Representation Of Interest In Electrical Vocational School Students In Bali Using Partial Credit Model Analysis

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Abstract. The purpose of this study is to represent the interest in the electricity of Vocational High School Electrical Engineering Study Program students in Bali Province. The research sample is students of class XI Electricity Engineering Study Program. The analysis uses the Rasch model method of Partial Credit Model (PCM). Data was collected by distributing electric interest questionnaires to students. There are 9 measured indicators represented by each 1 item statement. These indicators include 1) interest in the material of electricity, 2) attention to discussing with electricity practitioners, 3) curiosity with the phenomenon of electricity, 4) the willingness to study electricity, 5) attention to electricity, 6) more concentration on electricity, 7) pleasure in electricity, 8) desire to work in the electricity, and 9) pleasure in the work of electricity practitioners. Respondents have sampled as many as 110 students. The results of this study stated that 22.73% of students tend to have no interest in the electricity and 77.27 tend to have an interest in the electricity.

Keywords: electric interest, vocational high school, and PCM.

1 Introduction

In 2015 alone, a total of starred hotel rooms were estimated at 53,921 throughout Bali. In detail, the five-star hotel has 17,503 rooms, four-star rooms are 20,373 rooms, and 16,045 rooms (Source: Bisnis Bali Com, 2016). This number does not include the number of rooms in two and one-star hotels. This large number of rooms certainly requires a lot of electricity as well so that tourists feel comfortable in the hotel. Based on preliminary interviews conducted by researchers with the Director of Engineering (DoE) of Trans Hotel Bali (a five-star hotel in the Seminyak area of Kuta Bali) said that, on average hotels in Bali, the electricity system is often problematic, especially in weekends or other holidays and engineering staff overwhelmed to fix this electricity problem due to lack of energy in quantity and quality.

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One of the expertise packages in Vocational High Schools (SMK) is the Electrical Power Installation Technique. One of the subjects in this class is the Electrical Lighting Installation, where the learning process consists of 60% practice and 40% theory. This subject began in class XI. Electrical lighting installations contain theories that apply the concepts of electric current, electric voltage, electric power, and electrical equipment. These concepts become a system in the practice of electrical lighting installations. Bali tourism is in dire need of human resources who have educated skills in electricity to work in hotels both in quantity and quality. The quantity and quality of graduates of the majors/study programs in electrical engineering are strongly influenced by interests in the electricity sector.

Measurement of interest in vocational is often done by adjusting work compatibility and observing the behavior of an activity. Aiken (2009) revealed that besides these two ways, interest can be measured through performance tests and questionnaires [1]. According to Mardapi (2012), all four ways can be applied to examining basic interest groups [2]. In general, interests include affective characteristics that have high intensity. Interest in Vygotski's theory has begun to be accepted that the interest used by educators to be able to increase students' thinking power is higher than previously unstructured [3]. Interest is interesting for everyone who wants to improve academic performance [4]. Interest is defined as a feeling associated with something pleasant or that gives pleasure from a particular object [5] [8]. The learning process becomes fun or boring because interest and even interest can support learning achievement, so the curriculum in educational institutions should be adjusted to students' interests [6] [7]. Interest is a motivational component of the self, so interest has the highest position in discipline and learning success [9] [10]. Teachers in schools play a role in arousing interest in learning [11]. Without interest, the ability to learn will be lost, so the generation of interest becomes a learning strategy used by the teacher [12] [13]. Related to electricity, interest in the electricity is the quality of one's feeling of connection with all objects related to electric current, electric voltage, electrical power, electrical components, electrical measuring devices, and electrical installation work equipment consisting of elements of interest, fun, liking, willingness and willingness to learn, attention and concentration, curiosity, and awareness of the needs and needs of electrical objects related to the electrical phenomenon, work related to electricity, leisure activities and activities related to electricity, people professional in the electricity, and subjects related to electrical installations. Thus the measurement of student interest in the electricity needs to be done to take appropriate steps for the teacher so that learning objectives can be achieved.

Interest in the electricity is a latent variable, so it cannot be measured directly. Generally, researchers measure interest using classical scoring theory. By using this theory, all respondents get a score. All respondents were considered to have an interest in accordance with the raw sekor obtained. Because this interest variable is a latent variable, this method has a high measurement error.

Some researchers try to solve this problem by using a factor analysis of both EFA and CFA. Although both methods can provide information about the unidimensional nature of the item/statement items, they still need to provide the information of respondents who give inconsistent responses. The existence of respondents who gave responses to this inconsistent questionnaire could be caused by, 1) the existence of statement items containing the same dimensions, 2) other respondents or other statements influenced the respondent's response, and 3) the respondent's responses were changing to almost the same statement. Respondents with conflicting interests are better than further research samples concerned with interest. Two main

types of analysis can be used to handle this data: Classical Test Theory (CTT) and Item Response Theory (IRT). In CTT, the observed score is considered a good representation of the "real" score. An alternative analysis consists in using the IRT model, where responses to items are modeled as functions of latent variables. This variable is considered to be the ability as measured by a questionnaire [14].

