and they needed to be amended or dropped. Four or the items had a value greater than 1.4, while 14 items had a value smaller than 0.6. Items that exceeded the value of 1.4 were 0003 (9.90), PT2 (2.29), VLS43 (1.57) and APEL14 (1.49), while items less than 0.6 were APEL9 (0.58) Ø50 (0.57), VLS30 (0.57), O60 (0.55), O62 (0.53), O59 (0.53), O8 (0.53), O63 (0.52), O66 (0.51), O49 (0.50), VLS22 (0.50), APEL10 (0.45), APEL11 (0.42) and APEL17 (0.36). Four items (O49, VLS22, APEL11 and APEL10) were amended based on the experts' recommendations and the research objectives. The other 14 other items were eliminated.

Table 5
Item suitability (item fit) based on the MNSQ

Entry Number	Count	Outfit		Items
		MNSQ	ZSTD	
3	40	9.90	9.9	APEL3
2	40	2.29	4.2	APEL2
43	40	1.57	2.2	VLS43
14	40	1.49	2.0	APEL14
9	40	0.58	-1.5	APEL9
50	40	0.57	-1.8	O50
30	40	0.57	-1.4	VLS30
60	40	0.55	-1.4	O60
62	40	0.53	-1.6	O62
59	40	0.53	-1.8	O59
8	40	0.53	-1.9	APEL8
63	40	0.52	-1.6	O63
66	40	0.51	-2.0	O66
49	40	0.50	-2.2	O49
22	40	0.50	-1.6	VLS22
10	40	0.45	-1.8	APEL10
11	40	0.42	-2.3	APEL11
17	40	0.36	-2.3	APEL17

Standardised Residual Correlations Value

The residual correlation was consulted to determine whether there were items that overlapped each other. A high residual correlation showed that items had the same characteristics. If the correlation value of two items was above 0.7, only one item was selected. There were nine pairs of items that had a high correlation value (see Table 6); they were: APEL14 and APEL16 (0.85), VLS38 and VLS40 (0.85), PO71 and O72 (0.82), O67 and O68 (0.79), O60 and O61 (0.75), O52 and O53 (0.74), O63 and O64 (0.74), APEL6 and APEL8 (0.72) and VLS43 and VLS42 (0.70). Items with MNSQ values close to the value of 1.00 were retained, while the following items were eliminated based on previous analysis: APEL14, VLS40, PO71, O67, O60, O52, O63, APEL8 and VLS43.

Table 6
Standardised residual correlation of items

Correlation	Item	MNSQ Outfit	Result	Item	MNSQ Outfit	Result
0.85	APEL14	1.49	Eliminated	I0016	0.65	Retained
0.85	VLS38	0.85	Retained	I0040	0.83	Eliminated
0.82	O71	1.17	Eliminated	I0072	1.07	Retained
0.79	O67	1.16	Eliminated	I0068	0.97	Retained
0.75	O60	0.55	Eliminated	I0061	0.73	Retained
0.74	O52	0.72	Eliminated	I0053	0.79	Retained
0.74	O63	0.52	Eliminated	I0064	0.77	Retained
0.72	APEL6	1.35	Retained	I0008	0.53	Eliminated
0.70	CE42	0.93	Retained	I0043	1.57	Eliminated

DISCUSSION AND CONCLUSION

After the data were analysed, they were checked to confirm the validity and reliability of the instruments based on the Rasch Measurement Model. Elimination and amendment of the items were done taking into account the views and assessment of the experts. Overall, the pilot study showed that 18 items needed to be removed as they did not meet the requirements of the measurement set, while five items were amended to suit the objectives of the study. Table 7 provides an overview of the items that were retained and those that were eliminated.

Table 7
Summary of dropped and amended items

No	Construct	Retained Item	Retained Item Sum	Dropped Item	Dropped Item Sum
1	Accreditation of Prior Learning (APEL)	APEL1, APEL4, APEL5, APEL6, APEL7, APEL10, APEL11, APEL12, APEL13, APEL15, APEL16, APEL18, APEL19, APEL20, APEL21	15	APEL2, APEL3, APEL8, APEL9, APEL14, APEL17	6
2	Virtual Learning Space (VLS)	VLS22, VLS23, VLS24, VLS25, VLS26, VLS27, VLS28, VLS29, VLS31, VLS32, VLS33, VLS34, VLS35, VLS36, VLS37, VLS38, VLS39, VLS41, VLS42	19	VLS30, VLS40, VLS43	3
3.	Competency Evaluation (CE)	CE44, CE45, CE46, CE47, CE48	5	(None)	0
4.	System Operation (O)	O49, O51, O53, O54, O55, O56, O57, O58, O61, O64, O65, O68, O69, O70, O72	15	O50, O52, O59, O60, O62, O63, O66, O67, O71	9
		Total	54		18

Based on this pilot study, it was concluded that validity and reliability are very important aspects to consider in developing a new instrument for a study. The analysis found 18 items had to be dropped as they were dubious in terms of validity and reliability. The amended instrument was found reliable and valid for producing e-portfolio models as required by the Malaysian Skills Certification system.

REFERENCES

Bond, T. G., & Fox, C. M. (2006). *Applying the Rasch model: Fundamental measurement in the human sciences.* Psychology Press.

Handa, J., Arame, M., Goda, Y., Naganuma, S., & Gondo, T. (2011). Using e-portfolios: the impact of online group work.*International Journal, 5*(1), 75-85.

Jafari, A. (2004). Tackling the challenges & identifying attributes. *Educause Review, 39*(4), 38-45.

