SUSTAINING OPEN AND DISTANCE LEARNING (ODL) IN STATISTICAL LEARNING DURING AND POST PANDEMIC COVID-19

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ABSTRACT

Despite the Covid pandemic era, various sectors have changed in terms of administration as well as operations. Teaching and learning methods have changed from a traditional didactic approach to new delivery methods to deal with the effects of this pandemic and it is believed to be effective. It is an effort that has been made to comply with the Standard Operating Procedure (SOP) of social imprisonment. It is seen in line with Education 5.0 defined learning as a centric ecosystem that is sustainable, balanced, and conscientious, driven by values, powered by the intellect, and afforded by new, ubiquitous technologies. A major concern appears on the level of the student's ability to proficiently. Many students are not ready to participate in online classes, especially in the course that required calculation, particularly the Probability and Statistics course. Thus, an instrument consists of 20 items was developed by an experienced lecturer to measure the level of student's ability between the two groups. Data were captured through an interactive e-learning platform and analyzed using Rasch measurement method. Hence this study aims to explore students' understanding of counting rule and its probability concepts and examine which ideas were found most difficult by the students to understand.

Keywords: e-learning, probability, statistics, Rasch Measurement Model, teaching and learning

1. INTRODUCTION

Despite the Covid pandemic era at this time, various sectors have undergone changes in terms of administration as well as operations. The field of education is no exception. To deal with the effects of this pandemic, the university needs to break away from the traditional, content-based teaching practices to a new way of educating individuals which values the personalization of learning. One of the main areas in education field is teaching and learning methods need to be changed from traditional to new methods that are believed to be effective. Online Distance learning has been introduced to renew the way of learning and teaching. It is an effort that has been made to comply with the SOP of social imprisonment. It is seen in line with Education 5.0 where it defined a learning as a centric ecosystem that is sustainable, balanced and principled, driven by values, powered by intellect and afforded by new, ubiquitous technologies.

Probability is a study of the rules that offers the foundational theory of development of statistics. Because of that importance, this course has become a requisite in a wide field of study. It is designed to introduce the basic concepts and as a decision-making tool in many disciplines. Statistical concepts are the basis of learning statistics and should be given extra attention by every educational institution as statistics can be applied to a variety of areas including medicine, public health, psychology, biology, business, economics, engineering, education and sports among others. Research in learning of statistics probability concept has been done and well documented more than a decade ago. Regarding to Baharun et al. (2017), there are

several difficulties in learning and teaching statistics and some of these are students have no motivation in learning statistics since statistical ideas and methods are difficult and complex and counter-intuitive students. Therefore, it is difficult for lecturer to motivate student of this subject. Other than that, students consider that statistical learning is to memorize formulas and feel the results can be achieved only by operational knowledge. Students also consider mathematics and statistics is the same. Thus, this study is done to explore students' understanding of counting rule and its probability concepts and examine which concepts were found most difficult by the students to understand. The objectives of this study are:

1. To explore the level of students' understanding of counting rule and its probability concepts.
2. To test for sufficiency the e-learning method as an ODL platform in teaching n learning.
3. To assess the effectiveness of e-learning method as an ODL platform compared to traditional method.

2. METHODOLOGY

This study involves the entire student who taking STA150 (Probability and Statistics) course. These students are from Faculty of Computer and Mathematical Sciences in Universiti Teknologi MARA were labelled as Group A (Sem December 2015-March 2016) and Group B (Sem June-November 2016) students. Since the most topic that usually students not performed in Probability subject is Counting Rule, therefore in this study a set of structured test questions which consists of 20 questions related to Counting Rule topic been developed by a lecturer who experienced conducted this course. E-learning process will be marked as Group A and traditional learning process as Group B. Group A used Edmodo.com as a medium in conducting student's learning throughout the semester. The process of teaching and learning will be held during class.

The data were analyzed using Bond & Foxstep. The results are then presented in several sections namely data exploration, validation and calibration of items and responses. These analyses include item and person fit statistics in form of mean square values (MNSQ) and standardized z-score for in fit and outfit. The analysis was carried out in order to identify the calibration between item difficulty and person ability towards probability concept. Rasch Dichotomous Model is used to measure students' ability in probability course. This instrument provides items with dichotomous answers which are correct and incorrect based on the ability to answer the questions. The probability of person and item is defined mathematically as follows:

$$P_{ni}\{x = 1|\beta_n, \delta_i\} = \frac{\exp(\beta_n - \delta_i)}{[1+\exp(\beta_n - \delta_i)]} P_{ni}\{x = 1|\beta_n, \delta_i\} = \frac{\exp(\beta_n - \delta_i)}{[1+\exp(\beta_n - \delta_i)]}$$

where $P_{ni}\{x = 1|\beta_n, \delta_i\} P_{ni}\{x = 1|\beta_n, \delta_i\}$ is the probability of person n on item I scoring as correct (x=1) response rather than an incorrect (x=0) response, given person ability $\beta_n \beta_n$ and item difficulty δ_i δ_i.

