The Relationship between Students' MOOC-efficacy and Meaningful Learning

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Abstract: This research explored two important constructs in 21st century e-education—students' MOOC-efficacy and meaningful learning among undergraduate students in selected public universities in Malaysia. Its main objective was to examine the causal relationship of students' MOOC-efficacy on meaningful learning. The study conceptualized students' MOOC-efficacy in four dimensions (i.e. information searching, making queries, MOOC learning, and MOOC usability), while conceiving meaningful learning as having five dimensions (i.e. cooperative learning, active learning, authentic learning, constructive learning, and intentional learning). This research applied cross-sectional survey design. Data were collected with a 52-item questionnaire whose reliability indexes ranged from 0.822 to 0.890 for the dimensions. The study's population was identified as university students who have had some experience with MOOCs and who willingly volunteered to participate in the research. A sample of 603 respondents was drawn through simple random sampling. The full-fledged Structural Equation Modeling (SEM) was adopted for data analysis. The finding indicated that students' MOOC-efficacy was positively associated with meaningful learning. The results show that students' MOOC-efficacy explains 67% of the variance in meaningful learning. The fit indices indicate an adequate fit: RMSEA = 0.041, CFI = 0.923 and $\chi2/df$ = 2.067. The finding provides further insights into what works in an open online environment. The insights may be used to fulfill learners' needs and preferences. MOOC-efficacy interventions are crucial in order to encourage students' meaningful learning in the e-learning platform.

Keywords: Massive Open Online Course (MOOC), meaningful learning, students' MOOC-efficacy

1.   Introduction

The ninth shift of the Malaysia Education Blueprint 2015 – 2025 by Ministry of Higher Education (2015) focussed on Globalized Online Learning, which was introduced to achieve the desired outcomes set by the National e-Learning Policy (Dasar e-Pembelajaran Negara or DePAN) (Noor & Aziz, 2020). Thus, the increasing use of e-learning in advanced higher education has led to the establishment of Massive Open Online Courses (MOOCs), a learning platform that is quickly attracting

global attention. MOOCs are relatively recent when it comes to online education, which promote internet-based courses and the utilization of online open education resources (Dunn & Kennedy, 2019; Gómez-Galán et al., 2020). MOOCs have been identified as a potential innovation for improving traditional teaching and learning in order to respond to the technologically-driven environment of 21st century education (Almahdi et al., 2017). They are being widely accepted due to their applicability in different learning environments, flexibility in student learning, and accessibility in the contexts of pursuing education and enhancing professional development (Ministry of Education Malaysia, 2015). Due to the recent development and exploratory nature of the MOOC initiative in Malaysia, it is clear that there are many issues to be identified and improvements to be done. Notwithstanding, the gaps in the current MOOC initiatives show plenty of room for improvements (Adzhar et al., 2017; Daneji et al., 2019; Ghazali & Nordin, 2018).

Although MOOCs are utilized throughout the world, they face two major challenges, namely poor completion rates (reported to be between 5% and 15%) and high dropout rates (Almahdi et al., 2017; Goh, 2017; Greene et al., 2015; Jordan, 2013). One of the reasons why MOOCs have had such low completion rates and high dropout rates is the lack of positive self-efficacy beliefs among the course takers (Branson, 2017; Wang & Baker, 2015). Nordin et al. (2015) in their research on MOOC acceptance in Malaysia revealed that more than half of the students felt that they could not complete the tasks in MOOCs if no instructor was present to instruct and guide them. It was discovered that more than half of the students (50.9%) had low levels of MOOC efficacy and were not able to perform the learning tasks without explicit supervision.

Students' self-efficacy beliefs are critical to the success of MOOCs as an online learning model (Branson, 2017; Pilli & Admiraal, 2017; Wang & Baker, 2015). Students' self-efficacy is defined as students' perception of their own ability to perform specific tasks successfully (Bandura, 2000; Rodriguez & Armellini, 2017). As a descriptor of students' effort, motivation, participation, and achievement, self-efficacy is an important construct that can give us a deeper understanding of MOOC completion. Basically in the Malaysian context, most studies on MOOCs concentrated on perceptions, acceptance and challenges (e.g. Ahmad Dahlan et al., 2015; Daneji et al., 2018; Fadzil et al., 2015; Goh, 2017; Nordin et al., 2015), leaving much gap for a large exploration of self-efficacy in MOOCs (Almahdi et al., 2017; Ghazali & Nordin, 2018).

