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Article in *Indian Journal of Public Health Research and Development* · November 2018

DOI: 10.5958/0976-5506.2018.01640.6

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Items' Validity and Reliability Using Rasch Measurement Model for Factors that Influence Clothing Disposal Behaviour

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ABSTRACT

The purpose of this study was conducted to assess the validity and reliability of this research instrument using the Rasch Measurement Model (RMM). This instrument will be used to measure the factors that influences young consumers towards sustainable clothing disposal behaviour. The respondents consisted of 45 students of Fashion and Textile Design Course (SRFT) and there were 43 likert scale items with five sub-constructs which are attitude, awareness of environmental issues, controlled behaviour, social norms, and social action. Therefore, Winsteps 3.73.0 software was used to analyse the reliability of the items and respondents, the separation index of items and respondents, polarity of items, items suitability, difficulty level of items and item mapping. The findings showed that the reliability index of item is 0.89 and respondent is 0.99. The results also indicate that 9 out of the 43 items were misfit due to unfulfilled the conditional value of PTMEA CORR and Infit/Outfit MNSQ and these items need to be improved after consulting with the experts. Based on the research findings, it was evident that the items are quite good, acceptable and valid to be used. Apart from this, this research also intended to create awareness among the community regarding the importance ways to dispose clothing products.

Keywords: Clothing disposal behavior, young consumer, rasch measurement model, validity and reliability.

INTRODUCTION

Nowadays, clothing product is the most important asset of consumers (Lang, Armstrong & Brannon²⁷) especially for the younger generation consumers that are more interested to keep up with the latest fashion trend (Wai Yee, Siti Hasnah, & Ramayah⁴⁵; Saeid, Asghar, Asadollah, & Parviz⁴⁰). However, the rapid growth of the fashion and textile industry contributed towards alarming wastage of clothings and environmental pollution (Najdah, Marhana, Khatijah, & Shafiek³⁴; Arasinah, Suriani, & Zaliza¹). In western countries, the issue that is related to disposal of second-hand clothing is one of the serious issues. This problem has been discussed in some previous studies by Cruz-Cardenas, Gonza'lez, and Gasco¹⁶; Xu, Chen, Burman, and Zhao⁴⁷; Lang et al²⁷; Bianchi and Birtwistle⁹ and others. Not only that, Malaysia is also experiencing the similar problem (Lee, Ghozali, & Zulkifli²⁸; Wai Yee et al⁴⁵). However, in Malaysia this issue has not been taken seriously yet. This can be proven by the statistics issued by the

National Solid Waste Management Department in which Malaysia has produced approximately 8.4 million tonnes of solid waste per year and 4% of solid waste is made up of clothing and textiles (Wai Yee et al⁴⁵).

The unlimited production and usage of clothes also raises questions regarding how Malaysians practice sustainable clothing disposal behaviour in order to reduce the environmental pollution (Najdah, Marhana, Khatijah, & Shafiek³⁴). Some consumers threw their clothing directly into waste bins without thinking about the consequences of their action. This is because they have no clear understanding that this irresponsible behavior could bring negative impacts toward their daily lives (Wai Yee et al⁴⁵; Farah, Arasinah, Rahimah, Asliza, Rodia, & Baity²⁰). Thus, it is really crucial to create awareness among the public especially young fashion designer regarding the importance of disposing second-hand clothing in environmentally sound manner. Students of fashion majors are students who are more susceptible to the development of the fashion world. According to

Bianchi & Birtwistle⁹, fashion students are also known as young fashion designers. Therefore, they are said to be more susceptible in having the latest fashion and will dispose of clothes in a short period of time.

Other than that, second-hand clothing can be recycle or redesign to make a new product. This process will need some human labour. Thus, not only this method can solved the issue of increasing clothing wasted, but it also gives opportunities for citizen to create a new job. Based on the International Labor Organization's report, 200 million people in the world are unemployed and 75 million are made up of young people aged between 15-24 (Zanariah⁸). Therefore, to help achieve the government's target of creating 60% of new jobs to meet the needs of TVET skills (Zanariah⁸), this study was able to open the minds of young fashion designers that second-hand clothes not only can be donated (Laitala²⁶), but can even be recycled (Ekstrom & Salomonson¹⁹), redesigned into a new exclusive costume (Rahman & Gong²⁷), and this redesigned clothing can be sold (Bianchi & Birtwistle¹⁰) at high prices. Indirectly, these behaviors can help to create jobs opportunities and generate their daily income as well as generating highly skilled human beings, in line with the aspirations to be achieved in 2020 (Eleventh Malaysia Plan⁸, RMKe-11). Therefore, in order to ensure that the items adapted from literature reviews are able to measure accurately the factors that influences young consumers towards sustainable clothing disposal behaviour, RMM that was founded by Rasch¹⁸ was used to provide empirical evidences regarding the validity and reliability of this instrument, so that it can be used in the real study.

