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Research Article:

Bricks to Clicks: Students' Engagement in E-Learning during the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic has forced higher education institutions to execute mitigation efforts such as an e-learning mode of instruction to reduce the impact on pedagogical activities. These challenges have raised concerns on students' engagement in e-learning as students are at risk of falling behind in education. However, there is little empirical research focusing on students' engagement in e-learning experiences. The purpose of this study is to investigate students' engagement in e-learning as well as specifically assess their engagement based on gender, age, ethnicity, level of education and field of study in a Malaysian public higher education institution. This study used a non-experimental quantitative research design. Data were collected from a sample of 281 students using the Blended Learning Engagement Questionnaire©. WINSTEPS Rasch model measurement software was used to determine the reliability and validity of the research instrument. Subsequently, Differential item functioning (DIF) was conducted to assess students' engagement in e-learning as well as specifically assessing student's demographic factors such as gender, age, ethnicity, level of education and field of study. Findings indicate students have high levels of behavioural engagement as compared with cognitive and emotional engagement in e-learning. Further analysis indicated there were differences in students' engagement based on demographic factors such as gender, age, and field of study. This study provides insight into students' engagement in e-learning that will help lecturers to reflect on their own teaching practices. Implications and recommendations for future research are presented.

Keywords: student engagement, e-learning, COVID-19 pandemic, Rasch analysis

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INTRODUCTION

The COVID-19 pandemic has forced higher education institutions to pivot their instruction online to allow teaching and learning to continue (Adams et al., 2021). Mitigation efforts such as flexible online learning and e-assessment strategies were executed to reduce the impact of the pandemic on pedagogical activities (Rapanta et al., 2020). Students are required to study at home as an effort to control the pandemic (Adams & Dewitt, 2021). Additionally, many lecturers need to teach online for the first time. Lecturers have to carefully craft their instructional design to enable their students to fully digest and absorb the learning.

E-learning is an inevitable measure in this pandemic time (Adams et al., 2021). A significant change from on-site (bricks) to online (clicks) in teaching can be a challenging prospect. Online teaching can, unfortunately, turn students into passive learners as much of the learning is completed asynchronously and students often feel disconnected from their lecturers, as well as their peers (Vavasseur et al., 2020). Additionally, lecturers are struggling to gauge whether their students are grasping the course contents and partaking in the learning actively (Heilporn et al., 2021). They feel students are unlikely to benefit much from this type of education (Lizcano et al., 2020). Another challenge is to engage students in group activities as collaborative work is difficult when students are not physically present together, and most virtual classes become very instructor centred (Chuah & Mohamad, 2020; Mpungose, 2020). Other notable issues include security of online learning programs, user reliability, misuse of technology (Maatuk et al., 2021), high internet data usage and signal strengths in rural areas (Coman et al., 2020).

These challenges have raised concerns on students' engagement in e-learning as students are at risk on falling behind in education (Adams, Tan, & Sumintono, 2020). Students' engagement is often associated with better academic performance (Bazelais & Doleck, 2021; Fisher et al. 2018, Han et al., 2020) and it includes what students feel (emotional), think (cognitive), and plan to do (behavioural) (Schunk & Mullen, 2012). There is little empirical research focusing exclusively on students' engagement in e-learning experiences in Malaysia. Hence the purpose of this study is to investigate students' engagement in e-learning as well as specifically assess their engagement based on gender, age, ethnicity, level of education and field of study in a Malaysian public higher education institution.

LITERATURE REVIEW

E-Learning in Higher Education

The adoption of e-learning in higher education institutions across the globe has recorded a remarkable growth over the last decade. This surge is contributed by the advancement of learning technologies and the shift towards 21st century learning (Miller, 2018). Prior to this, the use of e-learning is limited to institutions that offer distance learning programmes (Osman et al., 2018). As technological devices and tools become more

cost-effective and the internet network coverage is expanded, the implementation of e-learning in higher education can be seen to be more wide-ranging. From fully online to blended and hybrid modes, more courses are incorporating e-learning features or components in order to enhance students' learning experience (Adams et al., 2018; Yang, 2020).

Over the last decade, researchers have shown great interest in examining e-learning adoption from several perspectives. One area that was widely studies was related to faculty and students' readiness in accepting such mode of learning (Cheng et al., 2019; Graham, 2013; Matheos & Cleveland-Innes, 2018). While these studies were investigating different higher education institutions, the results were consistent and indicative on the inevitable need to adopt e-learning since more resources are now readily available online. E-learning has been regarded as feasible option in extending learning beyond the class hours (Yang, 2020). During the campus closures due to the COVID-19 pandemic, studies on students' readiness for e-learning or its variants were also widespread as more institutions were putting emphasis on e-learning as a measure to mitigate the impacts of the pandemic (Tang et al., 2021).

