Analysing the Validity of Lower Secondary School Students' Personality Towards Design and Technology

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Abstract
This research aims to explore the tendencies of students pertaining to learning Design and Technology (RBT). RBT is a new subject introduced by the Ministry of Education Malaysia to all schools nationwide. Following that, technical and vocational teachers in schools are to teach this subject to students replacing the subject that was taught beforehand: Integrated Living Skills. The research per se was conducted to analyze the instruments distributed examining to what extent it was regarding the tendencies of lower secondary school students in Malaysia who are learning RBT. The problem arises when students in school have to choose whether to study RBT or Basic Computer Science. In order to explore the interest of students using quantitative research, a survey instrument consisting of twenty four items was formulated by referring to previous researches. The survey was then administered to Form 1 students studying in a secondary school in Malaysia. In order to attain the best instrument, the Racsh model analysis was used for the purpose of refinement. The findings show that the items in the construct are positively skewed and it does not contradict with the constructed items to be measured. It is also shows that, the misfit order featuring two items having the biggest outfit Mean-Square (MNSQ) and one item of value resulting from the smallest outfit MNSQ. The research findings will help teachers and students to assess the students' interest whether to learn RBT or Basic Computer Science.

Keywords: Design and Technology (RBT), Form 1 students, quantitative research, Racsh model

1.0 Introduction

This research aims to examine to what extent the lower secondary school students' interest is towards the subject RBT. Rohany (2003) stated that almost all students in secondary schools have problems in making choices in any stream. This includes lower secondary school students who are found to encounter problems pertaining to choosing subjects offered by the school. The issue identified especially in almost every secondary school is the enrolment of Form 1 students whereby they are to be placed in two different streams due to the transition in curriculum. Starting from 2017, all Form 1 students in Malaysia will be using the new curriculum for the teaching and learning in school. According to Mohammad Nurul Azmi et al. (2017), the Standard Based Curriculum for Secondary Schools (KSSM) has been executed for the school session since 2017 replacing the Integrated Curriculum for Secondary Schools (KBSM) with the aspiration to produce

dynamic students who are compatible at international level. The execution of KSSM also considers the intention of the Malaysia Education Blueprint 2013 – 2025 to review KBSM by placing emphasis on the mastery of 21st century skills like critical thinking and innovation.

Under the implementation of KSSM, the Ministry of Education Malaysia introduces two new subjects namely Design and Technology and Basic Computer Science to all schools in Malaysia to be learnt by lower secondary school students. The school authority has to decide whether to include both subjects or either one in the school curriculum based on the available manpower in the school. For schools which choose to take both subjects, the teachers and students do not have a special instrument to identify the interest of students. According to observation, schools only divide students into two and place them according to the prescribed classes and subjects given.

Result from interviews with teachers teaching RBT in school have concluded that there are no specific instruments to measure the level of students' interest in RBT. Instruments are very important as they can be used to measure a certain problem or research conducted (Mohd Effendi, 2015). In the teachers' perspective, a specific instrument can be formulated to enable teachers to place students in classes based on their desired streams. Such action prohibits problems namely unsatisfactory examination results, lack of interest in completing practical tasks and requesting to change to another stream by mid-year from happening repeatedly.

2.0 Literature Review

According to the Department of Education England (2013), the subject RBT is an inspirational yet practical subject that comprises creativity, imagination in designing and producing a product to solve complex problems in numerous contexts, needs and wants, as well as values and attitudes within oneself. Students will be exposed to more knowledge and the knowledge per se includes the Science, Technology, Engineering, Mathematics (STEM) disciplines. Besides, they are taught to take risks and to think creatively and critically other than being innovative and compatible. With the knowledge and experience learnt, students will understand the impact of design and technology towards daily lives and this will give crucial impact and contribution to creativity as well as the culture, wealth and well-being of the nation. To venture into a field specifically the technical and vocational field, one has to have interest in oneself.