Validity defines the level to which an instrument used in a research is able to measure what it is supposed to measure and maintain the accuracy of the instrument by protecting it from flaws (Hair, Black, Babin, & Anderson²³). According to Arasinah, Suriani, Zaliza, Che Ghani, & Rahimah² and Fraenkal and Wallen²², a researcher must validate the instrument so that the items are defensibility, accuracy, appropriateness, meaningfulness, and usefulness. In this research, the researcher chose content validity and construct validity in order to determine the accuracy and validity of this instrument.

Content validity is the measurement of the items in the instrument to ensure that those items indeed measure the intended construct. According to Creswell¹⁵, high content validity is based on the ability of the items that

have been developed, modified, or adapted to measure the intended construct precisely. Content validity is assessed by expert review. In this research, a total of three expert panels from the fashion field were appointed to determine the content validity and evaluate the items present in the questionnaire. The research selected the expert panels based on their expertise and experience in the fashion field. They were tasked to check the research objectives and provide comments on whether the adapted and modified items in the instrument are parallel with the research objectives and suit the Asian culture. As for the construct validity, the researcher utilised RMM to measure whether the adapted and modified items are suitable and fit to measure the intended construct. The analyses used to determine the construct validity were items' polarity, misfit of items, and items' map.

Reliability is the consistency that measures the variables of the research instrument and provides the degree of consistency and accuracy of the research instrument (Arasinah, Rahimah, Ab. Rahim, & Zaliza³). An instrument that has high reliability level produces the same result every time the instrument is used. There are three types of measurement and ways that are normally used to determine the reliability of an instrument which are sequential measurement, simultaneous measurement and internal consistency measurement (Cooper & Schindler¹⁴). In this research, the researcher determined the reliability by using internal consistency measurement utilising Cronbach's Alpha (α) coefficient.

Marnburg and Luo³² stated that α coefficient can be used to determine the reliability of a research instrument with multiple scales such as Likert, Thurstone, Guttman atau Semantic Differential, and Kuder-Richardson (instruments which has dichotomy). The reliability coefficient value must be between 0 and 1.0. When the coefficient value nears 1.0, the instrument is said to have high reliability (Arasinah et al³). In relation to that, this research was carried out to determine whether the items of this instrument measure the constructs of factors that influence clothing disposal behaviour. RMM also was used to produce empirical evidences regarding the validity and reliability of this instrument because this model is able to measure the consistency of a construct.

THE AIM OF RESEARCH

Generally, this research intended to measure the validity and reliability of items in this factors that influence

clothing disposal among SRFT students questionnaire. Sub-constructs involved in this research are attitude, awareness of environmental issues, controlled behaviour, social norms, and social behaviours. In this research, RMM was used to measure the reliability and separation index of items and respondents, the separation rate of items and respondents, polarity of items, item suitability, difficulty level of items and ability of the respondents.

METHOD OF RESEARCH

This research was carried out in Faculty of Art & Design, Universiti Teknologi Mara, Shah Alam. Cooper and Schindler¹³ stated that the need number of samples are around 25 to 100, meanwhile Johanson and Brooks²⁴ opinionated that there needs to be at least a minimum of 30 samples for a research. Thus, the researcher determined that the number of samples needed for this research was 45 students from UiTM Shah Alam using the simple random sampling technique. The questionnaires were distributed to 45 research samples by meeting them face-to-face. All the questionnaires were collected and all were completely answered.

This research used the instrument with Likert scale which were from 1 (Strongly Disagree) to 5 (Strongly Agree). A total of 43 items were modified and adapted from past researches by (Wai Yee et al⁴³); Zala Zurga et al⁴⁹; Taljaard⁴¹; Bianchi & Birtwistle⁹; Thompson & Tong⁴⁴; Azah³⁵; Chen & Chai¹²; Awuni et al⁷; and Lang et al²⁷. The main construct of this research was factors that influence clothing disposal behaviour and sub-constructs were attitude (5 items), awareness of environment (23 items), controlled behaviour (6 items), social norms (6 items), and social action (3 items). The number of items was deemed sufficient to measure the validity and reliability of the items because in the study of Khotimah and Sri²⁵, the researcher tested validity and reliability of items using RMM for only 20 items.

ANALYSIS AND DISCUSSION

In order to test the quality of the items in this instrument, the instrument's validity and reliability were measure using the RMM with Winsteps 3.73.0 software. The RMM was used to (i) test the reliability and separation index of items and respondents, (ii) detect the polarity of items, (iii) determine the items' suitability, and (iv) determine the difficulty level of items and ability of the respondents.

