

Study on Factors that Contribute towards Open Distance Learning Contentment in Mathematics among UiTM Tapah Students: Exploratory Factor Analysis

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Abstract

The number of positive cases raised over 553 cases on the 16th March 2020. Thus, the Prime Minister of Malaysia announced a Movement Control Order (MCO) starting from 18th March to 31st March 2020. After two weeks, the teaching and learning (TnL) process implemented with a new learning policy at home through online learning and UiTM started Open Distance Learning (ODL) on 12th April 2020 in order to complete the courses in the given period. There are lack of universities practicing with ODL before including UiTM Tapah. Teaching Mathematics via online was very challenging as students are accustomed to the method of Face to Face (F2F) learning since early education. In addition, students were commonly less proficient in spelling and mathematical calculations compared to reading skills. The educators must understand students' background and identify the factors which may affect the learning process. Therefore, this study intends to identify the factors that contribute on students' contentment towards ODL during COVID-19 pandemic. A set of questionnaire constructed using Google form consists of Personal Information (5 items) and ODL information (32 items) sections. Then, the Google form link is shared via Whatsapp and Telegram application. A sample of 336 students who experienced learning Mathematics course through ODL from various faculties in UiTM Tapah were responded to the questionnaire. This study applied convenience sampling method. This study executed Descriptive Analysis and Exploratory Factor Analysis (EFA). It found that there are five factors that contribute towards ODL Contentment in Mathematics among UiTM Tapah students which were Online Learning Readiness, Self-Directed Learning, Technologies, Internet, and Tools, Skills and Acceptance and Motivation for Learning.

Keywords: COVID-19, Open Distance Learning, Mathematics, Exploratory Factor Analysis

Introduction

The World Health Organization (WHO) announced a new epidemic outbreak recognized as SARS-CoV-2 then it officially named as coronavirus disease 2019 (COVID-19) on the 12th January 2020 (Allam et al., 2020). The first case of COVID-19 was found in Malaysia and traced back to three Chinese nationals who previously had close contact with an infected person in Singapore (Clark et al., 2021; Hoofman & Secord, 2021). Meanwhile the first Malaysian was confirmed with COVID-19 on the 4th February 2020. The 41-year old man had recently returned from Singapore when he started to develop a fever and a cough. He was quarantined at Sungai Buloh Hospital, Selangor (Yahya et al., 2021). As the number of positive cases raised over 553 cases on the 16th March 2020. Thus, the Prime Minister of Malaysia announced a Movement Control Order (MCO) starting from 18th March to 31st March 2020 (Ministry of Health Malaysia, 2020). Hence, the top management of every sector made quick and relevant decisions about their operations.

The higher education institutions and universities' management very concerned on this urgency of MCO and directed all universities' students return to their home. After two weeks, the teaching and learning (TnL) process among many universities just started to be implemented with a new learning policy at home through online learning where majority of higher education institutions dealing with Open Distance Learning (ODL) during this pandemic (Noor et al., 2020). Distance learning refers to a method of delivering contents and interaction between educators and learners through online communication technologies and tools (Stauffer, 2020).

The transformation of learning style form face to face (F2F) to ODL changed the education process among the academicians and students. This dramatic change is an effort from government to protect communities from being a victim of this pandemic while education learning needs to be continued (Shah et al., 2021). There are lack of universities practicing or experiencing with ODL before including UiTM Tapah. However, educators and learners are responsible to complete the courses in the given period through ODL (Aziz et al., 2021). Regardless they had no alternative to engage with learning activities except the ODL to complete their courses. UiTM started ODL on 12th April 2020. Prior to fully adopted ODL, blended learning (BL) was used to particular courses by integrating F2F and online TnL. However, the overall contentment towards the BL practices are still low (Abu Seman et al., 2019).

Mathematics is a core subject that has come to people apprehension. In Mathematics, educators previously teaching in F2F way using many symbols and formulas that they are used to writing on whiteboard for their students to see and understand (Okoye et al., 2021). In contrast to ODL, it is recognized that students who do not self-regulated in learning will face difficulties in engaging online learning, comprehension problems in Mathematics and tend to receive incorrect instructions from the educators. That is the reason why Mathematics achievement has often been focused because it considered as a tough subject. The shift to online learning during the COVID-19 pandemic was a big challenge among academicians (Kuhfeld et al., 2020). Educators must address students' challenges and obstacles during online learning activities by understanding students' backgrounds and identifying factors that can influence the learning process. Therefore, this study aimed to identify the factors that contribute to students' contentment towards ODL in learning Mathematics during the COVID-19 pandemic.