Therefore the classical scoring theory is not appropriate to measure interest in the electricity, as an alternative modern scoring theory is more appropriate for data analysis. One method in modern scoring is the use of the Rasch model. By using this method, the research objective is to represent students' interests in the electrical.

2 Method

This study uses a quantitative approach to data collection using a questionnaire survey method. The questionnaire uses a Likert scale with 5 categories: Very Appropriate, Appropriate, Neutral, Not Appropriate, and Very Not Appropriate, so that the data is in the form of polytomy. The aspects measured in the interest the electricity regarding 1) interest in electricity material, 2) interest in discussing with electricity practitioners, 3) curiosity with electricity phenomena, 4) willingness to study electricity, 5) attention to electricity, 6) more concentration on electricity, 7) curiosity with electricity phenomena) pleasure for electricity, 8) desire to work in the electricity sector and 9) pleasure in the work of electricity practitioners. This research was conducted in all vocational schools in Bali province, which have Electricity Engineering Study Program. The study was conducted within 1 year. The target population of this study is all students of State and Private Vocational Electricity Engineering Study Programs in the Province of Bali. Samples or respondents were 110 from the population of 252.

Because this study aims to find out respondents who gave inconsistent responses, the data were analyzed using the Rasch Model by selecting the Partial Credit Model (PCM). Partial Credit Model (PCM) was chosen because all items use the Likert scale with the same category [15] [16]. The software used is Winstep because this software can accommodate respondents' inconsistent responses. The partial credit model (PCM) assumes the probabilities :

$$P(Y_{pi}=r)=\frac{\exp\left(\sum_{l=1}^{r}\theta_p-\delta_{il}\right)}{\sum_{s=0}^{k}\exp\left(\sum_{l=1}^{s}\theta_p-\delta_{il}\right)},\quad r=1,\ldots,k, \tag{1}$$

3 Results

There were 252 students as pupils in this study, but 110 students could be collected for data collection. The data collected was the students 'response to 9 statements representing aspects of assessing students' electrical interest. Tables 1 and 2 show the statistical value of respondents and items. The table shows that the reliability of respondents is 0.53, and the reliability of items is 0.74.

Table 1. Summary of Respondent Statistics

	Raw Score	Count	Measure	Model Error	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	29.0	9.0	0.19	.34	.98	-.2	.98	-.2
S.D.	4.6	.0	0.54	.04	.54	1.5	.54	1.5
MAX.	42.0	9.0	2.28	.06	2.56	3.0	2.56	3.0
MIN.	17.0	9.0	-1.15	.32	.07	-4.4	.07	-4.4

REAL RMSE .37 ADJ.SD .39 SEPARATION 1.05 PERSON RELIABILITY .53
MODEL RMSE .34 ADJ.SD .42 SEPARATION 1.23 PERSON RELIABILITY .60
S.E. OF PERSON MEAN = .05
PERSON RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) PERSON RAW SCORE RELIABILITY = .52

Table 2. Summary of Item Statistics

	Raw Score	Count	Measure	Model Error	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	354.0	110.0	0.00	.09	1.00	.0	.98	-.1
S.D.	21.4	.0	0.19	.00	.14	1.1	.13	1.1
MAX.	373.0	110.0	.45	.10	1.32	2.5	1.28	2.2
MIN.	303.0	110.0	-.17	.09	.78	-1.9	.77	-1.9

REAL RMSE .10 ADJ.SD .16 SEPARATION 1.69 PERSON RELIABILITY .74

MODEL RMSE .09 ADJ.SD .17 SEPARATION 1.74 PERSON RELIABILITY .75

S.E. OF PERSON MEAN = .07

UMEAN=.000 USCALE=1.000

ITEM RAW SCORE-TO-MEASURE CORRELATION = -1.00

990 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 2734.84 with 870 d.f. p=.0000

Table 3. Standardized Residual variance (in Eigenvalue units)

Empirical		Modeled	
Total raw variance in observations	= 11.7	100.0%	100.0%
Raw variance explained by measures	= 2.7	22.9%	23.2%
Raw variance explained by persons	= 2.3	19.6%	19.9%
Raw Variance explained by items	= 5.4	43.2%	43.3%
Raw unexplained variance (total)	= 9.0	77.1%	100.0%
Unexplned variance in 1st contrast	= 1.5	12.8%	16.6%
Unexplned variance in 2nd contrast	= 1.4	12.3%	15.9%
Unexplned variance in 3rd contrast	= 1.2	10.5%	13.6%
Unexplned variance in 4th contrast	= 1.1	9.4%	12.1%

Table 3 shows that 22.9% of data unidimensionality requirements included moderate criteria. 19.6% of respondents' unidimensionality requirements had weak criteria. And item unidimensionality requirements 43.2%, including good criteria.