Reliability and Separation Index of Items and Respondents: Reliability refers to how far an instrument is able to produce the same or similar score when it used repeatedly (Arasinah et al²). When an instrument used on same samples but at different times produces same or similar scores, that particular instrument is said to have high reliability value and if the scores produced are different, the instrument is said to have low reliability value. Fisher²¹ classified the value of reliability when used RMM between 0.81 and 0.90 as good, 0.91-0.94 as very good, and best is 0.94. Devellis¹⁷ and Pallant and Tennant⁶ stated that the minimum reliability value that can be accepted is 0.70. According to Bond and Fox¹¹, good reliability value when using RMM is between 0.70 and 0.89 and very good is between 0.90 and 1.0. Separation refers to the level of respondents' consent distribution and good value of separation is between 3 and 4, very good is between 4 and 5 and best is 5 (Fisher²¹). However, (Linacre²⁹) suggested that good separation value is 2 and above.

Table 1 shows the reliability and separation value of items and respondents. The pilot test data analyses showed that the respondent reliability value based was 0.88 and separation value was 2.75 while the item reliability value was 0.93 and separation value was 3.59. The showed reliability values proved that the items of factors that influence clothing disposal behaviour among young fashion designers were good, acceptable, and can be trusted to be used in real research. Once the values were rounded, the respondent separation value showed that there were three levels of respondent agreeableness while item separation value showed that there were four levels of agreeableness and according to Fisher²¹, separation value between 3 and 4 can be considered good.

Table 1: Reliability and separation index of items and respondents

	Person	Item
Reliability	0.88	0.93
Separation	2.75	3.59

Detect the Polarity of Item: Point Measure Correlation (PTMEA CORR) can be used to detect item polarity (Mad Noor³¹). The purpose of detecting item polarity is to ensure that the items are parallel in measuring the intended construct (Arasinah, Rahim, Ramlah, & Soaib⁶; Linacre³⁰). On the contrary, if the PTMEA CORR value

is negative (-), the items do not fulfil the criteria of the measured construct and it is deemed that the items or individuals provided responses conflicting with the sub-constructs. Thus, those items and individuals need to be eliminated or modified (Ruhizan, Faizal, Ridzwan, Azmi, & Mohd Bekri³⁹).

Based on the Table 2, there were two items that showed negative PTMEA CORR values which were N6 and TLK1 while other items showed positive PTMEA

CORR values. Item N6 and TLK1 that produced negative PTMEA CORR values were repaired because did not fulfil the construct criteria. Apart from that, there were three items that had positive PTMEA CORR value but the values were too low which were K19, K7, and S2. It may mean that these items were hard to comprehend by the respondents and it lead to conflicting responses. The item that had the highest PTMEA CORR value was TLK2 and according to Linacre³⁰, this value showed the ability of an individual to distinguish the said item.

Table 2: Item polarity based on the PTMEA CORR values

Entry Number	PTMEA CORR	ITEM	Entry Number	PTMEA CORR	ITEM
41	0.60	TS1	16	0.61	K11
34	-0.04	N6	18	0.40	K13
31	0.50	N3	15	0.64	K10
30	0.67	N2	11	0.40	K6
35	-0.13	TLK1	13	0.36	K8
43	0.64	TS3	21	0.56	K16
42	0.65	TS2	14	0.56	K9
32	0.53	N4	22	0.54	K17
33	0.53	N5	20	0.52	K15
29	0.64	N1	10	0.43	K5
27	0.52	K22	3	0.38	S3
24	0.13	K19	5	0.54	S5
25	0.62	K20	6	0.39	K1
12	0.08	K7	7	0.32	K2
37	0.35	TLK3	4	0.45	S4
36	0.70	TLK2	8	0.42	K3
40	0.61	TLK6	17	0.28	K12
26	0.45	K21	9	0.47	K4
28	0.26	K23	1	0.37	S1
38	0.56	TLK4	19	0.34	K14
39	0.55	TLK5	23	0.61	K18
2	0.21	S2			

(PTMEA CORR = Point Measure Correlation)

Detecting Misfit Items: Infit Mean Square (MNSQ) is used to detect mismatch of items (Arasinah et al³; Ruhizan et al³⁹). The purpose of this is to ensure that the items in the instrument fulfil the construct criteria. According to Arasinah et al⁶, for items with Likert scale, the range of item fit that is acceptable is between 0.6 logits and 1.4 logits while Wright and Linacre⁴⁶, suggested that acceptable item fit range should be between the range

of 0.5 logits and 1.5 logits. A value of 0.6 and lower shows that the item overlaps other items (Linacre²⁹) while 1.4 logits and above shows that the items are not homogenous with other items in one measurement scale (Arasinah et al⁴). According to Bond and Fox¹¹, the value of Infit ZSTD should be between -2 and +2. However, if the value of Infit Mean Square (MNSQ) is acceptable, the Infit ZSTD value can be ignored (Linacre²⁹).

