Application of Rasch Model Analysis in Calibrating Undergraduates’ Challenges at Malaysian Universities

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Abstract: The purpose of this study was to calibrate the challenges faced by undergraduates in Malaysian universities. The challenges are divided into four aspects which include: academics, personal, social and career, as well as the infrastructural needs of universities. A total of 360 undergraduates from two local public universities participated in this study. Responses from the 30-item questionnaire were calibrated using the Rasch Model analysis, so as to determine (1) the most important challenges and (2) how different these challenges are from each other. The undergraduates agreed that lack of internet connection is the most important challenge (measure = -1.99 logit), followed by the quest for academic excellence (mean = -1.24 logits) and missing their family back home (mean = -1.18 logits). Based on the equal interval scale of the Rasch Model calibration, this study obtained the following information: Internet connection (measure = -1.99 logit) is about two times more important than the challenge to secure a job after graduation (measure = -1.02 logit) and financial challenges (measure = 0.22 logits) is four times more important than the issue of not having an appropriate place to study (mean = 0.89 logits).

Key words: Academic • Infrastructure • Personal • Rasch Model • Social

INTRODUCTION

Undergraduates enrolling into Malaysian universities may experience various difficulties. This is due to a variety of challenges that they need to confront, especially in regards to teaching, academic requirements, relations with members of the university community, adapting to new faculties, as well as the need to adapt to new relations among students [1]. Failure to meet the challenges is considered one of the most important factors, in explaining their failure to perform as expected or even withdraw from the university [2]. Therefore, it is not surprising that many studies are dedicated to understanding the challenges faced by undergraduates in the university.

In Malaysia, numerous studies have been carried out that focus on challenges among university undergraduates. Based on literature, the challenges among undergraduates in Malaysia can be divided into four main categories. Firstly, academic challenges are considered as highly important. It involves issues related to teaching and learning. Among such issues are the inability of the university to provide enough information to students [3] and inability to understand lecture [4]. Meanwhile, personal challenges deal with issues such as time management, finance, family, as well as the learning of English [5], [6]. Social and career challenges involve issues related to the relationship of undergraduates with the university community such as culture shock and the feeling of insecurity [7]. Studies have shown that they worry about securing their dream jobs [8]. Lastly, a growing number of literature has identified university’s infrastructure as an important challenge faced by undergraduates. Facilities such as library, hostel, toilet, health, signage and recreational places, have been reported as below standard [9], [10]. Nevertheless, the focus of most studies is on first year undergraduates, especially in regards to their adjustment to university life. It should be noted that university challenges are not unique to first year undergraduates. Thus, second, third and even final year undergraduates are also faced with similar or different challenges. Therefore, the identification of specific challenges may provide information especially in terms of providing help, so that they can be equipped...
with both academic and non-academic requirements for the demanding labor market. In addition, information gathered based on infrastructure, may help universities improve upon their facilities.

**Calibration with Rasch Model Analysis:** Calibration refers to a process of estimating test parameters, by transforming raw scores from the responses to challenges. Calibration brings about the ordering of challenges on a measured scale. As such, it provides more information on the challenges since it does not only assign numbers, but is also able to determine the differences between challenges and to what extent. One of the procedure for calibrating the challenges is by employing the Rasch Model analysis. This model is from a family of modern test theories called the item response theory that relates important parameters in the measurement of a construct [11]. In the Rasch Model, the probability of a person $n$ with ability $\theta$ correctly answered the item $i$, with difficulty $\beta$, $P(O_i)$ is given by $P_{ni} = \frac{\exp(\theta_n - \beta_i)}{1 + \exp(\theta_n - \beta_i)}$ [12]. For the Likert-scale responses, the probability of answering correctly is defined as the ability of a particular respondent to agree with the item. Therefore, a person who provides more positive responses (agrees) is considered more able, as compared with students who give many negative responses (disagrees).

Apart from the calibration of a person’s ability, the Rasch Model calibration also estimates the item difficulty parameter. The score is identified as ‘measure’ and defined in logits unit. Similar to the person’s ability parameter, estimation of the item difficulty parameter also has equal interval property, which is similar to a ruler or a thermometer. That is, Item A with measure of 1.0 logits is always two times more difficult than item B of 0.5 logits. This calibration is a prime interest in this study, since it does not only provide information on the ordering of challenges, but also on how one challenge is different from another. Despite the fact that Rasch Model analysis provides important information on the measured construct, its modeling comes with strong assumptions. Two important assumptions in the Rasch Model analysis that must be met are: (1) the data must fit the model’s expectation and (2) the construct being measured must pose unidimensionality property [13]. Analysis of fit helps detect discrepancies between the Rasch model’s expectation and the data collected. Model-fit issues are usually addressed by investigating the fit statistics such as the infit and outfit, mean-squares (MNSQ). Studies have suggested that MNSQs of between 0.6 to 1.4 logits, will provide evidence of acceptable model – data fit. On the other hand, unidimensionality assumes that items in a test, measure a single construct [14]. In Rasch Model analysis, the assumption of unidimensionality is investigated using the principal component analysis (PCA) of residuals procedure. According to reference [15], the unexplained variance from the second construct extracted from the procedure, should be less than 10%.