The findings of earlier studies show that self-efficacy plays a very significant role in determining students' behaviour, performance, achievement and learning (Abdullah et al., 2015; Bandura, 2000). Previous researchers have recommended exploring whether students' MOOC-efficacy would influence their experience of meaningful learning (Ghazali & Nordin, 2018; Hood et al., 2015; Pilli & Admiraal, 2017). The recommendations were made in lieu of the importance of creating a meaningful learning environment in MOOCs (Ministry of Education Malaysia, 2015; Tharmabalan, 2016), which could also facilitate 21st century learning (Hashim, 2014). Meanwhile, Koh (2017) also proposed a more rigorous examination of self-efficacy in blended learning courses and its relationship with the various meaningful learning dimensions. There have been a few studies published on best practices in technology use in an online environment to achieve meaningful learning (e.g. Hamdan et al., 2015; Sailin & Mahmor, 2018), but there is limited research exploring the relationship between self-efficacy in a MOOC platform and meaningful learning.

Therefore, this research aims to examine whether students' MOOC-efficacy on higher education exhibits an influence on meaningful learning. The research question and hypothesis of the research are stated below:

Research Question: Does students' MOOC-efficacy influence meaningful learning experience?
Hypothesis: Students' MOOC-efficacy is positively associated with meaningful learning.

1.1   Conceptual Framework

The conceptual framework of the present research was developed with the purpose of explaining the study's main theoretical component namely students' MOOC-efficacy, and connecting it to meaningful learning. This conceptual framework represents the extended version of the Self-efficacy in Internet-Based Learning Environment scale, or SIBLE (Chen, 2014) and the meaningful

learning framework of Howland et al. (2013). In this research, students' MOOC-efficacy refers to students' capabilities and beliefs to perform specific learning tasks in MOOCs while meaningful learning would stimulate students' intellectual curiosity and engagement in dynamic instructional activities.

The SIBLE scale (Chen, 2014) was adapted to measure students' MOOC-efficacy. In the present research, it is conceptualized as having four important dimensions: (i) information searching; (ii) making queries; (iii) MOOC learning, and iv) MOOC usability. The SIBLE scale is found to be suitable for capturing the elusive concept of perceived self-efficacy because it possesses reliable psychometric properties and assesses a wide range of competencies which are important for a virtual learning environment (Chen, 2014; Cheng & Tsai, 2011; Ching et al., 2014). SIBLE was developed from a combination of two survey instruments, one of an online academic help seeking (OAHS) behaviour and the other, a web-based learning self-efficacy (WLSE).

Empirical evidence is given to support the influence of self-efficacy on students' behaviour, performance, achievement and learning (Abdullah et al., 2015; Bandura, 2000; Rodriguez & Armellini, 2017; Zimmerman, 2000). The present research seeks to examine the influence of students' MOOC-efficacy on meaningful learning. This research finding falls in line with previous research recommendations which attempts to identify whether significant differences in students' MOOC capabilities would influence their ability to self-regulate their learning, hence making it meaningful (Ghazali & Nordin, 2018; Hood et al., 2015; Koh, 2017; Pilli & Admiraal, 2017). Any pedagogical use of technology, like MOOCs, should allow students to experience meaningful learning (Mas Nida, 2016; Howland et al., 2013).

Howland et al.'s (2013) meaningful learning framework that has five dimensions, namely (i) cooperative learning, (ii) active learning, (iii) authentic learning, (iv) constructive learning, and (v) intentional learning, was adopted in this research. Meaningful learning features an appropriate understanding on how a set of information learnt fits together. It is the opposite of rote learning which is the memorization of information based on repetition. Meaningful learning combines several teaching and learning activities that allow students to collaborate, develop knowledge, reflect on the activities, and articulate the information gained in them (Ghazali & Nordin, 2019; Omar et al., 2019; Sailin & Mahmor, 2018).

