Influence of Infrastructure and Info Structure, Curriculum, Pedagogy and Content in Teaching and Learning through MOOCs

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Abstract

In Malaysia, Massive Open Online Course (MOOC) is an emerging approach in the higher education teaching and learning which takes the new role of technology to the next level. However, the successful implementation of MOOC requires effective strategic planning and understanding of the whole process involved. This study investigates the influence of infrastructure and info structure, curriculum, pedagogy, and content towards enhancement in teaching and learning in Massive Open Online Courses (MOOCs) in one of the common course offered in Malaysian Public Universities. This study examines the pilot data from a bigger dataset collected from an online survey. Collected data was analyzed using Structural Equation Modeling (SEM), to propose a model of enhancement in teaching and learning through MOOCs. Preliminary analysis shows that infrastructure and info structure, curriculum, pedagogy, content, and enhancement in teaching and learning were significantly correlated to each other. The overall contribution of this model which to enhancement in teaching and learning was 13.0%. The model summarized that only curriculum construct influence the enhancement in teaching and learning (β=0.244; p<0.01) make it as the sole contributor for this model.

Keywords: MOOC, Infrastructure, Info Structure, Curriculum, Pedagogy, Content

Introduction

Teaching and learning using Massive Open Online Course (MOOC) is an emerging distance learning phenomenon in the higher education institutions. The natural features of MOOC are it offered for free for anyone around the globe and works on the open networked environment. MOOC enables students to learn outside the brick-and-mortar traditional classroom environment, thereby offering informal, autonomy, openness and emergent knowledge (Viswanathan, 2012). Furthermore, Liu, Kang and McKelroy (2015) stressed that MOOC offer opportunities for students to discuss and share ideas with individuals who have a wide range of experience, knowledge and skills while Karsenti (2013) pointed that MOOC provide an interactive learning environment for faculty members to form social communities centered on courses. Consequently, the emergence of MOOCs has led to the formation of new education models, learning examples and commercial models (Wood, 2013).

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In Malaysia context, MOOC is a teaching and learning concept which is claimed to be effective for public universities as participants can access the subjects anywhere and anytime through the platform. MOOC initiatives in Malaysia are mainly derived from the Malaysian Education Blueprint on Higher Education which aims to leverage on MOOCs by highlighting local expertise in niche areas and to use online learning to create a blended pedagogy at higher education institutions, rather than focusing on widespread global reach (Mansor, Latifah & Tengku Amira Munira, 2015).

The Globalised Online Learning (GOL) initiative in Malaysian Educational Blueprint for Higher Education (2015-2025) through MOOCs especially, is targeted to enhance the quality of teaching and learning as it directly transforms educational delivery towards a more interactive and engaging one thus improving educational outcomes. Students will benefit from robust cyber infrastructure that can support the use of technologies such as video-conferencing, live streaming, and MOOCs (Executive Summary PPPM 2015-2025).

With the implementation of MOOCs initiative, students are able to enhance their cognitive in term of idea, problem solving, concepts, and principles. By applying MOOCs in teaching and learning, it is also can enhance students' skills such as ICT skills, leadership, collaboration, communication, and critical thinking. According to Voss (2013), students who take MOOCs appear to experiment their experience or as a way to augment their previous education for skill enhancement purposes or personal self-actualization. By teaching and learning thorough MOOCs, students will have chance to communicate with people from different cultures and collaborate with them, hence it can uplifting their cultural and collaboration values (Welsh & Dragusin, 2013).

Teaching and Learning in Higher Education Institutions
Recent changes in higher education institutions have emphasized the need to improve teaching and learning by making it outcome-based, geared towards equipping students with problem-solving communication and moral reasoning skills, knowledge and attitudes, while measuring the outcomes of what students have taught (Rita, 2014). Teaching and learning styles are evolving, and the tools to accommodate these new practices are changing. Similarly, computer-mediated social networks have become part of the life of university students and have transformed learning (Dogoriti & Pange, 2014).

Hence, the non-face-to-face, primarily web-based educational models are starting to emerge (Lara, Lizcano, Martínez, Pazos & Riera, 2014). The use of the web as an educational tool has provided teachers with a wide range of new and exciting teaching experiences that are not possible in traditional classroom (Nam & Smith-Jackson, 2007). With the help of web-based educational resources, teachers nowadays are able to search for information, to set online activities and tasks, to create online libraries (Dina & Ciornei, 2015) and conducting assessments and evaluations online. Web-based educational resources or online learning are

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now largely used in schools, universities and educational centers. The applications are mutually enormous, ranging from class ratings and reviews to schedules, tests, textbooks and student – teacher management.