**MATERIALS AND METHODS**

The study sample consists of 360 undergraduates from two local public universities (male = 108, female = 252). A 30-item questionnaire was developed to measure the challenges faced by undergraduates in regards to academics (9 items), personal (8 items), social and career (6 items) and infrastructure (7 items). Majority of the undergraduates (69.4%) were in their second year of study, while the rest were in their third year. In this study, the Rasch Model software, namely, WINSTEPS 3.63, was employed to calibrate the challenges. The statistics of item measure and its standard error were used to describe the information provided by the Rasch Model calibration. Items (challenges) with high measure values means that the undergraduates had difficulty agreeing with the items. In contrast, items with low measure means that the undergraduates had less difficulty agreeing with the items. Thus, items with low difficulty measures were considered more important to the undergraduates.

**RESULTS AND DISCUSSION**

The infit MNSQ values for all 30 items ranged from 0.64 - 1.36 logits, while outfit MNSQ values ranged from 0.65 to 1.39 logits, thus the unexplained variance from the second construct extracted was 7.5%. Therefore, it can be said that both the model-data fit and unidimensionality assumptions have been achieved. Table 1 shows the statistics for each of the undergraduates’ university challenges in logits unit. The item difficulty estimation is shown in the measure statistics, while the standard error provides evidence on the accuracy of the estimation. The MNSQs, on the other hand, provide evidence on the model-data fit.

The poor internet connection in the university was agreed by most undergraduates as one of the challenges. The result is rather expected since undergraduates need a good internet connection to complete their learning tasks; especially as universities in Malaysia encourage
undergraduates to use the e-learning platform for information sharing, which is based on the Malaysian e-learning Policy. In addition, good internet connection is required for their personal purposes such as checking of emails and connecting to social media such as Facebook, WhatsApp and Twitter etc. However, to the best of our knowledge, this is the first study to report on the challenge in Malaysia. In contrast, the challenge of getting good cumulative grade points average (CGPA) is always considered as an important challenge for university undergraduates. Being homesick (missing family) – which is usually associated with first year undergraduates - completed the top three of the most important challenges for the respondents. Meanwhile, most of the undergraduates disagreed that they have chosen a wrong course in the university. Therefore, this challenge was regarded as the least important on the measured scale. Other challenges that are considered least important include the claim that the lecture halls are not up to standard and difficulty to communicate with friends and lecturers.

It should be noted that both the challenges of getting good CGPA and being homesick are always associated with first year undergraduates. This study was able to provide evidence that these challenges are important and are experienced by second and third year undergraduates as well. In contrast, several studies have reported wrong choice of courses, unconducive lecture halls and difficulty to communicate, as important challenges associated with first year undergraduates. This shows that undergraduates are able to overcome their first year challenges and move forward with their university life.

In this study, based on the equal-interval property of the items measured during the calibration process, poor internet connection (measure = -1.99 logits) was regarded as two times more important as securing a job after
graduation (measure = -1.02 logit) and four times more important than the challenges of transport. This may provide useful information for the management of universities, especially in ensuring successful implementation of the Malaysian e-learning Policy [16]. Poor internet connection will hinder the engagement of both students and lecturers with the virtual learning platform, which is an important part of the policy. Meanwhile, financial challenges (measure = 0.22 logit) is another important challenge perceived by the public. It is four times more important than the issue of not having an appropriate place to study (mean = 0.89 logits). Nevertheless, based on the calibration, it was three times less important than wrong expectation about the (measure = -0.44 logits) experience of undergraduates in the university [17].

CONCLUSION

The present study provided two important findings for better understanding of the challenges faced by undergraduates in the university. Firstly, although there are challenges that are unique to first year undergraduates, some of the challenges were also experienced by second and third year undergraduates, as well. Secondly, Rasch Model analysis was not only able to calibrate the challenges based on their importance, but provided information on how a challenge is different from other challenges. These findings are valuable to the respective universities management in providing conducive learning for their undergraduates not only to strive for academic excellence, but also for the acquisition of important skills essential to perform well in the challenging and unpredictable labour market.

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REFERENCES