1.2   Literature Review

Recent developments and the exclusive characteristics of MOOCs have led students to feel isolated, lonely and not connected (Almahdi et al., 2017; Kilgore & Lowenthal, 2015) thus, indicating the need for students to be responsible for their own learning and knowing their capabilities through the learning process in MOOCs (Fadzil et al., 2016; Nordin et al., 2015). With reference to the previous discussion, student's self-efficacy is defined as a student's perception of his or her own ability to perform a specific task successfully (Albert Bandura, 1986; Cartwright & Atwood, 2014; Gopal et al., 2018; Rodriguez & Armellini, 2017). Students' MOOC-efficacy in the context of this research refers to students' beliefs in their capabilities to perform a specific learning task in the context of MOOCs. Students in this research refer to those who are in the Malaysian Higher Education Institutions. Students' MOOC-efficacy in this research was measured and conceptualized in four dimensions: (i) information searching; (ii) making queries; (iii) MOOC learning and iv) MOOC usability, all of which were adapted from the Internet-Based Learning Environment scale (SIBLE) (Chen, 2014). The operational definition on the underlying dimensions of the students' MOOC-efficacy in this research is presented in Table 1 below.

Table 1. Operational Definition of Four Dimensions of Students' MOOC-efficacy

Dimensions	Operational Definitions
Information searching (IS)	Students' capabilities to search through the massive materials and volumes of input given by the MOOC instructor and other learners for relevant information, and extract the information using the

	various MOOC features provided (adapted from Chen, 2014; Goh, 2017; Nordin et al., 2015; Rodriguez & Armellini, 2017).
Making Queries (QU)	Students' capabilities to make queries from the relevant MOOC features and support systems. Students are required to know how to seek academic help and pose questions to progress in their learning in MOOCs (adapted from Almahdi et al., 2017; Chen, 2014; Fadzil et al., 2016; Nordin et al., 2015).
MOOC Learning (ML)	Students' capabilities to engage with the massive number of learners and learning materials. This dimension also gauges the students' capabilities to learn in an open online learning environment (adapted from Almahdi et al., 2017; Chen, 2014; Fadzil et al., 2015, 2016; Nordin et al., 2015).
MOOC Usability (MU)	Students' capabilities to use the learning features in the MOOC platform. This dimension attempts to quantify the degree of students' capabilities to engage with the content and learning tasks in the MOOC platform (adapted from Almahdi et al., 2017; Chen, 2014; Fadzil et al., 2015, 2016; Nordin et al., 2015).

The empirical evidence obtained somehow concludes that an individual's self-efficacy beliefs have a powerful effect on his or her behaviour or performance. Bressington et al. (2018) conducted a study on the concept-mapping approach among mental health nursing students. The findings of the study concluded that the approach used would help students to relate theory with practice which improved their learning self-efficacy and encouraged meaningful learning. Another study by Gurcay and Ferah (2017) proved that the improvement in students' individual self-efficacy increased their tendency for meaningful learning. Successful self-efficacy intervention conducted in the research by Erozkan (2014) also resulted in more meaningful art exploration. Highly efficacious students engage in their learning by fostering the development of their knowledge and skills, exerting efforts in the face of difficulties and sustenance in facing challenging tasks, in order to develop meaningful learning.

Previous scholars have recommended investigating the possibility of students' MOOC capability on influencing their experience of meaningful learning (Ghazali & Nordin, 2018; Hood et al., 2015; Pilli & Admiraal, 2017). Recent research by Koh (2017) also proposed a more rigorous examination of self-efficacy in blended learning courses and its relationship with the various meaningful learning dimensions. A well-designed MOOCs encourage meaningful learning among students (Rodriguez & Armellini, 2017). Meaningful learning stimulates students' intellectual curiosity and engages them in dynamic instructional activities, thus encouraging the growth of holistic human characteristics which are in line with the 4.0 industrial revolution (4IR) (Selamat et al., 2017) and 21st century learning (collaboration. communication, critical thinking and creativity) (Hashim, 2014; Sailin & Mahmor, 2018). Therefore, meaningful learning has been selected as a factor for human behaviour or performance to be explored in the present research. The researcher aims to determine whether students' MOOC-efficacy would influence their experience of meaningful learning. The findings of the research may afford insights into the pedagogical aspect of MOOCs and the deficiencies of the instructional model used in open learning environments, as highlighted by Fasihuddin et al. (2013).