With the rapid evolution of various technologies and approaches in online teaching and learning, public universities in Malaysia are continuously moving forward in expanding the potential of their e-learning programs. Currently, nearly every public and private university in Malaysia is implementing e-learning in their teaching and learning with the use of various platforms to support the necessary features and specifications.

In addition, blended learning has also becomes a popular approach for teaching and learning mode in higher education institutions. With the combination of various delivery modes, blended learning not only offers more choices, but it is also more effective in reaching the students. Realizing the global current trend in teaching and learning in higher education, public universities in Malaysia are being audacious in order to make their courses available online to public and be as open as possible. Accordingly, Malaysian government has been strategized various initiatives with the aims to transform Malaysia as an education hub internationally by using e-learning as a method to deliver programs and courses that can be highlighted at the global level.

As online learning has created positive impact in education, thus it has opened people's minds in terms of sharing their content and makes it open to public. In education, the concept of openness plays an important role in driving teaching and learning innovation and transformation. Openness has become the watermark for a fast growing number of learning materials and associated platforms and practices from a variety of institutions and individuals (Peter & Deimann, 2013). Yuan and Powell (2013) described the concept of openness as offering opportunities for sharing ideas, connecting and collaborating among institutions, educators, and learners locally and internationally, and facilitating more meaningful engagement in teaching and learning.

The growth of borderless open access, freely accessible, at massive scale of participants enroll in thousand online courses has become new educational paradigm and new learning skills. These lead higher education institutions compete each other to develop their own massive open online courses offer to anyone everywhere around the world. Malaysia has developed their MOOC courses namely Malaysian MOOC and currently over 60 courses offered with more than 199,166 students.

MOOC Initiative in Malaysia
In effort to expand and improve the access to Malaysian public universities' courses, four pilot courses have been developed in the form of MOOCs, in collaboration with the Ministry of Higher Education. This initiative is a collaborative effort of various parties at all levels with the aim to improve the quality of teaching and learning. The MOOC initiative in Malaysia started in

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November 2013 with a target to deploy four common first year undergraduate courses in September 2014, namely Islamic Civilization and Asian Civilization, *Ethnic Relations*, Introduction to Entrepreneurship, and ICT Competency through OpenLearning platform.

A study was conducted in order to evaluate the Malaysian MOOCs deployment. Thus, the framework for the study was adapted as depicted in Figure 1.
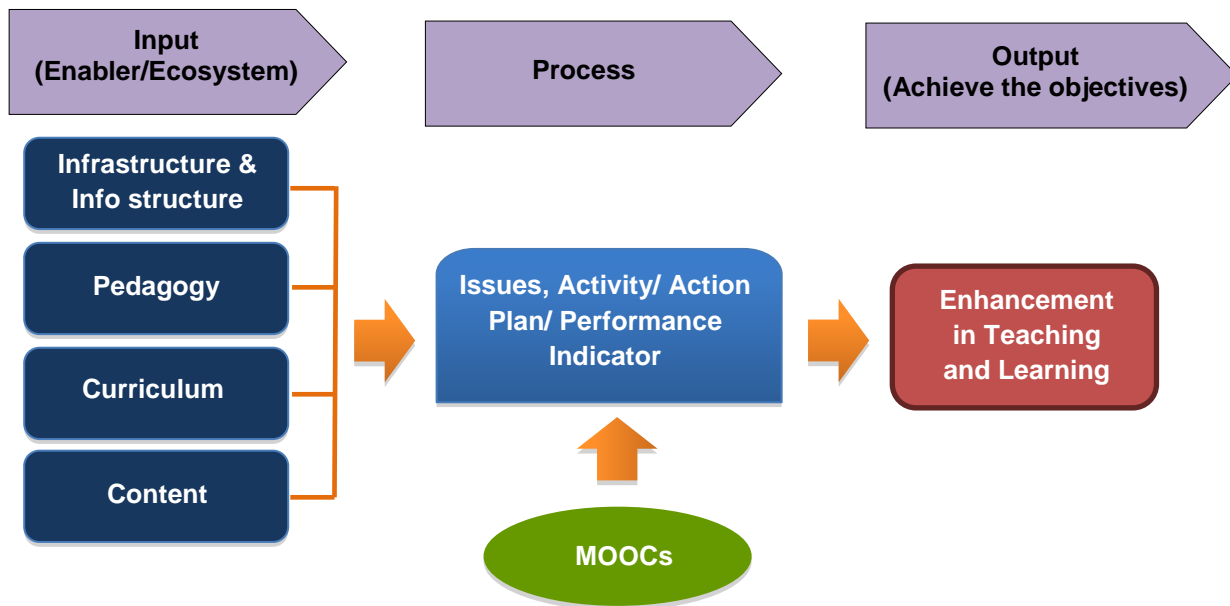
Figure 1: Conceptual Framework

