International Journal of Advanced Research in Education and Society
e-ISSN: 2682-8138 | Vol. 3, No. 4, 166-175, 2021
http://myjms.mohe.gov.my/index.php/ijares

Validity and Reliability of Google Classroom Assisted Economics Learning Impact Instrument Using the Rasch Measurement Model

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Accepted: 15 December 2021 | Published: 31 December 2021

DOI: https://doi.org/10.55057/ijares.2021.3.4.18

Abstract: *The 7th shift of the Malaysian Education Development Plan (2013-2025) highlights the Ministry of Education's efforts to leverage the use of ICT to improve the quality of learning in Malaysia. Currently, Malaysia is at the final phase in the implementation of the 3rd wave (2021-2025) of the development plan, in line with its aim to catalyse changes in the education system. In line with recent technology advances, the call is welcomed by educationists. However, there are still questions on whether ICT is accepted by students and whether it is more effective to support the learning of economics compared to the traditional teaching method. In this regard, it is important for teachers to practice effective teaching methods. The use of an effective teaching method could address issues related to students' economic achievement due to the lack of interests, self-efficacy and negative attitude. This pilot study is aimed to evaluate the validity and reliability of Google Classroom-supported economics learning impact instruments. Forty-six economics students were selected from three schools. The Rasch measurement model was used to test the reliability of the instrument through analysing the item's reliability, individual reliability, Cronbach's alpha value, individual-item discrimination, standardised residual correlation, item polarity, and item fit. The study found that the instrument has good validity and reliability. The reliability of the item and instrument respondents reliability test is high at 0.82 and 0.91, proving that the instrument is suitable for use in the actual study. It is hoped that the findings of this study will contribute to the development of knowledge, particularly in developing questionnaires among Malaysia teachers and provide economics teachers a tool for assessing the impact of learning. Appropriate follow-up actions by teachers can be taken to improve effective learning processes in the future. It is suggested for this questionnaire to be used in a real-world study on the impact of using Google Classroom-based learning on students' interest, self-efficacy, attitude and acceptance.*

Keywords: Google Classroom, economy education, Rasch model, validity, reliability

1. Introduction

The 7th shift of the Malaysian Education Development Plan (2013-2025) highlights the Ministry of Education's efforts to leverage the use of ICT in improving the quality of learning in Malaysia. At present, Malaysia is in the 3rd phase (2021-2025) of its implementation and it is aimed to catalyse transformation in the education system (Ministry of Education Malaysia, 2013). In the meantime, Google launched the Google Classroom education management

system platform in May 2014. The platform has many advantages, including easy to use, mobile-friendly and free (Al-maroof & Al-emran, 2018; Dash, 2019; Heggart & Yoo, 2018; Palma-Ruiz et al., 2019). In line with technology advances today, educators have largely welcomed the integration of technology into learning. In this regard, while the use of learning management systems in Malaysia is more prominent in higher education (Embi & Assembly, 2010). Hapini et al. (2019) stated that Google Classroom is increasingly used in Malaysian schools. Previous studies stated that learning approaches that complement learning management systems could positively enhance achievement, interest and collaborative skills (Khoo et al., 2018; Khoo, Zainizam, et al., 2018). These statements are supported by Solihati and Mulyono (2017) and Murtikusama et al. (2017) who found that the use of the Google Classroom learning management system supports virtual learning and collaboration as students are able to access materials at any time and learning could take place even outside the classroom.

Stavytskyi and Urazgaliyeva (2018) showed that the use of the Google Classroom app can enhance cognitive activity in economics learning. This shows the applicability of Google Classroom for teaching economics in Malaysia. The use of google classroom is relevant to enrich the classroom learning environment for form six students, who are at a transition phase to higher education. There is still no conclusive finding on whether Google Classroom is effective in helping candidates of the Malaysia Higher School Certificate (STPM), especially those majoring in economics. Economics education is one of the elective subjects offered for STPM students under the engineering and vocational stream. According to Mansor and Jamal (2001), students learn about economics for career, academic and mind development. Individuals with economic knowledge have the advantage of better understanding the implementation of the country's economic policies (Ramlee et al., 2019). According to recent statistics, there are 695 institutions offering form 6 level education nationwide (MPM, 2018). Students' admission into form six level economics is based on their results in the Malaysian Certificate of Education. Subsequently, form six economics students come from different backgrounds, including those with no basic understanding of elementary level economics. In this regard, students with no basic knowledge are highly disadvantaged compared to those with economics backgrounds (Khoo et al., 2019).