Based on the Infit MNSQ values suggested by Wright and Linacre⁴⁶, Table 3 shows four misfit items out of 43 items that measured factors that influenced clothing disposal behaviour. No items showed Infit MNSQ value

of 0.5 and lower and items that showed Infit MNSQ values of more than 1.5 were TLK1, N6, S2, and K19. The items that did not fulfil the requirements of Infit MNSQ values were repaired after consulting the experts.

Table 3: Item Misfit based on the MNSQ values

Entry Number	Item	Measure	Model S. E	INFIT		OUTFIT	
				MNSQ	ZSTD	MNSQ	ZSTD
35	TLK1	1.22	0.20	2.04	3.9	3.07	0.65
34	N6	1.52	0.19	1.72	3.0	2.42	5.1
2	S2	0.12	0.24	1.86	2.9	2.11	3.7
28	K23	0.39	0.23	1.46	1.8	1.81	2.9
24	K19	0.82	0.21	1.54	2.1	1.75	2.8
12	K7	0.63	0.22	1.39	1.6	1.70	2.6
31	N3	1.34	0.19	1.50	2.2	1.67	2.7
33	N5	1.03	0.20	1.18	0.9	1.21	1.0
18	K13	-0.48	0.25	1.18	0.8	1.19	0.8
29	N1	0.90	0.21	1.18	0.8	1.13	0.6
22	K17	-0.74	0.26	1.05	0.3	0.95	-0.1
30	N2	1.22	0.20	0.98	0.0	1.01	0.1
17	K12	-1.17	0.27	0.96	-0.1	0.92	-0.3
26	K21	0.39	0.23	0.93	-0.2	0.95	-0.2
13	K8	-0.67	0.26	0.91	-0.3	0.94	-0.2
6	K1	-1.02	0.27	0.93	-0.3	0.87	-0.5
8	K3	-1.10	0.27	0.93	-0.3	0.86	-0.5
27	K22	0.86	0.21	0.82	-0.7	0.92	-0.3
32	N4	1.03	0.20	0.87	-0.5	0.86	-0.6
5	S5	-1.02	0.27	0.86	-0.6	0.79	-0.9
37	TLK3	0.59	0.22	0.66	-1.5	0.86	-0.5
43	TS3	1.19	0.20	0.82	-0.8	0.86	-0.6
41	TS1	1.59	0.19	0.81	-0.9	0.85	-0.7
11	K6	-0.61	0.26	0.85	-0.6	0.81	-0.8
20	K15	-0.88	0.27	0.85	-0.7	0.77	-1.0
19	K14	-1.48	0.29	0.84	-0.8	0.77	-1.0
42	TS2	1.15	0.20	0.81	-0.9	0.84	-0.7
3	S3	-1.02	0.27	0.82	-0.9	0.78	-1.0
1	S1	-1.40	0.28	0.80	-1.0	0.73	-1.2
9	K4	-1.25	0.28	0.79	-1.0	0.72	-1.3
38	TLK4	0.29	0.23	0.76	-1.0	0.78	-0.9
7	K2	-1.02	0.27	0.77	-1.1	0.72	-1.3
25	K20	0.73	0.21	0.68	-1.5	0.76	-1.0
10	K5	-0.95	0.27	0.76	-1.2	0.69	-1.4
23	K18	0.07	0.24	0.76	-1.0	0.74	-1.1
14	K9	-0.74	0.26	0.73	-1.2	0.70	-1.4

Contd...

15	K10	-0.54	0.26	0.73	-1.2	0.67	-1.5
40	TLK6	0.44	0.22	0.68	-1.4	0.68	-1.4
39	TLK5	0.23	0.23	0.68	-1.4	0.67	-1.5
4	S4	-1.10	0.27	0.65	-1.9	0.65	-1.7
16	K11	-0.41	0.25	0.62	-1.8	0.59	-2.0
21	K16	-0.67	0.26	0.62	-1.9	0.58	-2.1
36	TLK2	0.54	0.22	0.58	-2.0	0.61	-1.9

(MNSQ = Infit/Outfit Mean Square; ZSTD = Z-Score)

Determine the Difficulty Level of Item and Ability of Respondents: The RMM is able to help the researchers to measure the difficulty of the items and ability of the respondents. In order to measure whether the adapted and modified items were parallel with the ability of the respondents, item map is used (Azrilah & Azami⁸). The dotted lines on the left show the position of the respondents involved in this study while the dotted lines on the right showed the items' position.