Another key focus on e-learning in higher education as identified in the previous studies is on addressing the challenges to implement it effectively (Heilporn et al., 2021; Rasheed et al., 2020; Roman & Plopeanu, 2021). The outcomes from e-learning adoption as reported in Malaysian literature are mainly positive despite some commonly reported challenges such as infrastructure and institutional support. Jie and Fernandez (2021) found maintaining a stable internet connection in modest cities remains a continuous challenge. Sukumaran et al. (2021) found there is lack of funding for technological innovations and technical skills support. Almaiah et al. (2020), on the other hand, discovered several factors not related to technology that could challenge e-learning implementation, namely cultural, trust and self-efficacy factors. These factors essentially are linked to students' engagement that affected perceived learning effectiveness as well as learners' satisfaction.

Students' Engagement in E-Learning

Despite its importance, students' engagement in e-learning is often overlooked by lecturers in higher education institutions. The term "students' engagement" is restricted to observable behaviours of active involvement such as students' frequency of responding to questions or the number of students who participated in a class activity. However, as mentioned by Schunk and Mullen (2012), learner engagement cover student's cognitive and emotional involvements in accomplishing a given task. Appleton et al. (2006) proposed shifting the focus from academic and behavioural indicators "the underlying cognitive and psychological needs of students" (p. 430). In relation to this call, studies have found e-learning structures that place emphasis on cognitive and emotional engagement tend to result in better academic performance (Al-Qahtani & Higgins, 2013; Bazelais & Doleck, 2018; Fisher et al., 2021, Han et al., 2020) and course satisfaction (Lane et al., 2021; Vavasseur et al., 2020).

Lane et al. (2021) investigated students' experiences of e-learning and their overall satisfaction in the format. Their findings indicated how emotional engagement is an applicable predictor of student satisfaction and success in e-learning courses. Vavasseur et al. (2020) studied 353 medical students' engagement and satisfaction on the online learning contents. They discovered that online learning approach increased students' performance and satisfaction. However, they measured engagement according to audience retention of videos and attendance on a content management system, which may not be sufficient to measure students' cognitive and social engagement. Hence, there is a need to measure students' levels of engagement more holistically.

Al-Qahtani & Higgins (2013) investigated the effect of three modes (traditional classroom learning, e-learning and blended learning) on students' achievement in higher education. The study, which involved 148 students, indicated the positive effect of online learning on students' achievement as compared to the other two modes. The flexibility of online learning in allowing students to be engaged with different activities is seen as a contributing factor of students' higher achievement. The same outcome was also reported by Bazelais and Doleck (2018) in which students' engagement in e-learning activities led to higher performance and acquisition of more skills among students of a first-semester physics course.

The study by Adams, Tan, Sumintono and Oh (2020) revealed high levels of cognitive, emotional and behavioural engagements in e-learning activities among students of higher education institutions in Malaysia. Students from engineering and medicine were more highly engaged in online learning activities than their peers in social sciences and natural sciences. Ożadowicz (2020) also found the same pattern among engineering students. These two studies showed that despite the technicality and difficulty of certain fields of study, online learning can still contribute to higher academic performances if the design and implementation are done systematically. Tang et al. (2021) also studied students' readiness in adopting real-time or live online classes during the COVID-19 outbreak and found out that students were mainly complying to the requirements to attend online classes and were not engaged when those classes were conducted. They also found out that postgraduate students have higher readiness as compared to undergraduates, prompting the need to devise measures in motivating them.

The review of previous studies shows that despite the reported benefits of e-learning practices in increasing student satisfaction (Lane et al., 2021; Vavasseur et al., 2020) and better academic performance (Al-Qahtani & Higgins, 2013; Bazelais & Doleck, 2018), there is still a gap in understanding students' levels of engagement in an e-learning environment by scrutinizing its relationship with demographic factors such as gender, ethnicity, locality and field of study.

METHODOLOGY

Research Participants

A quantitative approach with survey design was employed in this study. The data were collected using cross-sectional method utilising electronic format, namely google form platform, from one public university in Malaysia. The respondents for this study were students, where they invited by emails and social media to participate, it was stated in first page that it was strictly anonymous and voluntary to address ethical concerns. Thus, by completing the questionnaire, the students are given their consent.

The minimum sample size was 150 respondents, this is estimated based on Boone et al. (2014) calculation of precise item calibration at 0.5 logit and 99% confidence level. There were 400 students participated in the study. The next step is conducting data cleaning and validation using WINSTEPS version 3.73, a Rasch measurement model software, for detecting outlier (29 respondents who answered all minimum or maximum value) and misfit response (90 respondents with Outfit MNSQ index bigger than 2 or less than 0.4) (Andrich & Marais, 2019; Bond & Fox, 2015; Widhiarso & Sumintono, 2016). As a result, 281 respondents were analysed further in this study, their demographic profile is presented in Table 1.