Students' achievement in the Economics subjects largely depends on students' interests, self-efficacy and attitudes. Lack of interest causes students to lose focus in class. This is also contributed to the fact that economics involve high cognitive as students are required to interpret graphs and data and create economic curves (Arsaythamby & Julinamary, 2015; Arsaythamby & Ruzlan, 2015; Davis, 2019). Moreover, students who lack confidence in their ability to complete task given will exhibit negative behaviours, such as copying their peers' answers, inconsistent performance and not trying to correct weaknesses (Innocenti & Cowan, 2019). Self-efficacy factors are closely linked to attitudes and responsibilities in learning to understand and completing assigned tasks (Laging & Vobkamp, 2016; Susskind, 2005). Thus, active and interactive teaching and learning methods can engage students to further their understanding of abstract economic concepts and theories (Roche, 2014; Wooten, 2020).

Therefore, this questionnaire was developed to identify the effectiveness of Google Classroom on economic learning. A good instrument must have good validity and reliability (Mohd Majid, 2010). The Rasch measurement model was selected to analyse the instrument of this study. The Rasch model analysis has been proven to measure the validity and quality of items in an instrument (Azrilah et al., 2017). This alternative method is able to predict missing data and perform simultaneous measurements between the scale of measurement, respondents and items

in comparison to other classical measurement approaches that prioritize the cumulative value (Bambang & Wahyu, 2015).

2. Methodology

This research was conducted using the quantitative approach. It is aimed to evaluate the psychometric properties of the questionnaire used. The sample of this study involved 40 undergraduate economics students from a three national secondary schools in the district of Jasin, Malacca. The suggested sample size of Browne's (1995) pilot study is 30 people, while Kieser and Wassmer (1996) mentioned that 30 to 40 people is sufficient. This pilot study sample consists of a group of students not involved in the actual experimental study. The sample was kept heterogeneous and was chosen from schools that have similar characteristics to the population, where the selected students are in form six students under the economy stream and are studying the same economics syllabus. All of the students involved in the pilot study are STPM candidates. Before distributing the questionnaire, the researcher went through several procedures. First, the researcher requested the consent of several parties, including the Graduate Studies Institute, Sultan Idris University of Education, the Education Policy Planning and Research Division, Ministry of Education Malaysia and the Malacca State Department of Education. The consent of these parties is required for researchers to enter schools, which are considered as government premises. The questionnaire is divided into three parts, section A consists of demographic questions, section B contains items on the interest construct (13 items), section C focuses on self-efficacy (12 items), attitude is highlighted in section D (8 items) and items in section E probe about Google Classroom acceptance (12 items). The five-point Likert scale was used to probe the respondents' agreement of the statement. The instrument was reviewed by five experts to ensure content validity. All experts confirmed that this instrument, as a whole, is suitable for use.

The rasch measurement model was used to analyse the instrument of this study. This approach was introduced as an alternative to psychometric measurement method to scientifically measure latent variables. The model uses logit values for mathematical measurement where the probability of an individual correctly supporting or responding to an item depends on the individual's ability and level of item difficulty (Bond & Fox, 2007). This measurement is holistic as they consider the capabilities and complexity of the items simultaneously. In this study, latent variables that could not be directly measured refer to factors of interest, self-efficacy, attitude and student acceptance of the learning outcomes. This alternative method has the advantage of predicting missing data and is able to make simultaneous measurements between the scale of measurement, respondents and items compared to the use of classical measurement approaches that prioritise cumulative value (Bambang & Wahyu, 2015). The advantage of rasch model analysis is that it can prove the validity and quality of an instrument's items (Azrilah et al., 2017).