Ausubel (1963) who was a cognitive psychologist, explained that meaningful learning involves students in an active process of meaning-making where they interpret their learning experiences cognitively rather than regurgitate information. Meaningful learning is about how a person learns, the description of an instructional activity and how it should be organized. Meaningful learning occurs within "knowledge construction, not reproduction; conversation, not reception; articulation, not repetition; collaboration, not competition; and reflection, not prescription" (Jonassen et al., 2003). Meaningful learning involves understanding how the information learnt fits together, while rote learning is the memorization of information based on repetition. Therefore, rote learning is forgotten rapidly whereas meaningful learning is not (Ausubel, 1963). Recently, several studies tried to integrate technological advancement into the educational landscape in order to support meaningful learning (e.g. Hamdan et al., 2015; Koh, 2013, 2017; Sailin & Mahmor, 2018).

The underlying dimensions of meaningful learning for the research were adopted from Howland et al.'s (2013) meaningful learning framework that has five dimensions, namely: (i)

cooperative learning, (ii) active learning, (iii) authentic learning, (iv) constructive learning, and (v) intentional learning. The underlying dimensions of the meaningful learning construct in this research are presented in Table 2 below.

Table 2. Operational Definitions of the Five Dimensions of Meaningful Learning

Dimensions	Operational Definitions
Cooperative learning (CL)	Students' willingness to interact with the instructors and collaborate with other learners in the learning process (adapted from Howland et al., 2013; Koh, 2013, 2017).
Active learning (AL)	Students' willingness to participate in learning activities and explore new information throughout the learning process (adapted from Howland et al., 2013; Koh, 2013, 2017)
Authentic learning (UL)	Students' ability to relate what they have learned to daily life experiences and real-world phenomena. This dimension measures students' ability to recognize genuine real-world problems and look for solutions to problems (adapted from Hamdan et al., 2015; Howland et al., 2013; Koh, 2013, 2017).
Constructive learning (OL)	Students' ability to create a new understanding by integrating prior knowledge with new knowledge, articulate what they have learned, and reflect on the learning process (adapted from Embi & Hamat, 2014; Howland et al., 2013; Koh, 2013, 2017).
Intentional learning (IL)	Students' ability to set their own learning goals, regulate learning, identify gaps in understanding and resolve their lack of content understanding discovered in the learning process (adapted from Howland et al., 2013; Koh, 2013, 2017).

2. Materials and Methods

This research was purely quantitative in nature employing the cross-sectional survey design. The data was collected through a structured survey questionnaire.

2.1 Measures

In developing the items of students' MOOC-efficacy and meaningful learning, the following steps and procedures were adapted from The Standards for Educational and Psychological Testing (American Psychological Association, 2014.). Content validity ratio (CVR) is used for measuring the content validity for both scales. The pilot study was administered to two hundred and eighty-nine (n = 289) students who volunteered to fill in the questionnaire. The pilot study was intended to check whether the items were clear in meaning to respondents and to establish the instrument's construct validity and reliability. The data from the pilot sample were analyzed to examine construct validity and reliability of the instrument. The data collected in the pilot study were subjected to an Exploratory Factor Analysis (EFA) and reliability. The findings of the analysis suggest that the 52-items loaded well into four dimensions to represent students' MOOC-efficacy and five dimensions to measure students' meaningful learning. The measurement instrument achieved acceptable reliability ranging from 0.822 to 0.890 (students' MOOC-efficacy) and 0.838 to 0.885 (meaningful learning) (Ghazali et al., 2020) respectively.

2.2 Respondents

The data collection was conducted in three public Universities in Malaysia (i.e. Universiti Putra Malaysia (UPM), Universiti Sains Islam Malaysia (USIM) and Universiti Teknologi Mara (UTM)). The

study population was identified as university students who have had some experience with MOOCs and who willingly volunteered to participate in the research (N=1,524). The population was decided as such so that the study could have a clear sampling frame to make simple random sampling possible.

To maximize the precision in parameter estimation, four factors were considered in deciding the sample size for this research: the population size, an acceptable margin of error, the complexity of the hypothesized model and the required confidence level. These factors were decided based on the number of latent variables, indicators and path relationships present in the model (Kline, 2011). Previous scholarly literature contains some rules for estimating the minimum sample size needed in providing satisfactory statistical power in the analysis of the data. The present research accepted a 5% margin of error together with a 95% confidence level. The targeted sample size was calculated based on the target population size of this research (N=1,524)); therefore, the sample should be 95% ±5 = 306 based on Krejcie and Morgan's (1970) guidelines for deciding minimum sample size.