Table 1. Demographic profile of respondent (N = 281)

Demographics	Respondent	Percentage (%)
Gender		
Male	89	32
Female	192	68
Age		
under 20 years	22	8
20–29 years	215	76
30–39 years	27	9
More than 39 years	17	7
Ethnicity		
Malay	109	38
Chinese	78	28
Indian	11	4
Sabah-Sarawak	78	28
International student	5	2
Level of education		
Undergraduate	204	73
Postgraduate	77	27

(*Continued on next page*)

Table 1. (*Continued*)

Demographics	Respondent	Percentage (%)
Field of study		
Social sciences	205	73
Natural Sciences	54	19
Engineering	18	7
Medicine	4	1

Instrumentation

The BLEQ© (Blended Learning Engagement Questionnaire) instrument was adapted from Adams et al. (2020) in this study to measure students' engagement for online learning practice during COVID-19 pandemic. It consists of 16 items which divided into three dimensions: emotional engagement (five items), cognitive engagement (four items), and behavioural engagement (seven items). The response options for all dimensions are the same, using a four-point Likert-type scale from strongly disagree (1), disagree (2), agree (3) and strongly agree (4). To improve its use in this cross-sectional study, the instrument provided as self-administered, where respondents can choose to participate in their preferred time.

Measurement Model

A Rasch rating scale model approach was used to assess to the data. This is because students' engagement in an online learning involves latent trait which refer to student opinion, perception, and attitude in the activity which need precise and accurate measurement model (Andrich & Marais, 2019; Boone et al., 2020). The study using WINSTEPS software, where the raw data from the respondents (likert rating or ordinal type) were mathematically transformed into *logit* (logarithm odd unit) via the logarithm function which become an equal interval scale (Linacre, 2013). There were two type of logits data produced from the software, which are item logit used to inform about instrument quality and item calibration, and person logit which informs about respondents' level of engagement (Boone et al., 2014; Bond & Fox, 2015).

To determine whether the instrument has a good quality, the validity and reliability aspect in shown in Table 2. The table below shows that data gathered is fit to the model as Outfit mean square value is close to one (an ideal value) both for person and item, it also confirmed with significant value of Chi-square test. Reliability indices for person (0.93), item (0.96) and alpha (0.94) indicates that the consistency of person and item responses was 'very good' (Sumintono & Widhiarso, 2014). Separation indices, which inform about grouping respondents (3.71) and how widespread item difficulty level (5.10) showing the indices more than three (minimum acceptable value), supporting the fact that very reliable instrument and data were collected.

Table 2. Summary statistics of person and items

Psychometric properties	Person	Item
N	281	16
Outfit Mean Square		
Mean	0.96	0.96
SD	0.48	0.22
Separation	3.71	5.10
Reliability	0.93	0.96
Cronbach's Alpha	0.94	
Chi-square (χ^2)	5610**	
Raw variance	56.7*	
Unexplained variance Eigen value	2.3	

** $p < 0.01$

In addition, unidimensionality which is a main requirement of the Rasch model, where all the items must measure a single construct, this is assessed by looking at the fit statistics for the items and carrying out a principal components analysis (PCA) of the residuals (Andrich & Marais, 2019; Bond & Fox, 2015). There were two indices indicating this, which are raw variance should be more than 40% and Eigen value of unexplained variance less than three (Fisher, 2007), both indices as shown in Table 2 are in satisfactorily level of unidimensionality. The four-rating scale used in the study are functional, where threshold (step) between rating is all in the ideal value of 1.4 to 5.0 (Van Zile-Tamsen, 2017). Figure 1 shows that the average person measured by category moved up monotonically which indicating each rating scale has its own peak (Linacre, 1999), meaning that all of the Likert scale categories were well functioning.

