# Validity and Reliability of Survey Items in Employer Perspective Construct on the Quality of ECCE: Rasch Measurement Model Analysis

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**Abstract**

This paper examines and verifies the reliability of a survey instrument on the long term impact of early childhood and childcare education (ECCE) toward human capital development. The survey consists of separate questionnaires based on four perspectives; Individual Success, Peers, Parents and Employer perspective. This study highlights the reliability of item constructs from the employer perspective questionnaire distributed in the pilot study. This instrument was developed based on 56 items, and was further categorised into three sub-constructs; 1) individual character, 2) soft skills; and 3) good citizenship. Rasch Measurement Model analysis supported by Winsteps software version 3.73 was utilised to examine reliability of item and person, polarity of item and suitability of item. Findings from analysis of reliability of item indicated that Individual Character subconstruct showed a good level of reliability, whilst Soft Skills and Good Citizenship subconstructs showed reliability below par. Further analysis on polarity of item indicated all items scored positive values to measure the construct. While analysis on item fit revealed that a total of 6 items from the three subconstructs were discarded as they did not meet the criteria specified in the Rasch Model.

**Keywords:** early childhood and childcare education, validity, reliability, rasch measurement model

## 1. Introduction

Human capital development is the process of obtaining knowledge and skills that include science and technology, entrepreneurship, positive character, values and ethics (Ismail and Abdullah, 2011). Human capital development in Malaysia highlights education as a forefront in sustaining the nation's economic growth. Traits of successful human capital include critical thinking, problem solving competence and perseverance that are instilled among individuals in the education sector. One faction of education that could potentially give a positive impact to ensure the success of human capital is Early Childhood and Childcare Education (ECCE). Usakli (2010) posits that early childhood education provides a shielding environment for children against challenging tasks in later phases of human development as it provides a stimulating environment for children to explore various materials and opportunies for social interaction. Essa (2007) and Nielsen (2006) foresee the potential long-term impacts of providing a high-quality early childhood education to children in developing successful, law-abiding and productive citizens. Patton and Profeli (2007) reiterate the long-term benefit of early childhood education in terms of employability and economic growth through career exploration from childhood.

### *1.1 Objective*

The objective of this study is to examine the reliability of items in the employer perspective construct as well as its subconstructs in investigating employability as a potential long term impact of ECCE on human capital development. The employer perspective construct that was developed comprises three main subconstructs; individual character, soft skills and good citizenship. The Rasch diagnostic methods inspected in this study are items and person reliability,

item polarity and item suitability (item fit).

## 2. Methodology

The pilot study was conducted by applying the quantitative approach to ascertain understanding of the impact of ECCE on human capital development from four perspectives; successful individual, parents, peers and employer. A questionnaire instrument was developed for all four perspectives. The focus of this paper is on measuring the reliability of the instrument from the employer perspective. This questionnaire was distributed to 32 respondents within the span of twelve weeks. This sample size is considered an adequate number for a pilot study, as mentioned by Cooper and Schindler (2006), where they suggested sample size for pilot study to be between 25 and 100 people Items in the questionnaire were constructed based on the outcome of an interview. This instrument is developed based on 56 items, and is further categorised into three subconstructs, which are; 1) individual character, 2) soft skills; and 3) good citizenship. Reliability of the items in the employer perspective questionnaire construct was measured using the Rasch Measurement Model supported by Winsteps software version 3.73. Sharif, Hanapi, Nashir, Ghani and Abdullah (2019) state that this approach is most appropriate as this model enables the items to undergo detailed verification of their functionality.

## 3. Findings

The findings discussed are based on the data of the pilot study for employer perspective questionnaire items that were constructed after expert content validation. The pilot study was conducted to ensure that the item constructions meet the Rasch measurement model procedure. The item functionality inspection comprises reliability, polarity and suitability of item constructs.

### *3.1 Items and Person Reliability*

Items and Person reliability show the compatibility of the items that conform to the Rasch Model and item and person separation index (Kamis, Bakar, Hamzah, Asimiran and Norhaily, 2013). The acceptable range of reliability value of Cronbach's Alpha is between 0.71-0.99 (Baldwin and Ford, 1988). Table 1 highlight the summary for item reliability and separation index, while Table 2 displays the person reliability and person separation index.