Literature Review

Since COVID-19 outbreak has hit in 2019, the education division has almost completely changed the way of TnL from all levels. Due to this situation, most of the education division practiced an online TnL process instead of physical meeting before (Clark et al., 2021; Hoofman & Secord, 2021). Generally, the main purpose of education is to convey knowledge and information. The transition of TnL requires educators to communicate actively with their students, encourage them to participate and enjoy the TnL process even they came from various areas and conditions (Rafique et al., 2021; Yahya et al., 2021; YM et al., 2021). Distance learning may facilitate a pedagogical transition from an educator centered approach to a learner centered approaches where the students closely interact with their educators and other students (Shah et al., 2021; Veronika et al., 2021).

Teaching Mathematics via online was very challenging as students are accustomed to the method of F2F learning since early education (El Refae et al., 2021; Nugroho et al., 2021). It found that students were commonly less proficient in spelling and mathematical calculations skills compared to reading skills (Kuhfeld et al., 2020; Pavlovic et al., 2021). Thus, educator plays an important role to diversifying teaching methods creatively in order to attract student's attention and participation during online class session. (Chukwuemeka et al., 2021; Okoye et al., 2021). Besides, students must had additional efforts such as watching online lectures on YouTube or purchase optional remote learning sources such as question banks (El Refae et al., 2021).

Contentment refers to a pleasant feeling when people received something they wanted or when people have done something they wanted to do (Cambridge Advanced Learner's Dictionary, 2008). The ODL contentment refers to student's perceived value of their educational experiences (Astin, 1993). It depends on the attitudes and perceptions that could be influenced by other factors. There are several factors leading to the level of contentment among students in ODL. Some studies have reported the quality of distance learning technologies and tools (Haddad et al., 2014), the method and approach of teaching styles (Cheng et al., 2017), and skills and acceptance (Kamalluarifin et al., 2018) can affect the ODL contentment among students.

A study by El Refae et al. (2021) and Okoye et al. (2021), it found that technology readiness, self-directed learning, learner control and online communications contributed to the ODL contentment in Mathematics. Another study by Chukwuemeka et al. (2021) revealed that students in Pakistan were motivated to learn online, more receptive to new ideas and willing to interact among their classmates throughout online learning since the first lockdown announced by their government. For first year students, a "Campus Free" approach was introduced to ensure students are mentally, emotionally and physically prepared to online learning so that they keep happy and motivated with ODL learning style (Zafar & Dayat, 2000).

Besides, it is undeniable the important of a good online devices and internet connection to the contentment of ODL among students (Yusof & Ahmad, 2012; Haddad et al., 2014). Furthermore, it is important to make students more comfortable in online learning at a minimum usage of internet data and device specification (Chukwuemeka et al., 2021; Nugroho et al., 2021; Saidi et al., 2021) . Thus, the role of parents to provide advice and assistant, educators to motivate and to innovate the learning process and classmates able to communicate and discuss the learning topics or assignment in order to maintain the stability of student's learning motivation (Luca et al., 2021; Maboe, 2017; Shahrivini et al., 2021).

Methodology

This study performed primary data collection by initially constructing a set of questionnaires using Google form consists of two sections which are Personal Information and ODL information. Overall, there are five questions in the first section and 32 questions in the second section. In order to validate the statements of questionnaire, the research members have shared the Google form link via Whatsapp application together with the feedback form to some experts such as educators and students, then they reviewed that questionnaire. The questionnaire was amended based on the experts' comments and suggestions. The questionnaire designed using 5-point Likert scale representing a level such 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree.

The population in this study is the entire diploma students who enrolled in UiTM Tapah who experienced learning Mathematics course through ODL. A sample of 336 students who experienced learning Mathematics course through ODL from various faculties in UiTM Tapah were responded to the questionnaire. This study applied convenience sampling method because it is incredibly prompt, uncomplicated, and economical. The factors involved is displayed on Figure 2.