Inputs and output were measured based on students' perspectives, parallel to Jansen (1996) argumentation that states, in higher education, learning outcomes can be measured at an individual level or at student and group level. It is predicted that if the students perceived the appropriateness of infrastructure and info structure, curriculum, pedagogy, and content, they then shall view that teaching and learning could be enhanced.

Literature Review
Several studies were carried out to evaluate several aspects within the MOOCs. For the quality enhancement in students learning, can they learn effectively by using MOOC? Muñoz-Merino *et al.* (2014) split the concept of students' learning effectiveness into three new concepts: (i) Effectiveness of students with peers, (ii) Effectiveness of students with instructors, (iii) Effectiveness of students with contents. They classified that the first and the second kinds of effectiveness can be measured by considering the number and type of messages submitted by students in discussion forums and addressed to their peers or to the teachers, while the third kind of effectiveness can be measured by considering the number and type of educational

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resources and activities completed by students. Meanwhile, Gamage, Perera and Fernando (2015) revealed 10 dimensional framework for analyzing the effectiveness of e-learning in MOOC, namely interactivity, pedagogy, collaboration, usability, network of opportunity, motivation, technology, content, support for learner and assessment. By these types of learning effectiveness, they can improve the students' effectiveness in MOOC.

In order for the higher education institutions to implement MOOC, they have to fulfill several requirements regarding the infrastructure and info structure. In this sense, the server should be scalable in terms of number of users, and it should be able to support simultaneous access of thousands of users (Sarasa-Cabezuelo & Sierra-Rodríguez, 2014). López-sieben *et al.* (2014) proposed that the MOOCs platform should have the following features: (i) The platform must be robust enough; (ii) The interface must be user-friendly; (iii) The platform should have an advertising and client-capture system; (iv) The platform should include student–student and student–lecturer forums; (v) Security measures to control access to contents and personal details of the participants; and (vi) Personalized tools to monitor students' individual learning progress. From time to time, it is believed that platform providers would upgrade their platform features for ease of use of their users.

MOOCs represent a powerful force for change on traditional university curriculum, teaching practices, and the university system as a whole. As stated by Mullaney and Reich (2015), MOOCs have what might be described as "partially asynchronous" structures but include mechanism to encourage synchronicity. They also argued that many of MOOCs courses have only a final date at the end of the courses, release content every week, and some courses used recommended syllabi and reminder emails rather than enforcement mechanisms to keep students moving as a cohort. Although the courses were provided with the recommended syllabus to encourage students to follow it, Mullaney and Reich (2015) asserted that course developers should assume that most students would not stay on-track. Collaborative activities and discussions should assume a dimension of synchronicity. Thus, the MOOCs curriculum should consider the openness and scalable cohorts in MOOC.

On the aspect of pedagogy, Kop *et al.* (2011) stated that it should supports human beings in learning through active creation of resources based on the building of connections, collaborations and the exchange of resources between people, the building of a community of learners, and the harnessing of information flows on networks. Parallel to the notion, Sharples and Ferguson (2014) agreed that in order to develop an innovative pedagogy that is capable of catering thousands of learners, it has to be interactive, reflective and collaborative, consists of tutorial intervention and guidance, as well as self-sustainable. In relation to that, since MOOCs learners are vary in age, Chacón-Beltrán (2014) also suggested that the usefulness of courses offered should take into account the pedagogical aspect. He further explains pedagogy in the 21th century should provide the opportunity to learners in challenging existing knowledge and move beyond the 'simplicity of a literal functional description of the dichotomized theme of teaching and learning' (Male & Palaiologou, 2015).