Table 1. Item Reliability of the Employer Perspective constructs

| No | Construct | Total Items | Item Reliability | |
|---|---|---|---|---|
| | | | Item | Separation |
| 1. | Individual Character | 11 | 0.72 | 1.6 |
| 2. | Soft Skills | 21 | 0.31 | 0.66 |
| 3. | Good Citizenship | 24 | 0.52 | 1.04 |
| | **Total** | **56** | | |

Table 2. Person Reliability of the Employer Perspective constructs

| No | Construct | Total Items | Person Reliability | |
|---|---|---|---|---|
| | | | Person | Separation |
| 1. | Individual Character | 11 | 0.95 | 4.31 |
| 2. | Soft Skills | 21 | 0.94 | 4.10 |
| 3. | Good Citizenship | 24 | 0.94 | 4.03 |
| | **Total** | **56** | | |

Findings display three subconstructs have reliability scores ranging from 0.31 to 0.72. This indicates that the items in the Individual Character subconstruct are good as the values are close to 1.0. The reliability values between 0.6 - 0.8 are less acceptable and values less than 0.6 are not acceptable (Bond & Fox, 2007). Two subconstructs showed low item reliability index which are Good Citizenship (0.52) and Soft Skills (0.31). Soft Skills subconstruct shows the lowest score due to the presence of four subsections within the subconstruct. This could affect its overall reliability score. As for person reliability, the reliability score for all three subconstructs range between 0.94 to 0.95. These values are considered good reliability as the values are close to 1.0. This means that reliability of the respondents is of very good reliability with high level of consistency.

Separation index means the dispersion of construct items and person. Item separation index is the dispersion of item difficulty level, while person separation index is the differences in the ability level of respondents in the measured construct (Kamis et.al, 2013). Linacre (2005) postulates that a good separation index is a value that is more than 2.0.

Findings from Table 1 show that Individual Character obtained a value of 1.6 which is of relatively good condition, while Soft Skills obtained the lowest value of 0.66. Whereas for person separation index in Table 2, all three subconstructs indicate a separation value ranging from 4.03 to 4.31, which is more than 2.0. This value is considered as good condition and is acceptable (Fox & Jones, 1998, Linacre, 2005 and Bond & Fox, 2007).

*3.2 Polarity Item*

Polarity item refers to the extent of the item that can achieve the desired goal to measure the construct. Positive values from the point-measure (PTMEA) correlation score indicate that the respective item can achieve its goal of measuring the construct, whilst negative values indicate that the item does not measure the construct and needs to be revised or discarded. Table 3 displays the PTMEA score value for the subconstructs in the employer perspective questionnaire. Results show that all three subconstructs obtained positive values. For the individual character subconstruct, the positive values of from the PTMEA correlation range between 0.87 to 0.94; Soft skills subconstruct range between 0.76 to 0.87 and Good Citizenship subconstruct ranges between 0.64 to 0.86. This indicates that all the items from all three subconstructs positively move in one direction and they do not contradict with the constructs to be measured.

Table 3. Point-Measure Correlation (PTMEA CORR) value

| No | Construct | PTMEA CORR | | | | Total Item |
|---|---|---|---|---|---|---|
| | | Minimum | Item | Maximum | Item | |
| 1. | Individual Character | 0.87 | SA_KI_11 | 0.94 | SA_KI_9 | 11 |
| 2. | Soft Skills | 0.76 | V24_A | 0.87 | V35_A | 21 |
| 3. | Good Citizenship | 0.64 | SC_WB_7 | 0.86 | SC_WB_16 | 24 |
| | **Jumlah** | | | | | **56** |

*3.3 Suitability of Item*

Suitability or conformity of the items relates to the Infit and Outfit Mean Square (MNSQ) values that determine the appropriateness of the item in the measured construct (Rachman and Napitupulu, 2017). The Infit and Outfit MNSQ values should range between 0.6 and 1.4 (Bond and Fox, 2013) by which if the value exceeds 1.4, the items are considered too misleading for respondents, whereas values below 0.6 mean the items are too easily anticipated for respondents. Mohd. Kashfi (2011) posits that the Outfit MNSQ index is emphasized over Input MNSQ index as the items are seen as more congruent to measure the latent variables. Tables 4, 5 and 6 display the MNSQ values for each of respective subconstructs.

Based on Table 4, findings reveal that one item in the Individual Character subconstruct is not in the specified range and should be revised or discarded. The item that is less than the value of 0.6 is item SA_KI_6 with the outfit MNSQ value of 0.1. This means that the item needs to be revised as it can be too easily anticipated by respondents. Meanwhile, one item did not meet the specified range in the Soft Skills subconstruct from Table 5; V27_A with a value of 2.22 that exceeds the specified acceptable range of 1.4. This means that the item is too difficult for respondents to anticipate. For Good Citizenship subconstruct showed in Table 6 indicated one item that is below the required range of 0.6, with an MNSQ value of 0.22 (SC_WB_12). This means that this item is too easily anticipated by respondents and should be revised. It is also observed that three items from the same subconstruct exceed the required range of 1.4; SC_WB_7 (2.92), SC_WB_8 (1.85) and SC_WB_9 (1.77). This means that the items are too difficult for the respondents to anticipate and should be revised or discarded.