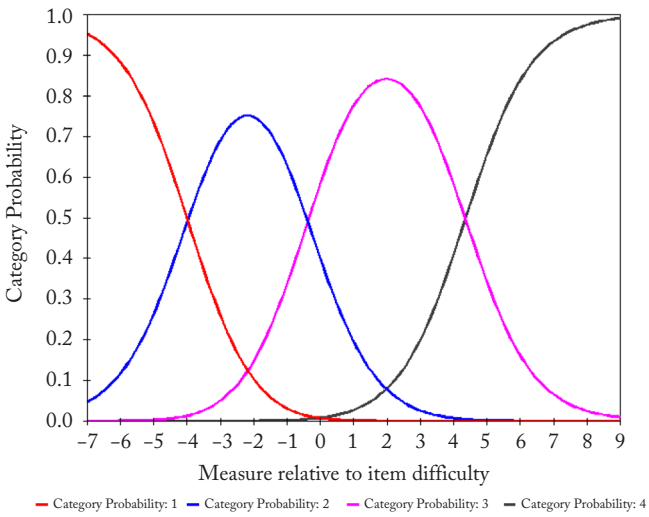


Figure 1. Rating scale analysis of BLEQ instrument

FINDINGS

Item Difficulty Level

The first result of Rasch model analysis in this study is estimation of item location (calibrations) or logit value of item (LVI). The bigger LVI means the higher order of the severity or difficulty level of the items on the scale, in other words the item tends to be not easy to agree by respondents. The item logit mean is fixed at 0.0 logit, and the value of item standard deviation (SD) in this study was 0.71 logit. To put into perspectives, mean and SD were used to grouping the item based on difficulty level (Table 3). There were 3 items (18%) in the category of very difficult to agree by respondents (LVI > 0.71 logit); in the second category, which is difficult to agree (+0.71 ≥ LVI ≥ 0.00) there were 4 items (25%); the next category which is easy to agree by respondents (0.00 ≥ LVI ≥ −0.71) there were 6 items (39%); and lastly 3 items (18%) fall into category very easy to agree by the respondents (LVI < −0.71 logit).

Table 3. E-learning engagement item calibration

Construct of engagement	Difficulty level			
	Very difficult	Difficult	Easy	Very easy
Cognitive	C2, C3	–	C4	C1
Emotional	E2	E3, E4, E5	E1	–
Behaviour	–	B1	B2, B3, B5, B7	B4, B6

As shown in Table 3, three dimensions in the instrument were showing three different response patterns. For the cognitive engagement, equally two items were categorized both difficult and easy to agree respectively. Whereas for emotional engagement more items (four out of five) were in the difficult to engage group by students. Interestingly, behaviour engagement in e-learning tend to be easy to be conducted by the students, where 6 out of 7 items fall into category easy and very easy to agree. These findings indicate that student's perception in e-learning behaviour, they do not have much difficulty to do that compare to cognitive and emotional engagement process which involve thinking and psychologically attached.

The complete item and person location in a logit measurement continuum is shown in Figure 2. The Wright map or item hierarchy map demonstrates how the items and participants fit together along on a logit continuum, the higher LVI meaning the item difficult to endorse/agree by the respondents. At the right side of the map, item C3 (*I prepare myself in reading materials online before attending classes* with LVI +1.02 logit) is the most difficult item to agree. This means that preparation before online lecture seldom conducted by students. Meanwhile item B4 (*I do my assignments and submit it on time online* with LVI −1.29 logit) located in the lower right of the map, informing that regard to assignment student don't have difficulty when change to online mode.

This finding from the two different LVI items conclude student's different situation in before and after the online lecture.