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Whether it is a conventional or online setting, the content of the course must be clear and understandable. Waard (2013) stated that the principles in content design have to be considered to provide interactivity, immediate feedback, and small size content to fit contemporary lifelong learning. Moreover, it is necessary to use information sources that are both recent, as well as those proven over time and always keeping access to content as simple as possible. Meanwhile, Grainger (2013) identified variations in course content, primarily on watching and downloading videos (60-80% of active learners), with other learning and assessment methods utilized by between 30-60% of active students and a relatively small minority (approximately 4%) of students participating in the forums.

Influence on Enhancement in Teaching and Learning in MOOC
The infrastructure and info structure can influence the enhancement in teaching and learning in MOOC. According to Voss (2013), the features that have been provided in MOOCs platforms can enhance the learning effectiveness. Meanwhile, Celina et al. (2016) designed several principles for creating infrastructure to support MOOCs to enhance learning especially in community of social mission. Bali (2014) mentioned that infrastructure aspects such as Internet access and electricity cuts have led to the students difficulties in learning through MOOCs.

MOOC curriculum is another aspect that able to influence the enhancement in teaching and learning. The MOOC curriculum is differ to any campus subject. Hence, Lau (2014) and Dikke and Faltin (2015) concurred that curriculum in MOOC is challenging due to limitations of online course format. Chernikova and Varonis (2016) mentioned that what to teach and how to teach must be considered when designing curriculum in online course. It has become imperative to recognize and understand what students want and develop innovative opportunities to increase student access to online programs that are flexible in time and location.

The enhancement in teaching and learning in MOOC can also be influenced by pedagogy. Amo (2014) mentioned that there are no actual designs and pedagogical approaches efficiently enhance students teaching and learning in MOOCs been documented so far. In teaching MOOCs, Evans and Myrick (2015) claimed that lecturers are struggled to discover the right level to produce material since the student body was so diverse, unknown backgrounds and different types of preparation. On the other hand, Sharples and Ferguson (2014) stated that pedagogy in MOOC should be interactive, reflective, and collaborative.

The aspect of content has also been identified as influencing the enhancement in teaching and learning in MOOC. A study by Habibah et al. (2015) found that content in TITAS course made the largest contribution to the prediction of enhancement in teaching and learning in MOOCs. Wang and Baker (2015) stated that student interest in content is more important for course completion than student interest in MOOCs. To provide a successful content, Amo (2014) claimed that it should consider providing interactivity, immediate feedback and small size content to fit contemporary lifelong learning. In order to improve students' enhancement in

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teaching and learning in MOOC, guidance on how to choose the best media according to each intention must be provided (Guàrdia, Maina, & Sangrà, 2013).

Based on the aforementioned discussion, it has been identified that the aspects of infrastructure and info structure, curriculum, pedagogy and content influencing enhancement in teaching and learning in MOOC. Hence, it is important to investigate the most prominent aspect that influencing MOOCs enhancement in teaching and learning among undergraduate students in Malaysian public universities. Therefore, this study aims to explore the following research question:

Do infrastructure and info structure, curriculum, pedagogy, and content significantly influence the enhancement in teaching and learning in MOOCs among first year undergraduate students in Malaysian public universities?

Methodology

Research Design
To answer the research question, a cross-sectional study was conducted using a survey as the method of data collection. This study aims to examine the pilot data from a bigger dataset collected from online survey software namely 'Survey Monkey'. Collected data was analyzed using Structural Equation Modeling (SEM), to estimate the influence of infrastructure and info structure, curriculum, pedagogy, and content towards enhancement in teaching and learning in MOOCs.

Population and Sample
The population was the selected first year undergraduate students from 20 Malaysian Public Universities that enrolled for four MOOC pilot courses in semester intake of September 2014. The reason for choosing these first year undergraduate students because they are the first batch that has been exposed with government MOOC initiative in Malaysia. Thus, it is important to examine their experience in using MOOC and how it can enhance their teaching and learning. For the data given by the OpenLearning platform on the number of first year undergraduate students registered for these four courses, as of August 11, 2015, there were approximately 54,791 first year undergraduate students in total.

Hair *et al.* (2010) suggested that for study using SEM analysis, the ideal number for sample size that appropriate for analysis in using SEM should be approximately 300 to 800 samples. Thus, a total of 400 first year undergraduate students who enrolled for one of the four MOOC pilot courses from 20 Malaysian Public Universities were selected as respondents for this pilot study. From this sample, a total of 126 (31.5%) of the respondents are male while a total of 274 (68.5%) of the respondents are female.