3. RESULT AND DISCUSSION

Table 1. Summary Statistics for Items Measure for Group A and Group B

Group A

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	43.1	74.0	.00	.28	1.00	.0	1.00	.0
P.SD	14.5	.0	1.09	.05	.09	1.0	.15	1.0
S.SD	14.8	.0	1.12	.05	.09	1.0	.15	1.1
MAX.	67.0	74.0	2.64	.41	1.16	1.9	1.26	1.9
MIN.	9.0	74.0	-2.09	.25	.82	-2.1	.77	-1.8
REAL RMSE	.29	TRUE SD	1.05	SEPARATION	3.62	Item	RELIABILITY	.93
MODEL RMSE	.29	TRUE SD	1.05	SEPARATION	3.69	Item	RELIABILITY	.93
S.E. OF Item MEAN = .25								

Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
Global statistics: please see Table 44.
UMEAN=.0000 USCALE=1.0000

Group B

SUMMARY OF 20 MEASURED Item

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	38.1	63.0	.00	.31	.99	-.1	1.04	.1
P.SD	8.9	.0	.93	.10	.12	1.2	.28	1.3
S.SD	9.2	.0	.95	.10	.13	1.2	.29	1.3
MAX.	51.0	63.0	1.09	.73	1.23	2.0	2.11	3.5
MIN.	25.0	63.0	-3.15	.27	.73	-3.2	.70	-2.7
REAL RMSE	.13	TRUE SD	.87	SEPARATION	2.65	Item	RELIABILITY	.83
MODEL RMSE	.12	TRUE SD	.87	SEPARATION	2.71	Item	RELIABILITY	.83
S.E. OF Item MEAN = .21								

Item reliability of the item difficulty can be interpreted on this 0 to 1 scale. Table 1 shows that there is high reliability index for Group A (0.93) and Group B (0.88) respectively suggests that the instruments used in this study quiet readily to be replicated to the other samples for whom it is suitable. The item separation index refer to the ability of the test to define a distinct hierarchy of items along the measure variables. Based on Table 1, the separation index for Group A 3.62 indicates that the items can be separated into 4 difficulty level. Meanwhile Group B results that the separation index of 2.65 indicates that the items can be separated into 3 difficulty level.

However, Table 2 shows how the person reliability measure obtained. The person reliability index for Group A is 0.54 indicates that the reliability coefficient is considerably low attributed to the considerable miss fitting responses in the data. However, Person reliability index for Group B is 0.61 indicates a medium ability variance and range of ability of the students.

Table 2. Summary Statistics for Person Measure for Group A and Group B

Group A

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	11.6	20.0	.42	.53	1.00	.0	1.00	.0
P.SD	3.0	.0	.82	.05	.22	.9	.37	.9
S.SD	3.0	.0	.83	.05	.22	.9	.37	.9
MAX.	18.0	20.0	2.65	.81	1.70	2.7	2.48	2.8
MIN.	5.0	20.0	-1.34	.49	.51	-1.5	.29	-1.1
REAL RMSE	.56	TRUE SD	.60	SEPARATION	1.08	Person	RELIABILITY	.54
MODEL RMSE	.53	TRUE SD	.63	SEPARATION	1.17	Person	RELIABILITY	.58
S.E. OF Person MEAN = .10								

Person RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .57 SEM = 1.96

Group B

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	12.1	20.0	.60	.52	1.00	-.1	1.04	.1
P.SD	3.4	.0	.88	.08	.13	.8	.36	.7
S.SD	3.4	.0	.89	.08	.14	.8	.37	.7
MAX.	19.0	20.0	3.20	1.08	1.27	1.4	2.68	3.5
MIN.	5.0	20.0	-1.21	.48	.74	-2.1	.66	-1.0
REAL RMSE	.55	TRUE SD	.69	SEPARATION	1.26	Person	RELIABILITY	.61
MODEL RMSE	.53	TRUE SD	.70	SEPARATION	1.32	Person	RELIABILITY	.64
S.E. OF Person MEAN = .11								

4. CONCLUSION

This study has proven that Rasch measurement approach plays a powerful tool to analyze the reliability and validity of the items in a test. It also provides a good indication to this study on the calibration between student's ability and the level of items' difficulties. Online platform has been implemented to pair with the traditional teaching method in order to deliver the chosen topic of probability concepts. Although it was found that the reliability index for the items is sufficiently ready to be replicated to the other samples, there is an issue on different difficulty of the person responses to the items. Hence, as mentioned earlier in the analysis part, the reliability index can be enhanced by omitting the unusual responses or rephrasing the items as this may improve the person's understanding to respond to the items.

REFERENCES

1. N. Baharun, N. F. M.Razi, N. A. C. Musa and Z.Mahmud, "Special issue. Special issue," Aust. ranger Bull., 9(6S), no. 1, pp. 429–441, 2017.
2. N. F. M. Razi, R. Z. Abidin, N. Baharun, and N. A. C. Musa, "Measuring students' understanding in probability concept between two different cohort using rasch measurement," Int. J. Recent Technol. Eng., vol. 8, no. 2 Special Issue 11, pp. 613–620, 2019.
3. J. Wang, J. Huang, and J. Wang, "Research on the relationship between perceived service and customer satisfaction," in ICSSSM11, pp.1-5, 2011.
4. University Teknologi MARA Academic Affair Division, "Education 5 at UiTM - UiTM Academic Compass (3.5.2019).pdf." p. 95, 2019.
5. Trevor, GB.Christine, M.F., Applying the Rasch Model Fundamental Measurement in the Human Sciences. (3rd Ed.), Lawrence Erlbaum Associates, Publishers,Mahwah,New Jersey,London,2007
6. Zamalia M. & Anne L. Potter. Using Rasch Analysis to Explore What Students Learn about Probability Concept. Indonesian Mathematical Society Journal on Mathematics Education, 6 (1), 1-11, 2015.

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Kelulusan daripada pihak YBhg. Profesor dalam perkara ini amat dihargai.

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