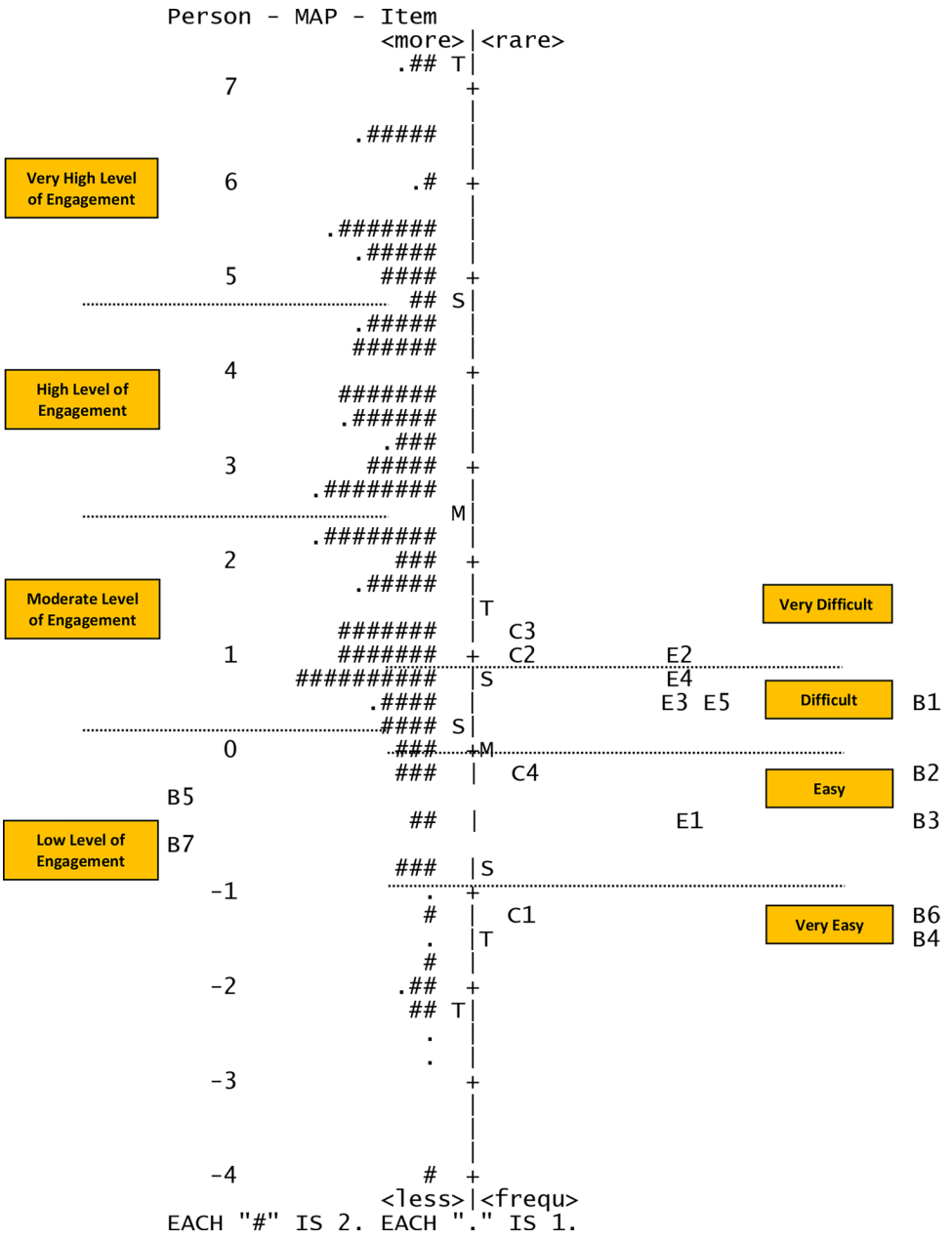


Figure 2. Item person map of BLEQ instrument

Students Level of Engagement in E-Learning

On the left side of Figure 2 is the spread of person level engagement. The higher logit value person (LVP), which is located top left, indicating that the person answers to items tend to state agree or strongly agree, showing a very high level of engagement in online learning. The mean of LVP was +2.47 logit with standard deviation 2.34, showing that the participants tended to be located higher than the items. This indicates that the level of engagement of this sample was higher than the difficulty level as reflected in the items, this also means that that the test-item targeting is satisfactory.

Like grouping of item difficulty level above, because Rasch model provide accurate and precise measurement on the level of engagement in e-learning, categorising students' responses is possible (Table 4). Using LVP of mean and SD, there are four levels of e-learning engagement (from very high level to low level of engagement), which identify number of students in each group. This analysis useful, because can go to individual centred statistics rather than group centred statistics, which can provide many details (Engelhard & Wind, 2018).

Table 4. Students online learning engagement level according to demographics (N = 281)

Demographic	Very high LVP > +4.81	High +4.81 ≥ LVP ≥ +2.47	Moderate +2.47 ≥ LVP ≥ 0.13	Low LVP ≤ 0.13
Gender				
Male	21	34	21	13
Female	32	54	78	28
Age				
Below 20 years	5	5	7	5
20-29 years old	44	65	79	27
30-39 years old	2	10	7	8
More than 39 years	2	8	6	1
Ethnicity				
Malay	24	34	40	11
Chinese	13	20	25	20
Indian	2	7	1	1
Sabah & Sarawak	14	24	32	8
International students	-	3	1	1
Level of education				
Undergraduate	44	56	75	29
Postgraduate	9	32	24	12
Field of study				
Social Sciences	34	59	77	35
Natural Sciences	16	17	16	5
Engineering	3	9	5	1
Medicine	-	3	1	-

Analysis on students' gender found around 55 out of 89 male students (62%) and 86 out of 192 female students (45%) were in very high- and high-level engagement of e-learning. In the moderate level engagement, there were 21 male students (24%) and 78 female students (40%); students who were low level of online learning engagement is the least percentage (15% each respectively for male and female students). This show that proportion of male student with higher level of engagement was higher from this study's sample.

In terms of age, the proportion of students belong to very high- and high-level engagement, nearly similar with those who consider themselves in moderate or low-level engagement in every age group. Also, students who perceived themselves had low levels of e-learning engagement are minority in all age groups, which were 22% for below 20 years old, 13% in 20–29 years, and 6% in more than 39 years age group, except for 30–39 years of age (29%).