Table 4. Item Fit based on MNSQ and ZSTD value for Individual Character subconstruct

| Entry no. | INFIT | | OUTFIT | | Item |
|---|---|---|---|---|---|
| | MNSQ | ZSTD | MNSQ | ZSTD | |
| 1 | 1.46 | 1.2 | 1.42 | 0.8 | SA_KI_1 |
| 8 | 1.09 | 0.4 | 1.32 | 0.6 | SA_KI_8 |
| 10 | 1.23 | 0.7 | 0.90 | 0.1 | SA_KI_10 |
| 7 | 1.18 | 0.6 | 0.63 | -0.1 | SA_KI_7 |
| 2 | 0.95 | 0.0 | 1.00 | 0.3 | SA_KI_2 |
| 11 | 0.93 | -0.1 | 0.66 | -0.6 | SA_KI_11 |
| 9 | 0.79 | -0.5 | 0.59 | -0.4 | SA_KI_9 |
| 5 | 0.73 | -0.7 | 0.40 | -0.5 | SA_KI_5 |
| 3 | 0.68 | -0.9 | 0.47 | -0.6 | SA_KI_3 |
| 4 | 0.61 | -1.1 | 0.47 | -0.8 | SA_KI_4 |
| 6 | 0.22 | -1.7 | 0.10 | -0.7 | SA_KI_6 |

Table 5. Item Fit based on MNSQ and ZSTD value for Soft Skills subconstruct

| Entry no. | INFIT | | OUTFIT | | Item |
|---|---|---|---|---|---|
| | MNSQ | ZSTD | MNSQ | ZSTD | |
| 10 | 1.04 | 0.2 | 2.22 | 1.8 | V27_A |
| 7 | 1.68 | 1.9 | 1.78 | 1.7 | V24_A |
| 15 | 0.65 | -1.0 | 1.77 | 1.3 | V32_A |
| 20 | 1.58 | 1.7 | 1.70 | 1.7 | V37_A |
| 5 | 1.45 | 1.3 | 1.36 | 0.9 | V22_A |
| 9 | 1.27 | 0.9 | 1.44 | 1.0 | V26_A |
| 6 | 1.04 | 0.2 | 1.27 | 0.6 | SB_KI_B2 |
| 16 | 1.20 | 0.7 | 0.90 | 0.0 | SB_KI_B4 |
| 2 | 0.52 | -1.7 | 1.11 | 0.4 | V19_A |
| 13 | 1.06 | 0.3 | 0.84 | 0.0 | V30_A |
| 1 | 1.00 | 0.1 | 0.94 | -0.1 | SB_KI_B1 |
| 19 | 0.91 | -0.2 | 1.00 | 0.1 | V36_A |
| 8 | 0.90 | -0.2 | 0.85 | -0.2 | V25_A |
| 14 | 0.87 | -0.3 | 0.76 | -0.3 | V31_A |
| 4 | 0.82 | -0.5 | 0.73 | -0.5 | V21_A |
| 12 | 0.79 | -0.6 | 0.68 | -0.5 | V29_A |
| 11 | 0.75 | -0.7 | 0.77 | 0.0 | SB_KI_B3 |
| 17 | 0.75 | -0.7 | 0.59 | -0.9 | V34_A |
| 3 | 0.72 | -0.9 | 0.65 | -0.9 | V20_A |
| 21 | 0.71 | -0.9 | 0.60 | -1.0 | V38_A |
| 18 | 0.71 | -0.9 | 0.56 | -1.0 | V35_A |