Upper part of the left map shows the position of respondents with high ability in answering the questionnaire while the upper right of the map shows the highest level of item difficulty. Figure 1 shows the level of item difficulty and ability of respondents towards the 43 items.

Based on Figure 1, most of the respondents were in between the min value of logit 0 and 4.45 for ability of respondents, which is almost nearing the min value of logit 0 determined for the items. This mapping describes that most of the individuals has high ability in answering the questionnaire items. It can be observed that the toughest item (TS1) was positioned at the top of the scale and the easiest item (K14) positioned at the bottom of the scale.

DISCUSSION

In order to achieve the standard validity and reliability of items using RMM, there are a few conditions to be fulfilled during the implementation of item checking. If the item did not fulfil the determined conditions, the researcher must refer back to the experts to determine whether the item needs to be eliminated or maintained (Arasinah et al³).

Based on the analyses, the item reliability value for the constructs of the factors that influence clothing disposal behaviour is 0.93 which is classified as very good while the respondent reliability value was 0.88 deemed good. These findings are parallel with the findings of Fisher²¹ and Bond and Fox³¹ in which the reliability value between

0.81 and 0.90 considered good while value between 0.91 and 0.94 considered very good.

The item separation value of the 43 items was 3.59 and this is categorised as very good. This finding showed that the items modified and adapted can be divided into four strata. The separation value for the 45 respondents was 2.75 which is good and shows that the ability of the respondents can be divided into three strata. Thus, this research found that the separation values were inlined with Fisher²¹ in which the value between 3 and 4 is considered good and any value between 4 and 5 is very good. The reliability and separation analyses of the items and respondents showed that the items in this instrument can be trusted and able to measure the factors that influence clothing disposal among students.

Apart from that, the research found that there were two items which produces negative PTMEA CORR values while other items produced positive PTMEA CORR values. However, there were three items that produced positive PTMEA CORR values but the values were lower than 0.3, thus needed to be repaired because did not fulfil the criteria of the construct. This is corresponding with Ruhizan et al³⁹ who stated that whichever item that did not fulfil the criteria needs to be eliminated or repaired to ensure that the item able to measure the intended construct. Meanwhile, the Infit/Outfit MNSQ values of the items showed fit values between the range of 0.5 logits and 1.5 logits as suggested by Wright and Linacre⁴⁶. However, there were four items that showed Infit/Outfit MNSQ values of more than 1.5 logits. According to Arasinah et al⁶, these items need to be separated for modification.

Moreover, by using RMM, the researcher was able to identify the level of item difficulty and the ability of the respondents in answering the questionnaire. Based on the item map analysis, it described that there 10 respondents who are highly able to answer the items in the questionnaire and there was no respondents with low

level ability. The easiest item was K14 with a value of -1.48 logits and the hardest item in the instrument was TS1 with a value of 1.59 logits. Table 5.0 shows the summary of the items that did not fulfil the criteria of RMM usage and these items were repaired according to the needs of the research context.