In terms of students' ethnicity, the similar result appears like in age group, except for Chinese students, others belong to very high- and high-level online engagement. The findings shows that the different also not big. Interestingly, except for Chinese students, in other groups of student ethnicities, low level engagement also the minority, which were range from 20% (International students) to 9% (Indian students). Analysis on student's level of education and their field of study found that less than in moderate and low-level online learning engagement. Also, not so much different in term of students' number in each group were showing that nearly similar response in this sample.

Differential Item Functioning (DIF) of Respondents' Demographic Factors

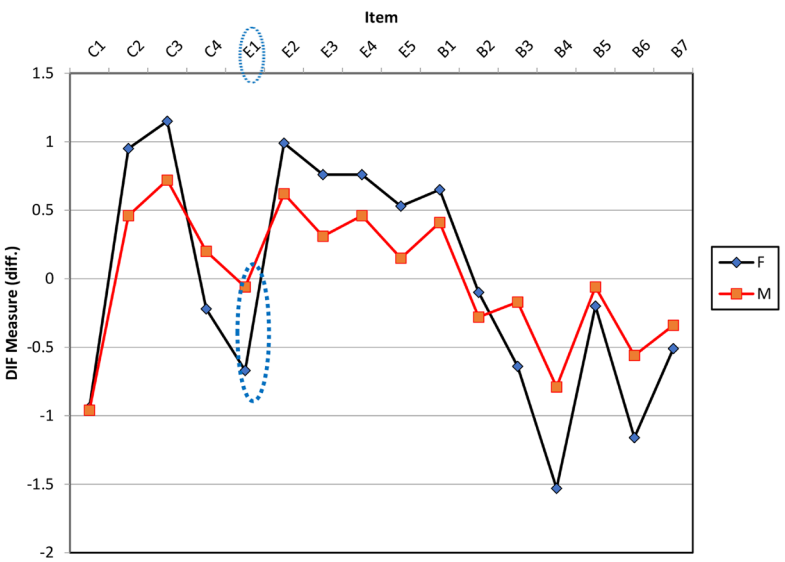
Further analysis was conducted to examine the differences in test item responses based on demographic profile which was Differential Item Functioning (DIF). The DIF analysis is sensitive to number of respondents, where the group less than 30 person is not suggested (Bond & Fox, 2015; Boone et al., 2020). So for this analysis there were two demographic variables, namely gender and level of study, can be analysed with DIF. An item was considered as having DIF if it had DIF contrast value of less than –0.5 or more than 0.5, the t value of less than –2.0 or more than 2.0, and the p (Probability) value of less than 0.05 or greater than –0.05 (Boone et al., 2014). Therefore, three items for gender and four items for level of study respectively were suspected has DIF as shown in Table 5. However, only one item, E1 (*I participate actively in online activities*) which was fulfilling in all three criteria of DIF, the rest only one or two criteria.

In addition, looking at DIF plot for the whole items provide very interesting findings. If the item location in the line close to the top, meaning that the item considers difficult to agree; whereas if located below it is perceived easy to agree. Figure 3 which show DIF plot based on gender, that each dimension has its unique pattern of response. For cognitive dimension, item C1 (*I'm able to do my best to complete online tasks*) was no different between male and female respondent; for item C2 and C3 it is considered difficult to agree by female than male counterparts. However, for item C4 (*I spend enough time and effort to learn online*), showing that male students agree lesser than female.

Table 5. Differential item functioning (DIF) of BLEQ (N = 281).

Item	DIF contrast	t	Prob.	Demographic variable
E1	*–0.60*	–2.12	0.0177	Gender
B4	–0.75	–2.52	0.1421	
B6	–0.60	–2.05	0.2553	
C3	–0.54	–1.89	0.5843	Level of study
E4	0.51	1.76	0.0732	
B4	0.58	1.92	0.3064	
B6	0.56	1.87	0.1680	

For the emotional dimension, except for E1 (which is detected as item DIF), the other items (E2 to E5) female respondents tend to response the item as difficult to agree than male. For instance, in the item E3 (*I feel my classmates respect my thoughts and views during online discussion*) and E5 (*I feel my lecturers show interest to my views during online discussion*) male students found the item easy to endorse, showing that female student's has different thoughts towards online learning. For behavior dimension, two items consider difficult for male students, B1 (*I participate actively in online activities*) and B2 (*I behave fairly to all my classmates when performing task online*), while the rest (B3 to B7) male students found it was easy to agree than female students. In this behaviour dimension shows that male students tend to be more active in online learning in nearly all items.