Subsequently, using a random generation of numbers in SPSS, the researcher selected 50% of students in the sampling frame (n = 1,524 students) as respondents in order to obtain adequate data to make up for possible missing respondents. In total, 762 copies of the questionnaire were distributed. At the start of the data collection, the researcher gave a short briefing to explain the research, its purpose and how to respond to lecturers and students. Students were given 15 minutes to complete and return the questionnaire as soon as possible. The time was sufficient for them to respond on the spot, thereby minimising the risk of losing the questionnaire.

2.3 Data Analysis Strategy

The data collected was analysed using Structural Equation Modeling (SEM). The full-fledged SEM approach was applied in this research to estimate the hypothesized conceptual model of students' MOOC-efficacy and meaningful learning. SEM is able to estimate the chains of direct and indirect causal influences among variables by simultaneously introducing them into a structural model (Baleghi-Zadeh et al., 2014; Hair et al., 2010). It enables the researcher to test a series of causal relationships between the independent and dependent variables (Ho, 2006) compared to the first generation methods such as the multiple regression analysis (Byrne, 2013). In the context of this research, the researcher examined the relationship between students' MOOC-efficacy and meaningful learning by using SEM. Cohen et al. (2013) agreed that the use of multiple regression is not realistic or feasible because it has restricted capacity to find results for linear relationships between constructs or variables. In such cases, multiple regression analysis may yield misleading results. The most important characteristic of SEM is its ability to evaluate the influence of multiple and interrelated variables simultaneously.

3. Results

3.1 Demographic Information

Out of the 762 questionnaires distributed, 657 were returned, constituting a response rate of 86.22%. However, 34 questionnaires were not usable as they contained missing data. According to Sekaran and Bougie (2016), a 75% return rate is required for a research to fulfil its purpose and objectives. Thus, the return rate of 81.76% (n = 623) obtained in the study was more than desirable. According to Kline (2011), 200 is commonly used for a SEM analysis in educational research, while Hair et al. (2010) suggested a minimum sample size of 100 to 150 to guarantee a stable maximum likelihood estimation. After the detection of outliers process, the data set leaving a final sample of 603 to be analyzed. A demographic profile of the respondents is presented in Table 3.

Table 3. Demographics of the sample (N=603)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	201	33.3
	Female	402	66.7
	Less than or equal 20 years	111	18.5
Age	21 to 23 years	426	70.6
	24 to 26 years	63	10.4
	More than 26 years	3	0.5
	UPM	278	46.1
University	UITM	218	36.2
	USIM	107	17.7
	Malay	569	94.4
Race	Chinese	15	2.5
	Indian	9	1.5
	Others	10	1.6
	Islam	575	95.3
Religion	Buddhism	10	1.7
	Hinduism	9	1.5
	Others	9	1.5

Note. UPM means Universiti Putra Malaysia; UITM means Universiti Teknologi Mara; USIM means University Sains Islam Malaysia.

3.2 Association between students' MOOC efficacy and meaningful learning

The resultant structural model of students' MOOC-efficacy and meaningful learning, together with the standardized estimates and fit indices obtained is shown in Fig. 1. The fit indices indicate an adequate fit: RMSEA = 0.041, CFI = 0.923 and $\chi2/df$ = 2.067. In this study, the squared multiple correlation (SMC) or $R2$ of the structural model on students' MOOC-efficacy and meaningful learning is 0.67 (presented in Table 4). The results show that students' MOOC-efficacy explains 67% of the variance in meaningful learning.

Table 4. The result of analysis for the hypothesized model

Endogenous Variable	Determinant	Hypothesized Model	
		SMC	Coefficient
MNL	SE	0.67 (67%)	0.82