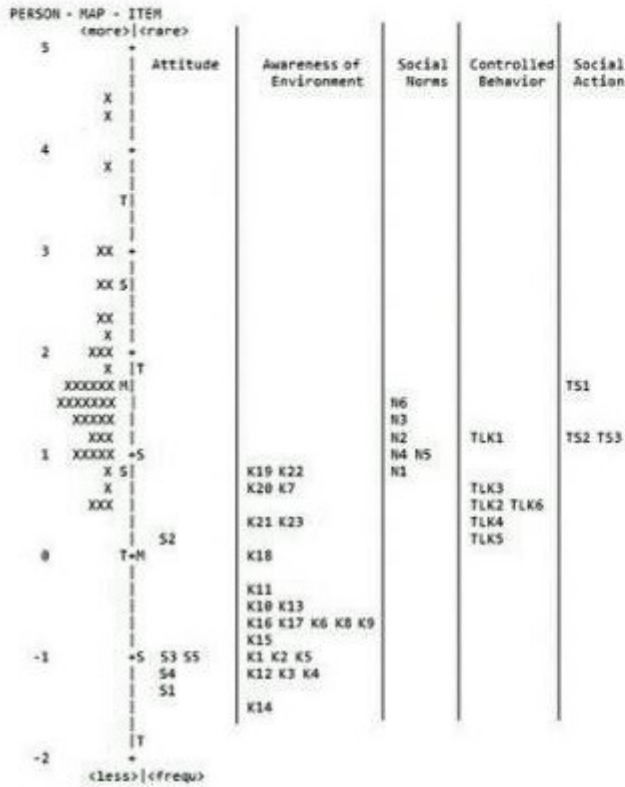


Figure 1: Item map for constructs of factors that influence clothing disposal

Table 5: Summary of items that need to be repaired

Sub-Constructs	Total Item	Misfit Item	Infit	Outfit	PTMEA CORR	RMM
						Items that need to be repaired
Attitude	5	S2	1.86	2.11	0.21	1
Awareness of Environmental Issues	23	K19	1.54	1.75	0.13	3
		K7	-	-	0.08	
		K23	1.46	1.81	0.26	
Social Norms	6	N3	-	-	0.50	2
		N6	1.72	2.42	-0.04	
Controlled Behavior	6	TLK1	2.04	3.07	-0.13	1
Social Action	3	-	-	-	-	-
Total	43					7

CONCLUSION

First of all, the authors wish to acknowledge their gratitude to the anonymous reviewers who gave freely time and effort, constructive recommendations that enhanced the value of this manuscript. The authors also would like to express their deepest thanks and appreciation to all the farmers of Turatea Distric who participated in the interview research. Special thanks go to Jenepono Government, Bappeda Jenepono and Hasanuddin University for supporting the studies of the authors that enabled them to conduct this research.

ACKNOWLEDGMENT

The author gratefully acknowledges Universiti Pendidikan Sultan Idris for the funding of the project GPU (University Research Grant). The author also acknowledges the constructive comments received by the anonymous reviewers.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Arasinah Kamis, Suriani Mohamed, Zaliza Hanapi. Selamatkan planet kita: Mereka bentuk semula pakaian terpakai untuk pelbagai kegunaan. In Malay Proc. 2nd International Conference. Creative Media, Design and Technology (REKA), Malaysia. 2016a;603-617.
2. Arasinah Kamis, Suriani Mohamed, Zaliza Hanapi, Che Ghani Che Kob, Rahimah Jamaluddin. Fashion and clothing instrument for Malaysian fashion lecturers: An analysis of the instructors' competency scale. GEOGRAFIA: Online Malaysian Journal of Society and Space. 2016b;12(3):35 – 45.
3. Arasinah Kamis, Rahimah Jamaludin, Rahim Bakar Ab, Zaliza Hanapi. Clothing Fashion Design Competency Instrument: An Application of Rasch Measurement Model. Advanced Science Letters. 2016c;22(5/6):1343-1347.
4. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran. Validity and