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Instrument

In this study, the instrument was own developed by the researcher based on the National MOOCs Implementation Framework. The instrument was divided into six sections: (i) Section A: Demographic information; (ii) Section B: Infrastructure and info structure; (iii) Section C: Curriculum; (iv) Section D: Pedagogy; (v) Section E: Content; and (vi) Section F: Enhancement in teaching and learning. The items are measured on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The questionnaire consists of two parts. The first part captures the demographics information of the respondents including name of the institution, gender, highest qualification, level of ICT skills, MOOC experience, frequent location, preferred time, and frequency of accessing MOOCs. The second part includes the variables identified in the research questions namely infrastructure and info structure, curriculum, pedagogy, content, and enhancement in teaching and learning.

After the questionnaire was developed, the validity of this questionnaire was done through a few series of group discussion of experts in Educational Technology field from four Research Universities in Malaysia.

Data Analysis

To answer the research question, a model has been proposed by using AMOS graphic software to identify the influence of exogenous variables or independent variables towards endogenous variable or dependent variable as shown in Table 1. However, before this analysis has been done, Pearson correlation test must be analyzed first in order to identify the existence of significant relationship between the variables in the proposed model (Baron and Kenny, 1986; Holmbeck, 1997).

Table 1: Constructs in the Proposed Model

Construct/variable	Latent
Exogenous variables (IVs)	Infrastructure and info structure
	Curriculum
	Pedagogy
	Content
Endogenous variable (DV)	Enhancement in teaching and learning

Pearson correlation analysis shows that infrastructure and info structure, curriculum, pedagogy, content, and enhancement in teaching and learning are significant to each other as illustrated in Table 2:

Table 2: Correlation between Infrastructure and Info Structure, Curriculum, Pedagogy, Content and Enhancement in Teaching and Learning (n=400)

Variable	Infrastructure and info structure	Curriculum	Pedagogy	Content	Enhancement in teaching and learning
Infrastructure and info structure	1	0.28**	0.19**	0.11**	0.27**
Curriculum	-	1	0.23**	0.26**	0.27**
Pedagogy	-	-	1	0.55**	0.23**
Content	-	-	-	1	0.31**
Enhancement in teaching and learning	-	-	-	-	1

**Correlations are significant at .001 levels (Two-tailed)

The findings of this pilot study will be discussed into three sub-topics according to the procedures proposed in the AMOS-SEM software namely (i) Confirmatory Factor Analysis (CFA); (ii) Measurement Model; and (iii) Structural Model.

(i)   Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was the first step in data preparation in SEM analysis. CFA was meant to define the individual constructs and was employed for three major purposes known as model fit, convergent validity, and construct reliability. Hair *et al.* (2010) suggested that if three or four of the fit indices criteria were fulfilled, it can be assume that the model is fit. Table 3 illustrates the criteria for fit indices.

Table 3: Criteria for fit indices

| Fit Indices	Recommended Value
p value	<0.01
Relative Chi-Sq	<5.00
AGFI	> 0.90
GFI	> 0.90
CFI	> 0.90
IFI	> 0.90
RMSEA	< 0.08
Factor loadings	>0.5 positive <1.0

Below are the findings and descriptions on the CFA for each construct:

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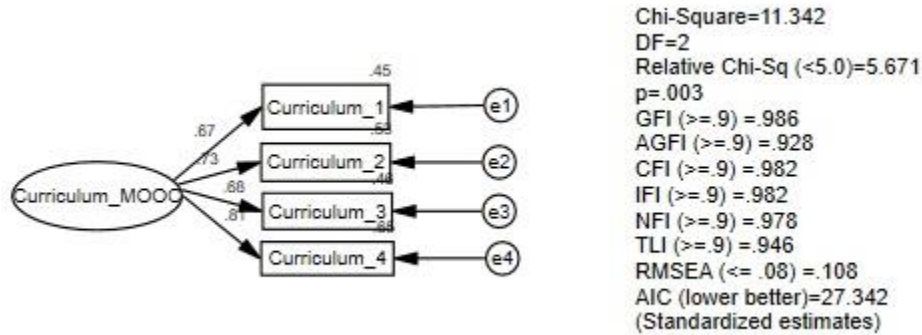**CFA for Infrastructure and Info Structure**

There were eight items (Infra_1, Infra_2, Infra_3, Infra_4, Infra_5, Infra_6, Infra_7 and Infra_8) measuring the infrastructure and info structure. The initial CFA showed a poor fit (CFI=0.653; IFI=0.656; RMSEA=0.208). Since the model was invalid, the process of improving the model was conducted by concentrating on the standardized factor loadings and referring to the Modification Index (MI).