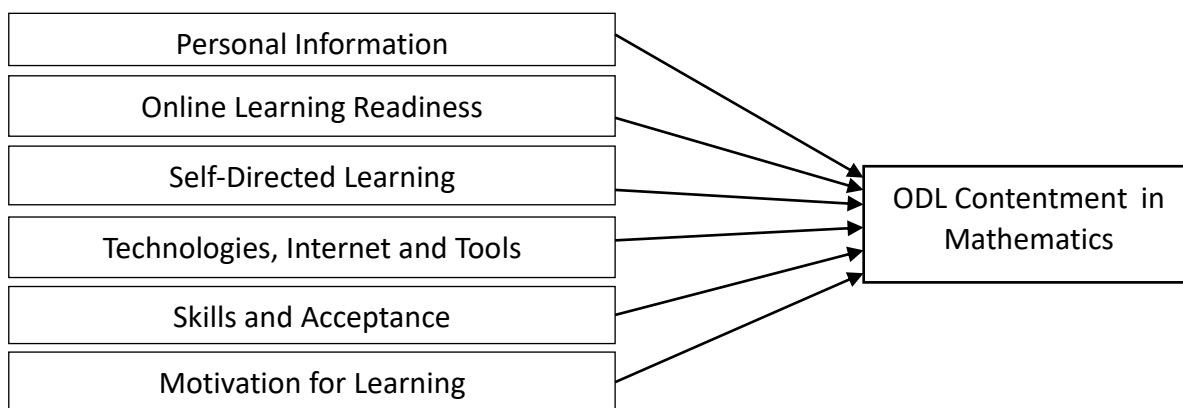


Figure 1. Conceptual Framework on ODL Contentment

This study executed two analyses which are Descriptive Analysis and Exploratory Factor Analysis (EFA) using IBM SPSS Statistics software. Descriptive Analysis is presented the Personal Information in term of frequency and percentage. The EFA begin by testing for normality using skewness statistic for each item followed by component extraction and testing for reliability. Normality test is performed to determine whether a dataset is modeled for normal distribution. This study considered skewness statistic to measure the asymmetry of each item. The normality assumption is fulfilled when skewness statistic lies between range -1 and 1 (Aziz et al., 2018; Zulkipli et al., 2018).

To ensure the data is relevant for EFA this study take into account Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. KMO statistic varies between 0 and 1. According to (Kaiser, 1974), it recommended accepting KMO statistic greater than 0.5 as barely acceptable. KMO values less than 0.5 should lead to more data collection or choosing variables to include. It described KMO statistic between 0.5 and 0.7 is mediocre, between 0.7 and 0.8 is good, between 0.8 and 0.9 is great, and more than 0.9 is superb. Then, Bartlett's Test of Sphericity is considered and it significant at p-value less than 0.001. It means that adequate correlation among items to proceed with factor analysis (Field, 2000).

The reliability of the questionnaire is then assessed using the Cronbach's Alpha statistic. If the statistic is greater than 0.7, it explained that all items enter in each factor are

reliable for further analysis and it pointed out that all factors extracted also reliable measuring the consistency of respondents responses (Chinna, 2009; Nunally 1978). For Component extraction procedure, it assumed adequate for further analysis when the total variance obtained is at least 50% (Habidin et al., 2015; Zakuan, 2009; Streiner, 1994). This study also considers at least 0.4 loads for every item to be included in an underlying factor (Aziz et al., 2018; Zulkipli et al., 2018).

Statistical Analysis

Descriptive Analysis

Table 1 showed the frequency and percentage of each attribute that represents the respondents' background in this study. Majority of respondents were female by 74.4% (250 respondents) and the remaining 25.6% (86 respondents) were male. According to age group, majority of the respondents aged between 18 and 20 years old by 81.5% (274 respondents) meanwhile the rest was aged between 21 and 23 years old by 18.5% (62 respondents). Referring to faculty, most of the respondents were from Faculty of Computer and Mathematical Sciences (FSKM) by 60.1% (202 respondents) followed by Faculty of Applied Sciences (FSG) by 28.9% (97 respondents) and another 11% (37 respondents) from Faculty of Accountancy (AC). It found that almost half of total respondents were from part 3 by 49.4% (166 respondents) followed by part 1 by 25% (84 respondents), part 5 by 12.5% (42 respondents), part 2 by 6.8% (23 respondents) and part 4 by 6.3% (21 respondents). For location of ODL, more than half of students performed their ODL at home where located in urban area by 51.8% (174 respondents) meanwhile respondents who their home located at rural area by 46.7% (157 respondents) and only 1.5% (5 respondents) performed their ODL in campus college. For internet access performance, half of respondents which was 51.8% (174 respondents) rated good followed by 28.9% (97 respondents) rated very good, 9.2% (31 respondents) rated poor, 8.6% (29 respondents) rated excellent and only 1.5% (5 respondents) rated very poor connection. By describing the most preferred online teaching method in learning Mathematics, it found that majority of the respondents which was 74.4% (250 respondents) preferred Pre-recorded (video) lecture uploaded to any online platform followed by 19.6% (66 respondents) preferred Zoom/Google meet/Webex, 5.4% (18 respondents) preferred Whatsapp/Telegram and another 0.6% (2 respondents) preferred Microsoft team.

Table 1

Descriptive Analysis of Personal Information

Factors	Attribute	Frequency	Percentage (%)
Gender	Male	86	25.6
	Female	250	74.4
Age group (years)	18 – 20	274	81.5
	21 - 23	62	18.5
Faculty	AC	37	11.0
	FSG	97	28.9
	FSKM	202	60.1
Part	1	84	25.0
	2	23	6.8
	3	166	49.4
	4	21	6.3
	5	42	12.5
Location of ODL	College	5	1.5
	Home (urban area)	174	51.8
	Home (rural area)	157	46.7
Internet access performance	Excellent	29	8.6
	Very good	97	28.9
	Good	174	51.8
	Poor	31	9.2
	Very poor	5	1.5
Online teaching method preference	Pre-recorded (video) lecture uploaded to any online platform	250	74.4
	Zoom/Google meet / Webex	66	19.6
	Microsoft team	2	0.6
	Whatsapp/Telegram	18	5.4

1. Testing for Normality

Table 2 showed that all skewness statistics fall within the range -1 and 1. It claimed that the data was normally distributed and qualified to continue with EFA.