Note. MNL means meaningful learning; SE means students' MOOC-efficacy; SMC (Squared Multiple Correlation).
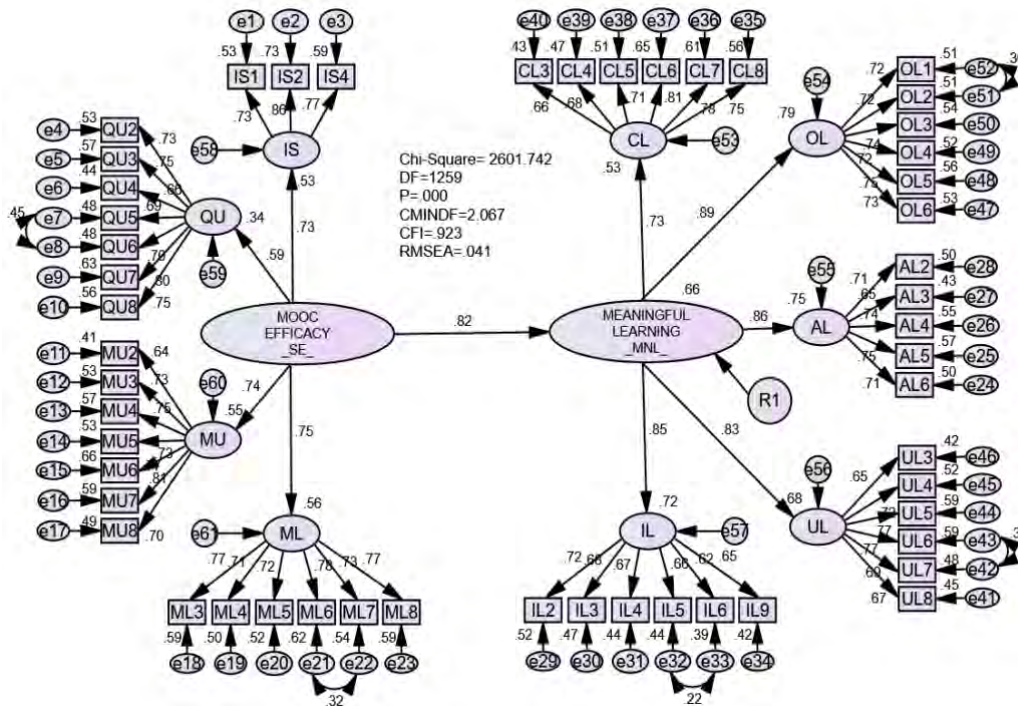
Fig. 1 The structural model of students' MOOC-efficacy and meaningful learning

The hypothesis of this research was tested using SEM via the AMOS platform. The structural model assessment, shown in Table 5, provides the results of the hypothesis tests. Table 5.0 shows that the C.R and p-value of students' MOOC-efficacy in predicting meaningful learning are 10.298 and <0.000, respectively. It means that the probability of getting a t-value as large as 10.298 in absolute value is <0.000. In other words, the regression weight for students' MOOC-efficacy in predicting meaningful learning is strong and significantly different from zero at the 0.000 level. Therefore, the hypothesis of this research is supported. Further, the path coefficient is 0.82, indicating a positive relationship. In other words, when students' MOOC-efficacy increases by 1 standard deviation, meaningful learning too increases by 0.82 standard deviation.

Table 5. Hypothesis testing results of the structural model for students' MOOC-efficacy and meaningful learning

H	Exog.		Endo.	Estimated	C.R	P-Value	Status	Result
H1	SE	⮕	MNL	0.82	10.298	0.000	Sig.	Supported

Note. MNL means meaningful learning; SE means students' MOOC-efficacy; SMC (Squared Multiple Correlation).

4. Discussion

The research question probed into the causal relationship between students' MOOC-efficacy and meaningful learning, which was tested in the Hypothesis: Students' MOOC-efficacy is positively associated with meaningful learning. The results show that the path coefficient between these two constructs was practically important and statistically significant. For that reason, the structural analysis of the model supported the study's hypothesis, which postulated that students' MOOC-efficacy would have a significant positive impact on meaningful learning experience.

The findings of earlier studies showed that self-efficacy plays a very significant role in determining students' achievement, motivation and learning (Abdullah et al., 2015; A. Bandura, 2000; Zimmerman, 2000). In fact, Abdullah et al. (2015) suggested that self-efficacy is a key factor that influences and promotes meaningful learning. The direct effect indicates that perceived self-efficacy

influences students' methods of learning as well as their motivation and meaningful learning (Zimmerman, 2000). For instance, Bressington et al. (2018) examined the impact of concept mapping on mental health, and found that it helped learners to relate theory to practice and improved their learning efficacy, resulting in meaningful learning. In another study, Gurcay and Ferah (2017) demonstrated a positive linear relationship between learning efficacy and meaningful learning experience where an increase in the former led to an increase in the latter. The successful self-efficacy intervention administered in the research by (Erozkan, 2014) also resulted in a more meaningful art learning exploration. Students with a high self-efficacy in various academic fields chose to engage in tasks that would foster the development of their knowledge and skills. They also exerted effort in the face of difficulty, and persisted longer at challenging tasks in order to develop meaningful learning (Artino, 2012).