- Reliability of Clothing Fashion Design (CFaDC) Competency Instrument. *Middle-East Journal of Scientific Research (Innovation Challenges in Multidisciplinary Research & Practice)*. 2014;19:89-97. ISSN 1990-9233. DOI: 10.5829/idosi.mejsr.2014.19.icmrp.14
5. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran, Norhaily. Competency Assessments of Clothing Fashion Design: Rasch Measurement Model for Construct Validity and Reliability. *Journal of Technical Education and Training (JTET)*. 2013;5(2):1-12.
 6. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran. Kesahan dan Kebolehppercayaan Instrumen Kompetensi Rekaan Fesyen Pakaian (RFP). In *Malay Jurnal Pendidikan Malaysia*. 2012;37(2):11-19.
 7. Awuni J. A, Du J, Yiranbon E. Factors Influencing Green Purchasing Behaviors: Some Insights from Tamale, Ghana. *British Journal of Economics, Management & Trade*. 2016;14(4):1-12.
 8. Azrilah Abdul Aziz, Mohd Saifudin Masodi, Azami Zaharim. Asas Model Pengukuran Rasch: Pembentukan Skala dan Struktur Pengukuran. In *Malay. Bangi, malaysia: Penerbit Universiti Kebangsaan Malaysia*. 2013.
 9. Bianchi C, Birtwistle G. Consumer Clothing Disposal Behavior: A Comparative Study. *International Journal of Consumer Studies*. 2012;3:335-341.
 10. Bianchi C, Birtwistle G. (2010). Sell, Give Away, or Donate: An Exploratory Study of Fashion Clothing Disposal Behavior In Two Countries. *The International Review of Retail, Distribution, and Consumer Research*. 2010;20(3):353-368.
 11. Bond T. G, Fox C. M. *Applying the Rasch Model: Fundamental Measurement in The Human Sciences* (2nd ed.). Mahwah, New Jersey: Lawrence Erlbaum. 2007.
 12. Booi Chen T, Teck Chai L. (2010). Attitude towards the Environment and Green Products: Consumers' Perspective. *Management Science and Engineering*. 2010;v4(2):27-39. ISSN 1913-0341.
 13. Cooper D. R, Schindler P. S. *Business Research Methods* (11th ed.). New York: McGraw-Hill/Irwin. 2011.
 14. Cooper D. R, Schindler P. S. *Business Research Methods* (8th ed.). New York: McGraw-Hill. 2003.
 15. Creswell J.W. *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*. (4th ed.). Boston, MA: Pearson Education. 2012.
 16. Cruz-Ca'rdenas J, Gonza'lez R, Gasco J. (2016). Clothing Disposal System by Gifting: Characteristics, Processes, and Interactions. *Clothing and Textiles Research Journal*. 2016;1-15.
 17. DeVellis R. F. *Scale Development Theory and Applications*. (2nd ed.). Thousand Oaks, California: Sage Publications. 2012.
 18. Eleventh Malaysia Plan (RMK-11) 2016-2020. Executive Summary Eleventh Malaysia Plan 2016-2020. [WWW. Document]. URL <http://www.epu.gov.my/en/rmk/eleventh-malaysia-plan-2016-2020>. Accessed on 2017 September 12th.
 19. Ekstrom K. M, Salomonson N. Reuse and Recycling of Clothing and Textiles-A Network Approach. *Journal of Macromarketing*. 2014;34:383-399.
 20. Farah Najwa Ahmad Puad, Arasinah Kamis, Rahimah Jamaluddin, Asliza Aris, Rodia Syamwil, Baiyy Bujeng. Environmental Responsibility by Sustaining the Practice of Disposal of Clothing. Manuscript submitted for publication. 2017.
 21. Fisher W. P. Jr. Rating scale instrument quality criteria. *Rasch Measurement Transactions*. 2007;21(1):1095. [WWW. Document]. URL <http://www.rasch.org/rmt/rmt211m.htm> (Accessed on 1st May, 2017).
 22. Fraenkel J. R, Wallen E. W. *How to design and evaluate research in education*. Boston, MA: McGraw-Hill. 2006.
 23. Hair J. F, Black W. C, Babin B. J, Anderson R. E. *Multivariate Data Analysis* (7th ed.). Beijing: China Machine Press. 2011.
 24. Johanson G.A, Brooks G.P. Initial Scale Development: Sample Size for Pilot Studies. *Educational and Psychological Measurement*. 2010;70(3):394-400.
 25. Khotimah Marjiastuti, Sri Wahyuni. Analisis Kemampuan Peserta Didik dengan Model Rasch.