To improve the model, factor loadings were observed and four items (Infra_2, Infra_3, Infra_4 and Infra_8) were identified less than 0.5 and were deleted. The CFA was conducted again and showed a good fit (CFI=0.984; IFI=0.984; RMSEA=0.093). The remaining four items (Infra_1, Infra_5, Infra_6 and Infra_7) were determined as the most reliable items measuring the infrastructure and info structure. The test for convergent validity was valid (0.50) and the construct reliability was reliable (0.71). Test for model fit for this construct (before and after) are illustrated in Figure 2 below:
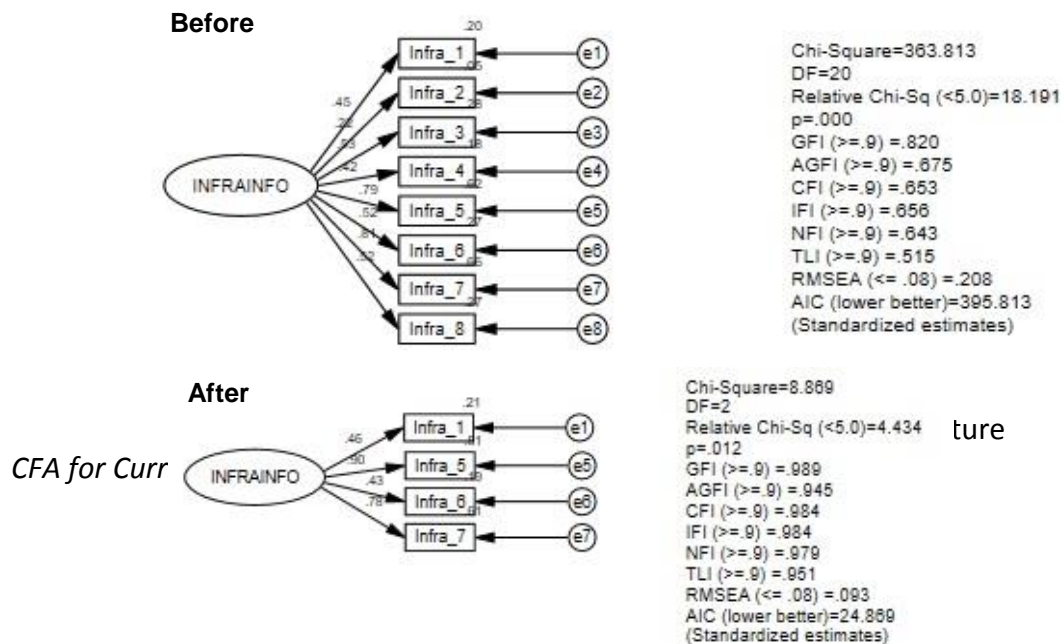
There were four items (Curriculum_1, Curriculum_2, Curriculum_3 and Curriculum_4) measuring the curriculum. The initial CFA already showed a good fit (CFI=0.982; IFI=0.982; RMSEA=0.108). The test for convergent validity was valid (0.52) and the construct reliability was reliable (0.74). Test for model fit for this construct is illustrated in Figure 3 below:
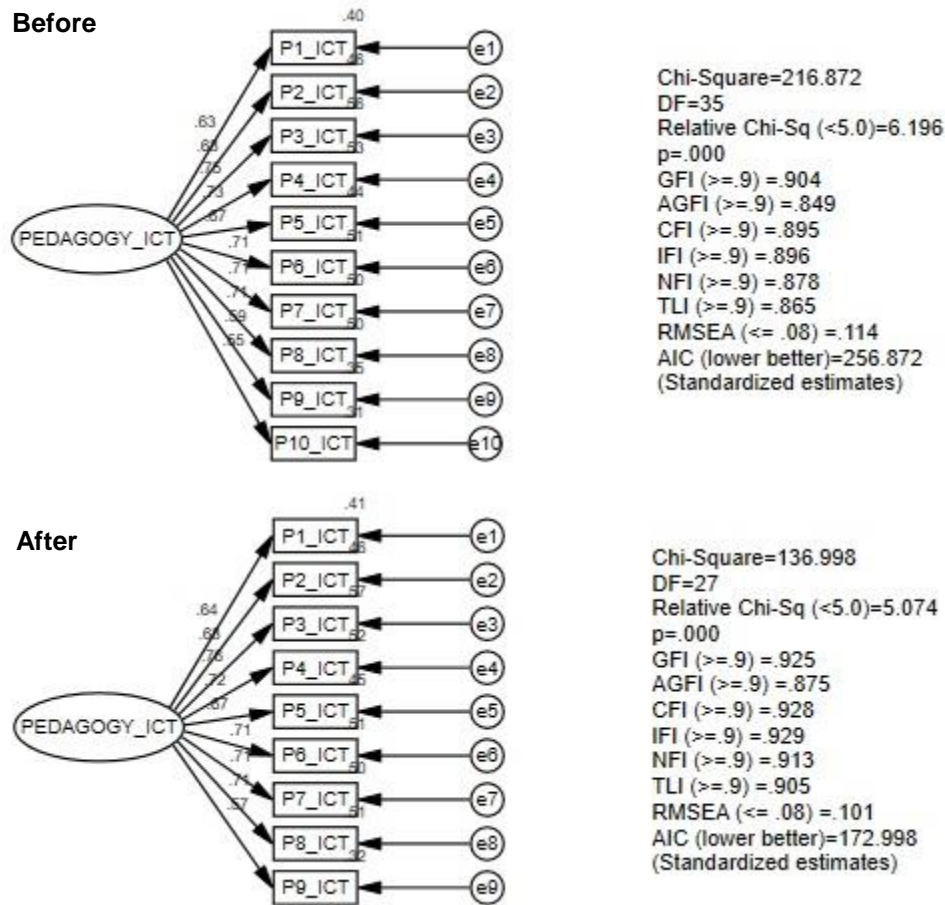
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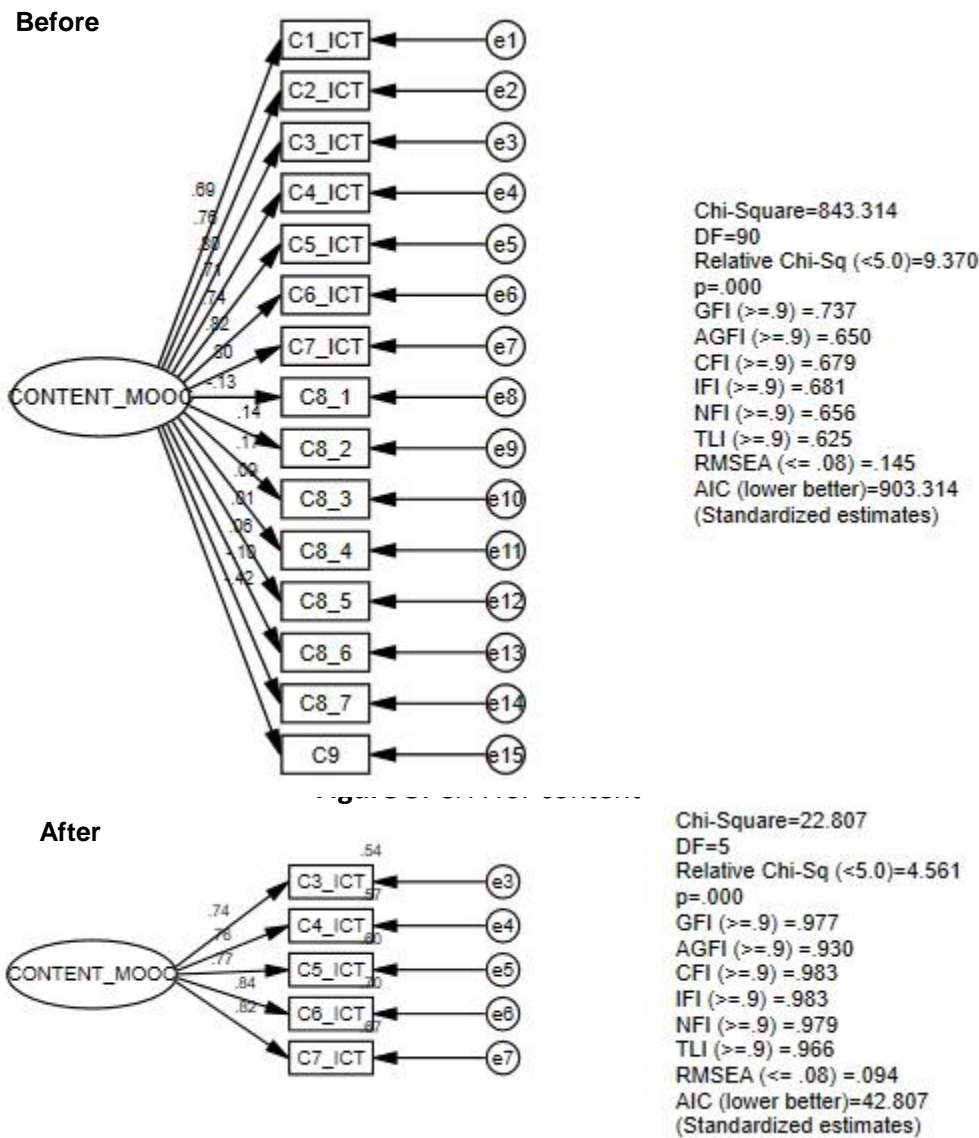*ISSN: 2222-6990*