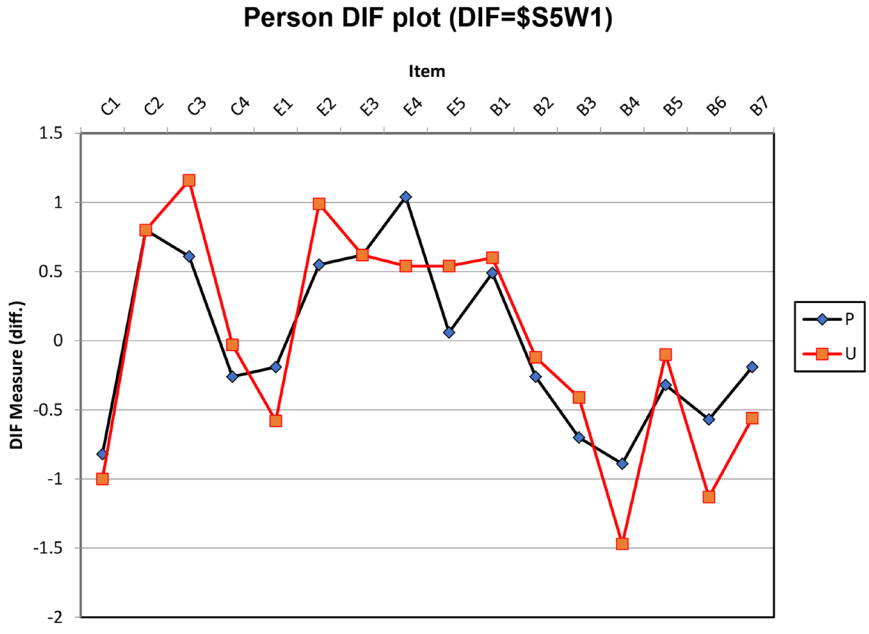


Legend: F = female, M = male; C = cognitive, E = emotional, B = behaviour

Figure 3. Person DIF plot based on gender to all items

In the Figure 4 which shows a DIF plot based on level of study, which has two groups, undergraduate (U) and postgraduate (P) students, the pattern of response a bit different. Only certain items have distinctive response from the two groups, the rest tend to be similar (such as C1, C2, C4, E3, B1, B2 and B5). For item C3 (*I prepare myself in reading materials online before attending classes*) postgraduate student are well prepare than undergraduate, showing the tendency and maturity of self-learning. The same response regard to item E2 (*I give importance to studying together with my classmates in a group online*) showing online learning more prefarafble for postgraduate students.

The real different can sense at the behaviour dimension, where identity as digital native is salient for undergraduate. For instance, in the item B4 (*I do my assignments and submit it on time online*), B6 (*I try to do my best in online group work*) and B7 (*I share information with my classmates during online discussion*), younger generation like undergraduate students don't have any difficulty regard to technical challenges in online learning compare to postgraduate students. The distance of behaviour engagement level actually showing generation gap.



Legend: P = postgraduate, U = undergraduate; C = cognitive, E = emotional, B = behaviour

Figure 4. Person DIF plot based on level of study to all items

DISCUSSION

The study aimed to investigate students' engagement in e-learning as well as specifically assess their engagement based on gender, age, ethnicity, level of education and field of study in a Malaysian public higher education institution. Based on the study results, we found students having high levels of behavioural engagement as compared with cognitive and emotional engagement in e-learning. This finding indicates that students have a positive participation, complete their activities, and assigned tasks during e-learning activities. The higher level of behavioural engagement among the students could reflect high level of effort they put forth during e-learning (Nguyen et al., 2020). Students put substantial effort when performing online tasks by listening to their lecturers carefully in order to understand the instructions required to complete the online tasks. Other behaviours include completing assignments and submitting it on time, trying to participate in online group work, and engaging in online discussions. This finding corroborates with the results of a previous work, where students had high level of behavioural engagement as compared with emotional and cognitive engagement (Adams, Tan, Sumintono, & Oh, 2020). Ma et al. (2015) found that lecturers' instructional design and preparation significantly influenced students' behavioural engagement in e-learning.

Students in this study were at a moderate level of complexity in cognitive engagement. In terms of cognitive engagement, students had difficulty to engage in learning activities that require complex thinking and advanced skills. Some of the activities include discussing assignments with their classmates using the learning management system in their universities and preparing themselves before attending classes by reading materials online. This cognitive engagement can be explained in terms of self-regulation (Fredricks et al., 2004; Furlong et al., 2003). In addition, as compared with behavioural and cognitive engagement, students perceived emotional engagement as the most challenging and difficult aspect of their e-learning process. Emotional engagement is the primary impetus for other domains of students' engagement, which has direct and indirect influence on behavioural and cognitive engagement (Hu & Li, 2017). Therefore, considerable attention must be paid on factors that facilitate emotional engagement. Some of these factors include peer group relationships and lecturers' support (Li & Lam, 2015). In online learning environment, students need their lecturers to be responsive and supportive by responding to students' queries promptly and developing a positive relationship with them (Martin & Bolliger, 2018). These findings suggest to enhance engagement in e-learning, where both lecturers and students need to take responsibility and putting conscientious effort as engagement does not occur automatically (Beth et al., 2015). More specifically, lecturers need to develop various strategies to increase online engagement with their students (Tao et al., 2018).