The objectives of this pilot study are to: a) identify the validity of the content of the instrument; b) identify the reliability of the instrument; and c) measure the validity of the instrument construction. It is stipulated that good instruments must have good validity and reliability (Mohd Majid, 2010). Hence, accurate measurement will ensure that the findings obtained are accurate, accurate and meaningful. In this study, the rasch measurement model was used to determine item reliability analysis, individual reliability and cronbach's alpha values to derive the instrument's reliability scores. Furthermore, the test of standardised residual correlation, item polarity and item fit indicate that the instrument items have construct validity. Data were

pre-coded before being analysed using Statistical Package for Social Science (SPSS) software and WINSTEPS 3.72.3.

3. Data Analysis

3.1 Content Validity of Instrument

According to Creswell and Clarke (2011) and Burn (2000), content validity is obtained through experts' consent on whether the item or question represents the scope or field under investigation. The validation questionnaire used four ordinal scales to determine the validity index for each item (I-CVI). To obtain the I-CVI value, the researcher will obtain the average value of the scale by summing the scores given by each expert and dividing it by the number of experts. Acceptable I-CVI values are 0.80 and above, while 0.90 values show excellent validity (Polit & Beck, 2006; Stewart & Haswell, 2013). The I-CVI value of the instrument obtained from the five experts is good and acceptable with 0.98.

3.2 Item and Person Reliability

An item's reliability index indicates the consistency of the item's position along its path if the same items are assigned to another sample with similar capabilities. Table 1 shows that the item reliability index of the study instrument is 0.82. According to Bond and Fox (2007), values greater than 0.8 are of high reliability and strongly accepted. The respondents' reliability index shows the consistency of the expected individual rule for the sample when given another set of items measuring the same construct. The reliability of the respondents in this study is 0.91. This shows that the respondents' reliability for responding correctly in this pilot study is very good. Meanwhile, the item separation index value is 2.10, which means that there are two different levels of item difficulty. The respondents' separation index value is 3.26, this indicates that there are three levels of sample ability. Fisher (2007) and Linacre (2007) mentioned that good index separation value should be higher than 2. In order to ensure that the items can be used in the actual study, the reliability scores obtained should range between 0.70 and 0.90 (Mc Millan & Schumacker, 1984). Wan Muhamad Amir et al. (2017) also mentioned that the reliability score above 0.9 denotes an excellent, very good and effective score. The overall reliability of this instrument based on cronbach's alpha value is 0.92, indicating that items are acceptable and can be used in the actual study. Table 1 summarises the item-respondent reliability index, the item-respondent separation index and Cronbach's alpha values.

Table 1: Summary of Item-Respondent Reliability Index, Item-Respondent Separation Index and Cronbach's Alpha Value

	Reliability	Separation	Cronbach's Alpha
Respondent	0.91	3.26	
Item	0.82	2.10	
Overall			0.92

3.3 Standardised Item Residual Correlation

When the correlation value of two items exceeds 0.7, there is a high correlation value and only one item is required for measurement (Linacre, 2005). Thus, the item with MNSQ outfit value away from 1.00 needs to be dropped and the item retained should have an MNSQ value of close to 1.0. In this study, overlapping items were detected, as the correlation value between items E9 and E10 exceeds 0.7, as shown in Table 2. The item retained is E10 because its MNSQ value is 1, meanwhile, item E9 was dropped from the questionnaire.

Table 2: Item Correlation

Correlation	*Entry*		*Entry*	
	Number	*Item*	*Number*	*Item*
0.72	42	E9	43	E10
0.68	24	C11	30	D5
0.66	3	B3	30	D5
0.66	37	E4	39	E6
0.65	41	E8	42	E9
0.65	39	E6	40	E7
0.63	1	B1	2	B2
0.62	37	E4	40	E7
0.61	39	E6	42	E9

3.4 Determining Item Fit

Item fit indicates the consistency of an item that measures a construct or latent variable. According to Bond and Fox (2007), the MNSQ outfit index or range accepted for likert scale is 0.6 to 1.4, while according to Linacre (2005), the accepted index or range is between 0.5 to 1.5. In this study, three items scored the index of less than 0.6 and three items exceeded 1.4, thus, items C1 (0.52), C2 (0.47), C5 (1.81), C7 (1.43), C8 (1.98) and C9 (0.51) were dropped from the actual study questionnaire.