Fajar Drian (2017) classified interest into four types. The first type of interest is the interest that is stated verbally showing that one likes or dislikes an activity. As for the second type of interest, it is the explicit interest in which it can be derived from the participation of an individual in a certain event. The third type is the interest that is tested. Such interest is based on the testing of knowledge or skills in a certain activity. The last type is the inventory interest in which the interest is expressed via interest inventory or activity registers same as the question. Based on the aforementioned statements, it can be deduced that a person having interest

on something can be seen from what s/he speaks or states verbally that indicates the person being attracted to a certain object or activity. Apart from that, interest can also be identified based on the types of activity or the vast number of it which makes a person to be interested in what s/he is doing.

Furthermore, interest can also be depicted as something that consists the following elements: (a) interest is an action of psychology and psychomotor, (b) it is the central focus with regards to the attention of feelings and thoughts from the subject because of being attracted towards something, (c) there is the feeling of joy towards the targeted object, (d) there is motivation from emotional, internal and external factors, and (e) there is a desire or tendency on the subject itself to do something to achieve an objective. There are also several theories that state that the tendencies of an individual is said to influence the interest of the individual per se. One of the theories is the Holland's Theory in which it explains the classes of characteristics in a more detailed manner.

Holland's theory (1985 and 1997) is made up of several simple ideas and more complex details. First and foremost, we can characterise people based on their similarities in accordance with the six types of personalities: realistic, investigative, artistic, social, enterprising and conventional. The closer a person resembles a personality, the higher the possibility it is for that person to exhibit traits and behaviours associated to the type of personality itself. Secondly, the environment where a person lives can be mapped with the person's similarities with respect to the six environment models: realistic, investigative, artistic, social, enterprising and conventional. Lastly, the people and their environment bring upon the outcome that is predictable and understood based on the knowledge of types of personality and environment models. The outcome includes vocational choices, vocational stability and achievement, education choice and personal competency achievement, social behaviour as well as the tendency to influence.

3.0 Methodology

Researchers devised a survey instrument based on previous researches adapted from numerous classes of theories. The survey form was adapted from Holland's (1950) model and a few amendments were made to suit the research context. Employing the 5-point Likert scale, the survey form comprises twenty four items encompassing four constructs: internal drive, external drive, social motive and emotional factor. The survey form was then distributed to a total of one hundred fifty students in different secondary schools in Malaysia. The data was then analysed with the Winsteps (Version 3.74) software.

The aim of the research is to identify and validate the reliability regarding the tendencies of lower secondary school students with respect to the subject RBT.

4.0 Finding and Analysis

Employing the Rasch measurement model, researchers did inspection

of functional items based on (i) the item reliability and respondent separation; (ii) identifying polarity items that measure based on PTMEA Corr (iii) suitable items to measure and (iv) measurement of items to construct. Based on the Rasch measurement model, the acceptable range of values regarding the Cronbach's Alpha (α) is between 0.71 and 0.99 indicating it is at good level (71% - 99%). In the pilot test, the reliability score based on the Cronbach's Alpha (α) is 0.96. Hence, this shows that the instrument administered is in an effective and good condition with a high level of consistency. Polarity item and polarity person will verify it to determine and separate the Rasch model.

A comprehensive analysis was also done on the instrument i.e. the reliability, item separation and respondent. Table 1 shows the item reliability and separation index. The item reliability is 0.89 while the item separation is 2.90 (in 3 significant figures) or 3.0 (in 2 significant figures). An item reliability of 0.89 is within a good and acceptable range (Devillis, 2013). Although the item separation is 2.90 or 3.0 (when rounded off to the nearest unit), the coefficient is still acceptable as it portrays the overall items which are divided into 8 measurement levels. According to Linacre (2015), a separation index is best when its value exceeds 2.0.

Considering that the respondent reliability is 0.92 and the respondent separation is 3.43, both show that the respondent reliability is of very high and satisfactory level in relation with the proposition that a reliability index of more than 0.8 is good and well-accepted by Devillis (2013). The item and respondent separation depicts good separation at item difficulty level which is in accordance with Linacre (2015) who proposes a separation exceeding 2.0 as a good coefficient.