Based on the findings, this research proposes that students' MOOC-efficacy exercises an influence on meaningful learning and adds a new perspective to the MOOC literature with its finding that high MOOC-efficacy levels exert an impact on meaningful learning. The findings also support the existing perspective that a strong sense of self-efficacy leads to a stronger academic performance, while a weak sense of self-efficacy leads to a weaker academic performance (Erozkan, 2014). The findings suggest that implementing a successful curricular self-efficacy intervention will help increase student performance which should lead to more meaningful learning explorations. Conducting a needs assessment could also be helpful to identify students' needs, problems and capabilities (Pilli & Admiraal, 2017).

4.1   Limitations and Recommendations

This research is not free from limitations. One of the limitations was the study's reliance on just one source of data--the self-reported students' MOOC-efficacy and meaningful learning questionnaire. Thus, there is limitation in terms of getting a complete picture of the data. This is due to a number of reasons. First, respondents of a self-reported questionnaire may not be completely truthful in their responses, may lack the self-awareness to answer the questionnaire items correctly, or may not understand the importance of the study. Therefore, the data collected cannot be guaranteed as very accurate. Document analysis and other forms of quantitative or qualitative methods such as interviews and observations could have given richer data. Another limitation of this research is the response rate and data provided. The study's response rate was beyond the researcher's control. The data provided by the students represented their beliefs at the particular point in time when the survey was administered. Their beliefs may vary at different points in time. In addition, the researcher also had no control over factors that may have influenced students' responses such as their emotion and mental stability while answering the questionnaire, or may be students answered the questionnaire in a rush due to some personal matters they needed to attend to.

In the present research, all the respondents were undergraduate students of Malaysian public higher learning institutions. It is suggested that further studies include graduate students in their samples, rather than limiting the survey participants to only undergraduates. Similarly, the target populations can be expanded to include a greater number of higher learning institutions to enable the generalizability of the results. Future studies also need to consider different student and lecturer populations in private learning institutions in Malaysia. The findings of studies of this scale should be able to yield more inclusive and far-reaching findings. Scholars claim that the self-efficacy dimension is complex, multidimensional, domain-specific, and culture-specific (e.g. Wang & Baker, 2015). Self-efficacy is best assessed in relation to specific skills. This research had adapted the dimensions of SIBLE (Chen, 2014) to develop a psychometrically sound instrument of students' MOOC-efficacy. The dimensions were restricted to those proposed by SIBLE (Chen, 2014). Based on the findings, the four factors of MOOC-efficacy had a significant positive impact on students' meaningful learning. This creates opportunities for the examination of other MOOC-efficacy factors in future research that might influence meaningful learning, such as MOOC interaction, MOOC challenges, and time management in MOOCs. These additional factors may offer additional information to better explain what enhances students' meaningful learning.

5.   Conclusion

This research has brought a new perspective and contribution to the existing literature on students' self-efficacy in the context of MOOCs and meaningful learning. A research model based on the Social Cognitive Theory, Self-efficacy in Internet-Based Learning Environments scale (SIBLE), meaningful learning framework, previous research on students' self-efficacy and meaningful learning was proposed and tested with data collected from students of higher learning institutions. As the present study is an attempt at testing a structural model delineating a causal relationship between students' MOOC-efficacy and meaningful learning, the role of the former construct in making learning via MOOC worthwhile is established. The finding of the research has demonstrated a strong, positive relationship between the students' MOOC-efficacy and meaningful learning. It can be concluded then that the proposed model supports the hypothesis of a causal relationship between students' MOOC-efficacy and meaningful learning exploration in this research. The outcomes of this research might be beneficial to students, researchers, instructors, MOOC developers and administrators, higher learning institutions and policy makers. Further research can be done in the future to improve the current implementation of MOOCs and students' self-efficacy in this online learning environment, resulting in a more meaningful teaching and learning process. Students' MOOC-efficacy and meaningful learning are important issues that must be further discussed due to the importance of online learning and new technologies in 21st century education.

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