3.5 Item Polarity

Bond and Fox (2001) described that item polarity could be determined by PT-Measure Corr, which also serves as an early detection for construct validity. Item polarity is used to determine whether the item measures the construct the researcher wants to measure. A positive PT-Measure Corr value indicates that an item is measuring the construct to be measured. Whereas, if the value of PT-Measure Corr is negative, then the researcher needs to consider whether to amend or drop the item. As shown in Table 3, as there are no negative PT-Measure Corr values, no items were dropped.

Table 3: Item Polarity

Outfit		PT-Measure		Exact	Match	Item
MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%	
1.57	3.6	0.14	0.47	40.0	42.3	C8
1.28	1.2	0.15	0.51	35.0	41.6	D7
1.24	3.1	0.23	0.49	35.0	44.3	C5
1.20	0.8	0.30	0.48	50.0	43.9	E9
1.41	1.7	0.30	0.48	37.5	44.0	E6
1.17	0.8	0.31	0.50	37.5	44.3	E8
1.15	0.8	0.33	0.51	37.5	41.7	D6
1.33	1.3	0.33	0.49	45.0	44.3	E4
1.32	1.4	0.36	0.50	40.0	43.5	E5
0.90	-0.4	0.37	0.45	57.5	41.5	E12
1.17	0.7	0.37	0.45	45.0	41.5	E3
1.35	1.1	0.39	0.40	47.5	42.4	C10
0.73	-0.1	0.39	0.48	55.0	44.0	D4
1.06	0.2	0.41	0.47	40.0	41.6	C4
1.02	0.1	0.42	0.49	45.0	44.3	E7
1.29	1.2	0.46	0.47	47.5	42.3	E2
0.89	-0.5	0.48	0.45	40.5	41.5	B7
1.18	0.8	0.48	0.52	45.0	39.6	D8
0.60	-1.9	0.49	0.46	65.0	42.1	E11

0.72	-1.3	0.50	0.45	50.0	41.5	B8
1.15	0.5	0.50	0.46	42.5	42.1	B10
0.93	-0.5	0.50	0.44	57.5	41.3	D3
0.79	-1.1	0.50	0.45	50.0	41.5	B12
0.95	-0.1	0.51	0.49	37.5	44.3	C6
1.50	1.8	0.52	0.44	35.0	41.3	C7
1.20	0.9	0.52	0.49	50.0	44.3	E1
0.77	-1.0	0.53	0.47	47.5	42.3	E10
1.19	0.8	0.53	0.48	45.0	44.1	B13
0.81	-0.9	0.53	0.46	40.0	42.0	D5
0.94	-0.4	0.54	0.46	47.5	42.0	B11
1.25	1.0	0.54	0.49	42.5	44.3	C3
0.79	-1.1	0.54	0.39	40.0	42.4	D2
0.91	-0.4	0.55	0.48	42.5	44.0	B6
1.22	0.9	0.55	0.48	40.0	44.0	B2
0.68	-1.6	0.55	0.45	40.0	41.5	B3
0.81	-0.9	0.56	0.45	47.5	41.5	D1
0.88	-0.7	0.57	0.44	45.0	41.3	C12
0.79	-1.1	0.59	0.44	40.0	40.8	B9
0.54	-2.5	0.59	0.40	57.5	42.4	C9
0.94	-0.1	0.60	0.48	35.0	43.9	B4
0.78	-1.2	0.60	0.44	50.0	40.8	C11
0.96	-0.1	0.61	0.50	35.0	44.3	B5
0.46	-3.0	0.62	0.47	57.5	42.1	C2
0.61	-2.0	0.65	0.48	40.0	43.3	B1
0.51	-2.7	0.78	0.50	55.0	44.4	C1

Based on the overall results of the pilot study, seven items were dropped. 13 items remained in the construct of interest and no items were dropped. Meanwhile 6 items were dropped from the self-efficacy construct and only six were retained, furthermore, all eight-items under the construct of attitude were retained. Lastly, out of 11 items under the construct of acceptance, 11 items were retained and only one item was dropped. Table 4 summarises the retained and the dropped items.