Table 2

Skewness Statistic of Each Item

Item	Skewness Statistics	Item	Skewness Statistic
Q1	-0.392	Q17	-0.280
Q2	-0.230	Q18	-0.115
Q3	-0.369	Q19	-0.087
Q4	-0.754	Q20	-0.282
Q5	-0.422	Q21	-0.016
Q6	-0.170	Q22	-0.178
Q7	0.266	Q23	-0.175
Q8	0.049	Q24	-0.063
Q9	-0.222	Q25	-0.861
Q10	0.102	Q26	0.203
Q11	0.063	Q27	-0.782
Q12	-0.033	Q28	-0.735
Q13	-0.621	Q29	-0.186
Q14	-0.062	Q30	-0.697
Q15	-0.093	Q31	-0.618
Q16	-0.076	Q32	-0.031

2. Exploratory Factor Analysis

Exploratory factor analysis (EFA) is a part of multivariate statistical methods purposely to identify the smallest number of factors or known as latent variables. In addition, it used to identify the common factors that explain the order and structure among measured variable. Based on Table 3, Kaiser-Meyer-Olkin (KMO) showed the sampling adequacy as 0.913 greater than 0.5. It determined the sampling adequacy of data that are to be used for factor analysis. Then, Bartlett's Test of Sphericity, was significant at p-value lower than 0.001, indicating sufficient correlation among items to proceed with the factor analysis as well.

Table 3

Result of KMO and Barlett's Test

Test	Statistic
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	0.913
Bartlett's Test of Sphericity:	
Approximation Chi-Square	5597.736
Degree of freedom	496
p-value	0.000

Five factors in initial solution was generated as presented in Table 4 where the factors contributed 58.3% from the total variance which is adequate for further analysis since it greater than 50%. It also stipulated that the variance explained by extraction solution was 58.3%. Hence, no doubt that total of five factors were accepted. This study accepted items with a minimum 0.4 loading to be included in a particular factor. The first factor named as Readiness made up of the 7 items. For second factor named as Self-learning ability made up of 10 items. Meanwhile, factor three, four and five named as Computer and internet facilities, Challenges and Motivation were made up of five items respectively.

Table 4

Component Extraction

Factor	Factor's name	Item	Factor Loading	Factor	Factor's name	Item	Factor Loading		
1	Online Learning Readiness	6	0.678	3	Technologies, Internet and Tools	1	0.731		
		7	0.797			2	0.662		
		8	0.763			3	0.750		
		15	0.571			4	0.774		
		16	0.833			5	0.699		
		17	0.580			4	Skills and Acceptance	9	0.824
		18	0.806					10	0.812
		2	Self-Directed Learning					19	0.545
20	0.572			12	0.723				
21	0.507			14	0.456				
22	0.442			5	Motivation for Learning	13	0.400		
23	0.590					25	0.405		
24	0.625					27	0.795		
26	0.739					28	0.635		
29	0.401					31	0.604		
30	0.493								
32	0.667								

Reliability

Table 5 showed the Cronbach's Alpha statistic for each factor. The Cronbach's Alpha statistic for Factor 1 (Online Learning Readiness), 2 (Self-Directed Learning), 3 (Technologies, Internet and Tools), 4 (Skills and Acceptance), and 5 (Motivation for Learning) were 0.899, 0.867, 0.844, 0.808, 0.733 respectively. These values were greater than 0.7 presented that the questionnaire constructed was reliable indirectly it pointed out that all factors extracted also reliable measuring the consistency of respondent's perceptions.

Table 5

Testing for Reliability

Factor	Cronbach's Alpha statistic
1	0.899
2	0.867
3	0.844
4	0.808
5	0.733

Conclusion

As a conclusion, this study found that there are five factors that contribute on Students' Contentment towards Open Distance Learning in Mathematics. The set of questionnaires is classified according to relevancy of items that represent those particular factors such as Factor 1 (Online Learning Readiness), 2 (Self-Directed Learning), 3 (Technologies, Internet and Tools), 4 (Skills and Acceptance), and 5 (Motivation for Learning). In addition these factors are reliable and consistent to be used for quantitative analysis such as Confirmatory Factor Analysis in the future.

It is hoped both educators and students have better in understanding the concept of ODL and work towards empowering the teaching and learning process in Mathematics.

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