Fig.1. Wright Map of Student Electrical Interest

Table 4. Discrepancy Rate of Statement Items

Entry Number	Total Score	Count	Measure	Model SE	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD	PTMEA Corr.	Exact Obs%	Match Exp%	Item
9	365	110	-.10	.10	1.32	1.5	1.28	1.2	A .54	26.4	36.1	E9
6	368	110	-.12	.10	1.03	.3	1.04	.3	B .34	37.3	36.3	E6

8	303	110	.45	.09	1.03	.3	1.01	.1	C .40	40.0	35.0	E8
5	342	110	.11	.09	1.03	.3	1.00	.0	D .54	35.5	35.4	E5
4	369	110	-.13	.10	1.01	.1	.96	-.3	E .46	41.8	36.3	E4
1	370	110	-.14	.10	1.00	.1	.98	-.1	d .42	28.3	36.3	E1
3	357	110	-.03	.09	.97	-.21	.95	-.4	c .48	33.6	35.81	E3
7	339	110	.13	.09	.87	-1.1	.86	-1.2	b .40	32.7	35.4	E7
2	373	110	-.17	.10	.78	-1.9	.77	-1.9	a .45	51.8	38.8	E2
Mean	354.0	110.0	.00	.09	1.00	.0	.98	-.1		36.4	35.9	
S.D.	21.4	.0	.19	.00	.14	1.1	.13	1.1		7.2	.5	

Table 4 shows that all items fit because the requirements have been fulfilled, namely the first is 0.5 <MNSQ Outfit <1.5. the second is -0.2 <ZSTD Outfit <+2. and third is 0.4 <PTMEA CORR <0.85. Thus the nine items are appropriate to measure student interest in the electricity. However, Table 1 shows the respondents' reliability is quite small (0.53). This identifies that many respondents have measurement errors that tend to be inconsistent.

Based on the results of data analysis using Winstep software. There were only 12 respondents who met the three requirements above. Thus only 12 respondents gave consistent responses to the questionnaire, or in other words. these 12 respondents had relatively smaller measurement errors. Ignoring the consistency of respondents' responses can be seen Wright's map in Figure 1. Based on Figure 1 and considering the level of logit that is formed. It can be classified in the student's electric interest, as shown in Table 5.

Table 5. Classification of Interest in Electricity Students

Interest Category	Total	Percentage (%)
Very Low	**1**	**0.91**
Low	**35**	**31.82**
Medium	**65**	**59.10**
Height	**8**	**7.27**
Very High	**1**	**0.91**

4 Discussion

Interest in electricity for Vocational High School students in the Electricity Engineering Study Program is an initial force in pursuing education in the electricity. If the interest in the electricity is high, it can be predicted that the student's electrical learning outcomes are also high. This interest is a variable that cannot be directly measured. Therefore measurement is approached by the Rasch model. In this study, the instruments used in data collection used a questionnaire and then the data collected were analyzed with a Rasch-type Partial Credit Model (PCM) model. Some results have been obtained, such as the reliability of respondents and item reliability. In this study, the respondent's reliability value (0.53) is smaller than the item's reliability value (0.74). These results state that the item has good reliability, so the item is good enough to be used to measure students' interest in the electrical.

Judging from the unidimensionality requirements, the items used are pretty good, but the respondents have relatively small unidimensionality values. This illustrates that respondents give responses that form groups between respondents.

Based on Wright's map, the items that tend to be the easiest to the most difficult for the respondents in order are E1, E2, E4, E6, E9, E3, E5, E7, and E8. Wright's map also shows that out of 110 respondents, 0.91% of respondents have very high interest, 7.27% of respondents have high interest, 59.1% of respondents have moderate interest, 31.82% of respondents have low interest, and 0.91% of respondents have very low interest in electricity. Thus, 0.33% of the respondents have an interest in bad electricity.

5 Conclusion

Several things can be concluded about the results of this study. Namely 1) there are 9 items used to measure the interest of respondents in the electricity. 2) the reliability of respondents is smaller than the reliability of the items. 3) the distribution of interest in the student's electricity is divided into 5 logits. 4) The easiest items to be approved until the most difficult to be approved by respondents in sequence are E1. E2. E4. E6. E9. E3. E5. E7. E8. and 5) 0.33% of the respondents have a bad interest in the electricity.

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