Table 6. Item Fit based on MNSQ and ZSTD value for Good Citizenship subconstruct

| Entry no. | INFIT | | OUTFIT | | Item |
|---|---|---|---|---|---|
| | MNSQ | ZSTD | MNSQ | ZSTD | |
| 7 | 2.84 | 4.5 | 2.92 | 4.5 | SC_WB_7 |
| 8 | 1.92 | 2.7 | 1.85 | 2.5 | SC_WB_8 |
| 9 | 1.43 | 1.4 | 1.77 | 1.8 | SC_WB_9 |
| 11 | 1.32 | 1.1 | 1.45 | 1.2 | SC_WB_11 |
| 10 | 1.30 | 1.0 | 1.06 | 0.3 | SC_WB_10 |
| 20 | 1.29 | 1.0 | 1.18 | 0.6 | SC_WB_20 |
| 13 | 1.28 | 0.9 | 1.11 | 0.4 | SC_WB_13 |
| 15 | 0.71 | -1.0 | 1.27 | 0.8 | SC_WB_15 |
| 2 | 0.88 | -0.3 | 1.27 | 0.7 | SC_WB_2 |
| 19 | 1.22 | 0.8 | 1.16 | 0.6 | SC_WB_19 |
| 18 | 0.98 | 0.0 | 0.83 | -0.3 | SC_WB_18 |
| 5 | 0.98 | 0.1 | 0.70 | -0.6 | SC_WB_5 |
| 3 | 0.58 | -1.5 | 0.92 | -0.1 | SC_WB_3 |
| 17 | 0.90 | -0.2 | 0.79 | -0.4 | SC_WB_17 |
| 24 | 0.75 | -0.7 | 0.62 | -0.7 | SC_WB_24 |
| 4 | 0.62 | -1.4 | 0.71 | -0.8 | SC_WB_4 |
| 23 | 0.69 | -0.9 | 0.68 | -0.4 | SC_WB_23 |
| 21 | 0.68 | -1.0 | 0.43 | -0.9 | SC_WB_21 |
| 6 | 0.63 | -1.3 | 0.53 | -1.5 | SC_WB_6 |
| 14 | 0.57 | -1.6 | 0.54 | -1.3 | SC_WB_14 |
| 1 | 0.54 | -1.6 | 0.53 | -1.1 | SC_WB_1 |
| 22 | 0.48 | -1.8 | 0.38 | -1.1 | SC_WB_22 |
| 16 | 0.35 | -2.6 | 0.34 | -1.6 | SC_WB_16 |
| 12 | 0.30 | -2.8 | 0.22 | -1.4 | SC_WB_12 |

## 4. Discussion

From the analysis on item reliability, it is observed that reliability of the subconstruct Soft Skills did not meet the required standard of the Rasch model, with a score of 0.31. The reason for this low score is due to the presence of four subsections presented in this subconstruct. This had affected the overall score of this subconstruct. Further analysis was conducted to revise all 56 items in the employer perspective construct to ensure the items adhere to Rasch Model's standard conditions. This is to ensure validity and reliability of the instrument. Findings from Table 7 shows that a total of 10 items from the Individual Character subconstruct, 20 items from the Soft Skills subconstruct and 20 items from the Good Citizenship subconstruct were suitable to be included in the instrument. Meanwhile, one

item from Individual Character subconstruct, one item from Soft Skills subconstruct and four items from Good Citizenship subconstruct were not suitable to be included to measure employer perspective in early children care and education for human capital development.

Table 7. Summary of dropped and retained items

| No | Construct | Item | Total Item | Analysis of Rasch measurement model / expert. Dropped Item | Total dropped Item | Improved Item | Total improved Item | Maintained Item | Total maintained Item |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Individual Character | SA_KI_ 1- 11 | 11 | SA_KI_ 1 | 1 | | | 2,3,4,5,6,7,8, 9,10,11 | 10 |
| 2. | Soft Skills | SB_KI_ B1/1- 5 | 5 | V_27_A | 1 | | | 2,3,4,5 | 4 |
| | | SB_KI_ B2/1- 5 | 5 | | | | | 1,2,3,4,5 | 5 |
| | | SB_KI_ B3/1-5 | 5 | | | | | 1,2,3,4,5 | 5 |
| | | SB_KI_ B4/1-6 | 6 | | | | | 1,2,3,4,5,6 | 6 |
| 3. | Good Citizenship | SC_WB _1- SC_WB _24 | 24 | SC_WB _7, SC_WB _8, SC_WB _9, SC_WB _17 | 4 | | | 1,2,3,4,5,6,10 ,11,13,14,15, 16,17,18,19,2 0,21,22,23,24 | 20 |
| Total | | | 56 | | 6 | | | | 50 |

## 5. Conclusion

In conclusion, the aspect of validity and reliabiltiy of the instrument developed in the study should be scrutinised to follow the standard condictions of relibility with accordance to Rasch Measurement Model. Findings from the study indicates that the majority of the items in the employer perspective questionnaire comply to the formal conditions of instrument reliability and only six items were discarded to eliminate outlier factors. The implications of this analysis pose as a reference for researchers to construct reliable and valid instuments, particularly in measuring the long-term impact of Early Childhood and Childcare Education towards human capital development.

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