Table 1: Summary of Reliability Statistics and Separation of Polarity Item and Person to be Constructed

	Item	Person
Separation	2.90	3.43
Reliability	0.89	0.92

4.1 Item Testing Using Point Measure Correlation (PTMEA Corr)

The Point Measure Correlation testing aims to detect to what extent the items are constructed to achieve its goal. A positive (+) value of PTMEA Corr shows that the item can measure the constructed item to be measured (Devillis, 2013) while a negative (-) value shows that the item fails to measure the desired item. Thus, such items have to be revised or removed because the items do not converge the focus towards the question or they are hard to be answered by respondents. Based on Table 2, there is one item i.e. B6 having a negative value of PTMEA Corr while the rest show a positive PTMEA Corr suggesting that the items measuring the constructed items can be measured (Devillis, 2013). Considering that a negatively-valued PTMEA Corr needs to be revised or removed, hence the item per se was removed from the overall 24-item survey. As for the other positively-valued items, items D2, D3 and E5 registered the lowest score (0.44) indicating that the

items may pose difficulty to be answered by respondents (Devillis, 2013). Hence, preparation for refinement has to be done. However, the findings show that the items in the construct are positively skewed and it does not contradict with the constructed items to be measured. If the PTMEA Corr is high, then the item is said to be able to distinguish between ability of respondents.

Table 2: Polarity Item from PTMEA Corr

Entry Number	PT-MEASURE Corr	Item	Entry Number	PT-MEASURE Corr	Item
18	-.25	B6	13	.58	D1
14	.44	D2	21	.59	E3
15	.44	D3	8	.60	C2
23	.44	E5	9	.60	C3
3	.48	B3	20	.60	E2
24	.49	E6	1	.61	B1
22	.50	E4	12	.62	C6
2	.53	B2	6	.64	B6
5	.53	B5	10	.64	C4
16	.53	D4	19	.64	E1
4	.56	B4	11	.65	C5
17	.57	D5	7	.67	C1

4.2 Item Fit Measure for Construct

Construction of items can be viewed via measuring the Infit and Outfit Mean-Square (MNSQ). According to Devillis (2013), the infit and outfit MNSQ have to be in the range of 0.6 and 1.4 to ensure that the item is productive for measurement. However, the infit MNSQ has to be priotised compared to the common MNSQ used to determine the suitability of items that measure construct or latent variables (Mohd Effendi, 2015). If the MNSQ value is equal to or greater than 1.4, then the item is distorted. If the MNSQ has a value less than 0.6, then it shows that the item can be easily predicted by the respondent (Linacre, 2015). Besides, fitting and the Zstd Cronbach's Alpha (α) value has to be within -2 and 2 (Devillis, 2013). But if the infit and outfit MNSQ are accepted, then the Zstd index can be ignored (Linacre, 2015).

Thus, if the following conditions are not fulfilled, then the item can be considered to be removed or reviewed. Table 3 below shows the misfit order featuring two items having the biggest outfit MNSQ and one item of value resulting from the smallest outfit MNSQ. Based on Table 3, there are three items that do not fall within the prescribed range and they must either be reviewed or removed. The items that are outside the range of 0.6 and 1.4 in the outfit MNSQ column are item 14 (1.55), item 15 (1.52) and item 18 (9.90).