Table 4: Analysis of retained and dropped items according to constructs

Factors	Retained Items	Number of items retained	Dropped items	The number of items dropped
Interest	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12, B13	13	-	0
Self efficacy	C3, C4, C6, C10, C11, C12	6	C1, C2, C5, C7, C8, C9	6
Attitude	D1, D2, D3, D4, D5, D6, D7, D8	8	-	0
Acceptance	E1, E2, E3, E4, E5, E6, E7, E8, E10, E11, E12	11	E9	1

4. Conclusion

The overall content validity the instrument, as shown by the expert assessment is high at 0.92. The reliability of the instruments' item and respondents are also high, specifically item reliability at 0.82 and respondents' reliability at 0.91. This finding proves that Google Classroom's-assisted economic learning impact instrument has good validity and reliability. As such, the questionnaire could be used to measure the interest, self-efficacy, attitude and acceptance of Google Classroom among form six economics students. This empirical finding

is important in maintaining the validity of the instrument used and ensuring that the research findings are accurate. In this light, highly accurate results could be obtained when the questionnaire items used are valid and measure what should be measured. Apart from providing measurement data, the approach opened up further opportunities to examine individual characteristics related to the learning stimulus provided. On the other hand, it is important to note that this research involves a small number of samples and its findings cannot be generalised to the actual population. The findings have an impact on students and teachers. The data analysis helps identify factors lined to students' interest, self-efficacy, attitude and acceptance. The finding will also help teachers to make improvements to the learning process. Appropriate intervention could be provided to overcome students' academic weaknesses due to factors of interest, self-efficacy and student attitude. It is hoped that the findings of this study will contribute to the development of knowledge in the development of questionnaires in Malaysia and provide economics teachers with a tool to assess the impact of learning. Lastly, it is suggested that this questionnaire could be used in a real-world study to examine the effects of learning using Google Classroom on student interest, self-efficacy, attitude and student acceptance.

Acknowledgements
This study was supported by Malaysian Ministry of Education that enables this study to be carried out.

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Appendices

Construct	Items
Interest	I enjoy learning about economics.
	Economics is one of my favourite subjects.
	I know economics is useful in my daily life.
	I can make better decisions based on the economic concepts I learned.
	I give my own opinion even when it contradicts others.
	I will try to find additional information on an economic issue.
	During class, I am willing to share my knowledge with my peers.
	I take part in group work discussion.
	I will ask my teacher about any questions that I do not understand.
	I find economic reading material to supplement the notes given by my teacher.
	I can concentrate throughout my lessons.
	I learned new interesting things about the country's economy.
	I will choose a career in economics in the future.
Self-efficacy	I am able to answer questions during the Economics test confidently.
	I am confident that I can get better marks in Economy.
	I studied some Economics topics myself without my teacher's guidance.
	I didn't give up even though I got low marks.
	I consider difficult tasks a challenge.
	I keep trying to solve difficult questions with multiple sources.
Attitude	I try to complete the tasks given within the set time.
	I'm at a disadvantage if I didn't attend any Economics class.
	I am excited when my Economics teacher is teaching.
	I revise Economics topics I learned in class at home.
	Economics is an important subject to learn for our everyday lives.
	I made preparations before class started.
	I take part in economics programmes .
	I raise my hand and volunteer to answer the teacher's questions in class.
	Studying Economics has value in my daily life.
Acceptance	*Google Classroom* can help my learning beyond the classroom.
	I can learn using *Google Classroom* anywhere and anytime.
	Google Classroom helps me find information from the internet.
	Google Classroom gives me a chance to learn collaboratively.
	Google Classroom makes it easy for me to interact with my friends.
	The ability to use mobile devices allows me to learn using *Google Classroom*.
	Prior experience of using *Google Classroom* makes it easier for me to use it in learning.
	I love using *Google Classroom* for learning.
	I am positive over the use of mobile devices for learning using *Google Classroom*.
	The implementation for *Google Classroom* can help me in my learning.
	I'm ready to use *Google Classroom* for learning economics.
	I'm ready to use *Google Classroom* for future learning