Johanson, G. A., & Brooks, G. P. (2010). Initial scale development: Sample size for pilot studies. *Educational and Psychological Measurement, 70*(3).

Kementerian Pelajaran Malaysia. (2011). *Pelan strategik transformasi pendidikan vokasional.* (pp. 1-98). Putrajaya: Kementerian Pelajaran Malaysia,.

Ku, D. T., & Wen-Chih, C. (2011, June). uFolio: A conceptual design framework for a learning platform and assessment system. In *Networked Computing and Advanced Information Management (NCM), 2011 7th International Conference on* (pp. 358-363). IEEE.

Linacre, J. M. (2004). Test validity and Rasch measurement: Construct, content, etc. *Rasch Measurement Transactions, 18*(1).

Miller, A., Oliver, B., & Lilly, L. (2011). *Eportfolios Australia Conference: Making a Difference – Showing the Difference, Book of Abstracts and Papers.* Perth: eLearning Services Queensland University of Technology.

Rodriguez-Donaire, S., García, B. A., & del Olmo, S. O. (2010, April). e-Portfolio: A tool to assess university students' skills. In *Information Technology Based Higher Education and Training (ITHET), 2010 9th International Conference.* (pp. 114–124). IEEE.

Smyth, R., Horton, G., Studdert, C., Griffin, B., & Symonds, I. (2010). Adopting an e-portfolio as an assessment tool: Investigating options, issues and future possibilities. *ePortfolios Australia Conference 2011* (p. 112).

Stefani, I., Mason, R., & Pegler, C. (2007). *The educational potential of e-portfolios supporting personal development and reflective learning* (p. 114).New York: Routledge.

APPENDIX

Pilot study item instrument

Item No.	Statement
	Accreditation of Prior Learning (APEL)
APEL1	Student's biodata
APEL2	Student's ambition
APEL3	Future career planning
APEL4	Validated academic certificates
APEL5	Educational background (Year, level, grade achieved and institution)
APEL6	Validated education institution project summary
APEL7	Professional organisation membership document
APEL8	Proof of work (Photos of finished projects, reports, budgets and technical drawings)
APEL9	Professional course attended
APEL10	Industrial training attended
APEL11	Working experience (Period, post, job description, employer)
APEL12	Technical skills in knowledge area (i.e. tools handling skills, repair skills etc.)
APEL13	Track record of managing workplace safety skills
APEL14	Track record of organisational structuring skills in the workplace
APEL15	Track record of English language skills (Writing, reading and speaking)
APEL16	Track record of managing work activity skills
APEL17	Work ethics (Related to appearance, personality and time management)
APEL18	Track record of project management skills
APEL19	Malay language skills (Writing, reading and speaking)
APEL20	Acknowledgement of information certified by employer who has extensive experience in the field of expertise of the candidate
APEL21	Acknowledgement of information certified by the supervisor with extensive experience in the field of expertise of the candidate
	Virtual Learning Space (VLS)
VLS22	Allow owners to edit the information in the portfolio
VLS23	Provide space for learning materials that are collected
VLS24	Allow portfolio owners to present the information in different ways
VLS25	Allow students to send homework online
VLS26	Allow instructors to guide students online
VLS27	Allow instructors to monitor students' work online.
VLS28	Allow instructors to detect the process of online learning
VLS29	Allow students to conduct practical work to prove their level of skills and knowledge
VLS30	Enable online discussion of activities
VLS31	Provide test methods by which students can answer multiple-choice questions
VLS32	Provide test methods by which students can write a short essay
VLS33	Exhibit an overall score for the test online
VLS34	Conduct formative tests (Tests carried out continuously, i.e. during teaching and learning to identify weaknesses inherent in the process of teaching and learning)
VLS35	Conduct summative tests (Tests carried out at the end of a course or programme that aims to obtain overall information about student achievement)

APPENDIX *(continue)*

VLS36	Enable suggestions and comments by teachers
VLS37	Confirm assessment tasks
VLS38	Provide space for sharing ideas on learning activities
VLS39	Provide space to send messages concerning learning activities
VLS40	Provide space for students to reflect on learning activities
VLS41	Provide space for students to communicate with classmates
VLS42	Provide space for communication between teachers and students
VLS43	Provide space for students to communicate with other students
	Competency Evaluation (CE)
CE44	Evidence of achievement for all work activities evaluated based on Competency Unit (CU)
CE45	Cumulative Achievement Record (CAR) for the programme
CE46	Cumulative Achievement Record (RCE) for core ability
CE47	Training pathway chart
CE48	Performance evaluation of generic skills (core ability) evaluated for each Competency Unit (CU)
	E-Portfolio System Operation Element (O)
O49	Find information in the system
O50	Looking for information online
O51	Upload information (file) to the e-portfolio system
O52	Create a diverse portfolio template
O53	Produce information no longer needed in the system
O54	Perform verification of downloaded information
O55	Delete a template no longer needed without deleting the information (file)
O56	Rename information
O57	Send message by email
O58	Send a signal to consumers about new activities
O59	See the latest consumer use of the e-portfolios
O60	Receive messages using email
O61	Allow self-registration to access e-portfolio
O62	Share views with others
O63	Export all information in the system to other software
O64	Export the information in the system to other software
O65	Store information or artefacts for a certain period of time
O66	Enable portfolio owner to modify information
O67	Enable portfolio owner to download video
O68	Enable portfolio owner to download audio
O69	Enable portfolio owner to download image
O70	Enable portfolio owner to create/produce information
O71	Enable users to write and send a reflection on information
O72	Enable users to write and send a reflection on an activity