- In Malay. Seminar Nasional Evaluasi Pendidikan. 2014. ISBN 978-602-14215-5-0.
26. Laitala K. Consumer's Clothing Disposal Behavior-A Synthesis of Research Results. *International Journal of Consumer Studies*. 2014;38:444-457.
 27. Lang C, Armstrong C. M, Brannon L. A. Drivers of Clothing Disposal in the US: An Exploration of the Role of Personal Attributes and Behaviours in Frequent Disposal. *International Journal of Consumer Studies*. 2013;37:706-714.
 28. Lee Khai Loon, Mohamad Ghozali Hassan, Zulkifli Mohamed Udin. The Effect of Supply Chain Technology Adoption: An Empirical Study of Textile and Apparel Industry in Malaysia. *Journal of Engineering and Applied Sciences*. 2016;11:1727-1734.
 29. Linacre J. M. A User's Guide to WINDTEPS Rasch-Model Computer Programs. Chicago, Illinois: MESA Press. 2007.
 30. Linacre J.M. Test Validity and Rasch Measurement: Construct, Content, etc. *Rasch Measurement Transactions*. 2004;18(1):970-971.
 31. Mad Noor Madjapuni, Jamaluddin Harun. Validity and Reliability of Digital Games-Featured Instrument Towards Critical Thinking Using the Rasch Model Measurement. 2016. [WWW. Document]. URL https://www.researchgate.net/publication/313842169_Validity_and_Reliability_of_Digital_Games-Featured_Instrument_towards_Critical_Thinking_using_the_Rasch_Model_Measurement?enrichId=rgreq-553074d78e08b27a0a5637086ec006ce-XXX&enrichSource=Y292ZXJQYWdlOzMzMzgz0MjE2OTtBUzo0NjM1MDcwODc5OTA3ODRAMTQ4NzUyMDEwOTA1Mg%3D%3D&cl=1_x_3&esc=publicationCoverPdf. (Accessed on 21st April, 2017). DOI: 10.1109/AMC.2016.12.
 32. Mamburg E, Luo Z. Testing The Validity and Reliability of the Levels of Self-Concept Scale in the Hospitality Industry. *Journal of Tourism & Recreation*. 2014;1(1):37-50. ISSN 2368-2655. DOI: 10.12735/jotr.v1i1p37.
 33. Mat Salleh N. S, Din R, Abdul Manaf S. Z, Hamdan A, Karim A. A. Kesahan dan Kebolehpercayaan Soal Selidik Kebolegunaan Modul Pembelajaran Kendiri Menggunakan Model Pengukuran Rasch. *In Malay Journal of Advanced Research Design*. 2015;8(1):1-11. ISSN: 2289-7984.
 34. Najdah Abd Aziz, Marhana Mohamad Anuar, Khatijah Omar, Shafiek Mokhlis. Fashion and Environment: Antecedents of Ethical Consumer Behavior. *International Business Management*. 2017;11:25-32.
 35. Norazah Mohd. Suki. Green Awareness Effects on Consumers' Purchasing Decision: Some Insights from Malaysia. *IJAPS*. 2013;9(2):49-63.
 36. Pallant J. F, Tennant. A. (2007). An Introduction to the Rasch Measurement Model: An Example Using the Hospital Anxiety and Depression Scale (HADS). *Br J. Clin Psychol*. 2007;46(1):1-18.
 37. Rahman O, Gong M. Sustainable Practices and Transformable Fashion Design-Chinese Professional and Consumer Perspectives. *International Journal of Fashion Design, Technology and Education*. 2016;9(3):233-247.
 38. Rasch G. Probabilistic Models For Some Intelligence And Attainment Tests. Chicago: The University of Chicago Press. 1980.
 39. Ruhizan Mohd. Yasin, Faizal Amin Nur Yunus, Ridwan Che Rus, Azmi Ahmad, Mohd Bekri Rahim. Validity and Reliability Learning Transfer Item Using Rasch Measurement Model. *Procedia - Social and Behavioral Sciences*. 2015;204:212 - 217. 4th World Congress on Technical and Vocational Education and Training (WoCTVET), 5th-6th November 2014, Malaysia.
 40. Saeid Dehyadegari, Asghar Moshabaki Esfahani, Asadollah Kordnaej, Parviz Ahmadi. Study the Relationship Between Religiosity, Subjective Norm, Islamic Veil Involvement and Purchase Intention of Veil Clothing Among Iranian Muslim Women. *International Business Management*. 2016;10:2624-2631.
 41. Taljaard H. Male Consumers' Pro-Environmental Motivation and Intent to Acquire Eco-Friendly Apparel in South Africa. Dissertation submitted in partial fulfilment of the requirements for the Degree Master Consumer Science (Clothing Retail Management). University of Pretoria. 2015 July.

42. Tennant A, Pallant J. F. Data Variance Explained by Rasch Measures. *Transactions of the Rasch Measurement SIG American Educational Research Association*. 2006;20(1):1045-1048. ISSN 1051-0796.
43. Textile Exchange. *FastFacts: textile and product waste*. 2012. [WWW. Document]. URL <http://www.purewaste.org/media/pdf/textile-product-waste-fast-facts.pdf>. (Accessed on 10th March, 2017).
44. Thompson A, Tong X. Factors Influencing College Students' Purchase Intention towards Bamboo Textile and Apparel Products. *International Journal of Fashion Design, Technology and Education*. 2016;9(1):62-70. DOI: 10.1080/17543266.2015.1132781.
45. Wai Yee L, Siti Hasnah Hassan, Ramayah T. (2016). Sustainability and Philanthropic Awareness in Clothing Disposal Behavior Among Young Malaysian Consumers. *SAGE Open*. 2016;1-10.
46. Wright B, Linacre J. Combining and Splitting Categories. *Rasch Measurement Transactions*. 1992;6:233-235.
47. Xu Y, Chen Y, Burman R, Zhao H. Second-Hand Clothing Consumption: A Cross-Cultural Comparison Between American and Chinese Young Consumers. *International Journal of Consumer Studies*. 2014;38:670-677.
48. Zanariah. Technical and Vocational Education and Training (TVET). Education 2030 Launch and Symposium, Hotel Istana, Kuala Lumpur, Malaysia. 2016 August 23rd. [WWW. Document]. URL <http://www.moe.gov.my/images/Terbitan/Rujukan-Akademik/Presentation-Education-2030-Launch-Symposium-23rd-August-2016-Hotel-Istana-Ballroom-Kuala-Lumpur/Zanariah-Hj-Ahmad/Zanariah%20Hj.%20Ahmad.pdf>. (Accessed on 10th September, 2017).
49. Zurga Z, Hladnik A, Tavcer P. F. Environmentally Sustainable Apparel Acquisition and Disposal Behaviors among Slovenian Consumers. *Autex Research Journal*. 2015;15 (4):243-259.