Based on four levels of e-learning engagement identified in this study, the findings disclosed male students were more engaged in e-learning activities than female students. This study supports evidence from previous findings (e.g., Adams, Tan, Sumintono, & Oh, 2020; Martin & Bolliger, 2018). DIF analysis further depicts male students

participates more actively in online activities than female students. However, despite male students outperforming their female counterparts in cognitive and emotional components of engagement, female students achieved higher levels of engagement in the behavioural components. This finding could be due to the higher level of excitement and motivation that male students have in online activities than female students (Win & Wynn, 2015). Previous findings also reported that male students preferred online learning as compared to female students who preferred traditional face-to-face learning (Yu, 2021). These findings may help instructors to carefully consider cognitive and emotional engagement aspects when teaching female students in an e-learning setting.

In terms of students' age, there was no significant difference across age groups in their e-learning engagement. This finding is contrary to a previous study that suggests students aged above 29 years old are more engaged in reading materials online and are more prepared for online classes than younger students, whereas students aged below 20 prefer completing and submitting assignments on time, and study in groups (see Adams, Tan, Sumintono, & Oh, 2020). In the literature, students' age appears as a significant factor that influences the level of both behavioural and cognitive engagement (Li & Lam, 2015). Even though no significant difference was identified within the age groups used in this present study, postgraduate students remained well prepared and prefer e-learning than undergraduate students. This result is in line with previous studies (Adams et al., 2018; Li & Lam, 2015). Postgraduate students are found to be more cognitively engaged (Li & Lam, 2015). A possible explanation for this result might be that postgraduate students are more independent and matured learners who self-regulate their learning. Most undergraduate students depend heavily on their lecturers; expecting lecturers to send regular announcements and reminders to them as compared with postgraduate students (Martin & Bolliger, 2018). According to DIF analysis, undergraduate students found it difficult in preparing themselves before attending online classes. Despite this result, undergraduate students preferred to complete assignments and submit online, and try to engage themselves more in online group work as compared with postgraduate students. These differences might indicate a generation gap in terms of digital nativity. Undergraduate students in this study grew up in the cyber age, thus they are "native speakers" of the digital language, and able to easily adapt to online classes (Wang et al., 2019).

IMPLICATIONS AND CONCLUSION

Overall findings of this study revealed students have high levels of behavioural engagement as compared with cognitive and emotional engagement in e-learning. The findings also disclosed male students were more engaged in e-learning activities than female students. However, there was no significant difference across age groups in their e-learning engagement. In terms of students' level of education undergraduate students found it difficult in preparing themselves before attending online classes. Thus, e-learning lessons needs to be developed according to students' competency, interest and skills (Adams, Tan, & Sumintono, 2020). We might be turning students into passive learners and making

them feel disconnected from their lessons if we fail to first identify their competence and needs (Adams et al., 2018; Adams, Tan, & Sumintono, 2020; Vavasseur et al., 2020). Lecturers must design their lessons that promotes student engagement in learning. They must guide their students towards a more self-directed style of learning, away from their usual preferred learning styles. Students should be guided in diagnosing their learning needs, formulating their own learning goals, and sourcing their own resources or materials for learning.

This study has several limitations. Firstly, the study was conducted only in a public in Malaysia. Thus, generalising the finding is not possible as one group of students in a public university cannot represent all students in other universities. Therefore, future studies could be conducted to other universities, both public and private, while factoring in the lecturers' perspectives as well. Secondly, the addition of qualitative data such as interviews and focus group discussions will further explore and explain the quantitative findings. Furthermore, investigating what e-learning strategies that are most effective in engaging students would add significantly to the current body of knowledge.

We conclude that the implementation of an e-learning model of instruction is closely bounded with an institution's policy and adoption practices (Adams, Tan, & Sumintono, 2020; Adams, et al., 2018). The process of transforming traditional teaching and learning into e-learning is a complex process which may involve changes in lecturers' beliefs, aptitude and attitude. Hence, academics and students alike may need to unlearn and relearn concepts of teaching and learning. As e-learning is an inevitable measure during the COVID-19 pandemic, support systems and training programmes must be in place (Rasouli et al., 2016) to ease the transitional process of students and instructors.

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