Table 3: Item Fit Measure Based Outfit MNSQ

Entry Number	Infit		Outfit		Items
	MNSQ	ZSTD	MNSQ	ZSTD	
1	.73	-3.1	.72	-3.2	B2
2	.96	-.5	.98	-.1	B2
3	.37	-1.7	.90	-.5	B3
4	.82	-.4	.84	-.9	B4
5	.90	-1.1	.90	-1.1	B5
6	.79	-2.4	.79	-2.4	B6
7	.84	-1.9	.86	-1.6	C1
8	1.03	.4	1.05	.6	C2
9	1.19	2.0	1.19	2.1	C3
10	1.03	.4	.99	.0	C4
11	.86	-1.5	.87	-1.4	C5
12	.76	-2.7	.79	-2.3	C6
13	.85	-1.6	.85	-1.7	D1
14	1.55	5.3	1.55	5.3	D2
15	1.47	4.7	1.52	5.1	D3
16	1.38	3.7	1.37	3.7	D4
17	1.14	1.4	1.13	1.3	D5
18	7.37	9.9	9.90	9.9	D6
19	.83	-1.9	.82	2.0	E1
20	1.00	.1	.97	-.2	E2
21	.97	-.1	.97	-.1	E3
22	.83	.1	1.02	.2	E4
23	.74	.1	1.37	1.9	E5
24	1.12	1.3	1.12	1.3	E6

5.0 Discussion

After analysing the date according to standard index and compulsory conditions to achieve standard instrument validity and reliability based on the Rasch measurement model via checking every item, elimination and refinement of items is done by referring to and considering ideas and judgement from experts. Based on the results obtained, there is an item that does not fulfil the need analysis and is therefore being removed. Hence, there is a total of twenty-three items for the validity analysis pertaining to the lower secondary school students' personality towards RBT. The result is as shown in Table 4 below.

Table 4: Items Removed/ Retained

Construct	Item	Number of Items	Item Removed	Number of Items Removed
Internal Drive	B1, B2, B3, B4, B5, B6	6	-	-

External Drive	C1, C2, C3, C4, C5, C6	6	-	-
Social Motive	D1, D2, D3, D4, D5, D6	6	D6	1
Emotion	E1, E2, E3, E4, E5, E6	6	-	-

Using the reliability item and respondent test, it can be seen that the pre-observation set is valid and can be trusted to measure the personality of students. Hence, there are no errors in terms of item and respondent (more than 50% are suitable) found during data analysis. This can be attributed to the fact that the Rasch measurement model is able to identify the ability of the item and respondent. According to Devillis (2013), the method per se can identify the item difficulty level and respondent ability. Next, the research items that are problematic can be amended or removed to ensure that it measures the construct. Thus, the result obtained related to the reliability of construct and validity of the survey can be accepted to answer the research questions.

6.0 Conclusion

As mentioned above is the Rasch analysis result to analyse the validity of lower secondary school students' personality towards RBT and to validate whether all items in the survey are constructed statistically and are valid for the next stage of analysis as well as being able to measure certain objectives in the Rasch model. The findings were supported with the Cronbach's Alpha (α) at 0.93 and the item reliability at 0.95 respectively. Based on the summary of statistics comprising twenty-four items, one item is suggested to be removed while the others are retained. The criteria regarding lower secondary school students' personality towards RBT include four constructs: internal drive, external drive, social motive and emotional factor, with each construct having six items respectively. It is suggested that the profile of students in school is explored in the future research to gain valuable insights about the students' personality. Another suggestion is the combination of both quantitative and qualitative analyses and the data is further analysed with the aim to minimise the tendency risk of understanding instrument measurement.

References

Department Of Education England. (2013). Design and Technology.

Fajar Drion Sindu (2017). *Minat Pelajar Sekolah Menengah Teknik Terhadap Bidang Kerjaya Teknikal di Negeri Perak*. Universiti Pendidikan Sultan Idris, Perak.

Holland, J.L. (1997). *Making Vocational Choices, A Theory of Voacational Personalities and Work Environments*,(3rd ed). Odessa, El: Psychologicall Assessment Resources, Inc.

Holland, J.L. (1973). *Making Vocational Choices: A Theory of Career*. Englewood Cliffes, NJ: Prentice-Hall.

Mohd Effendi Mohd Matore. (2015). Pembinaan Instrumen Kecerdasan Mengahadpi Cabaran (IKBAR) Bagi Pelajar Politeknik Menngunakan Model Rasch. *Tesis Phd*. Universiti Sains Malaysia.

Rohany Nasir. (2003). *Isu-Isu Kaunseling dan Perkembangan Kerjaya*. Kuala Lumpur: Utusan Publication and Distributors Sdn. Bhd.