Figure 3: CFA for curriculum

CFA for Pedagogy

There were 10 items (P1_ICT, P2_ICT, P3_ICT, P4_ICT, P5_ICT, P6_ICT, P7_ICT, P8_ICT, P9_ICT and P10_ICT) measuring the pedagogy. The initial CFA showed a poor fit (CFI=.653; IFI=.656; RMSEA=.208). Since the model was invalid, the process of improving the model was conducted by concentrating on the standardized factor loadings and referring to the Modification Index (MI).

To improve the model, factor loadings were observed and one item (P10_ICT) was identified less than 0.5 and was deleted. The CFA was conducted again and showed a good fit (CFI=0.928; IFI=0.929; RMSEA=0.101). The remaining nine items (P1_ICT, P2_ICT, P3_ICT, P4_ICT, P5_ICT, P6_ICT, P7_ICT, P8_ICT and P9_ICT) were determined as the most reliable items measuring the pedagogy. The test for convergent validity was valid (0.50) and the construct reliability was reliable (0.85). Test for model fit for this construct (before and after) are illustrated in Figure 4 below:

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CFA for Content

There were 15 items (C1_ICT, C2_ICT, C3_ICT, C4_ICT, C5_ICT, C6_ICT, C7_ICT, C8_1, C8_2, C8_3, C8_4, C8_5, C8_6, C8_7 and C9) measuring the content. The initial CFA showed a poor fit (CFI=0.679; IFI=0.681; RMSEA=0.145) and therefore, factor loadings that were identified less than 0.5 were deleted. The CFA was conducted again until it showed a good fit (CFI=0.983; IFI=0.983; RMSEA=0.094). Five items were determined as the most reliable items measuring the construct. The test for convergent validity (0.62) and the construct reliability was reliable (0.83). Tests for model fit for this construct (before and after) are shown in Figure 5 below:

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Before

Chi-Square=843.314
DF=90
Relative Chi-Sq (<5.0)=9.370
p=.000
GFI (>=.9) =.737
AGFI (>=.9) =.650
CFI (>=.9) =.679
IFI (>=.9) =.681
NFI (>=.9) =.656
TLI (>=.9) =.625
RMSEA (<= .08) =.145
AIC (lower better)=903.314
(Standardized estimates)

After

Chi-Square=22.807
DF=5
Relative Chi-Sq (<5.0)=4.561
p=.000
GFI (>=.9) =.977
AGFI (>=.9) =.930
CFI (>=.9) =.983
IFI (>=.9) =.983
NFI (>=.9) =.979
TLI (>=.9) =.966
RMSEA (<= .08) =.094
AIC (lower better)=42.807
(Standardized estimates)

CFA for Enhancement in Teaching and Learning

There were 23 items (OUTPUT_1, OUTPUT_2, OUTPUT_3, OUTPUT4_1, OUTPUT4_2, OUTPUT4_3, OUTPUT4_4, OUTPUT4_5, OUTPUT4_6, OUTPUT5_1, OUTPUT5_2, OUTPUT5_3, OUTPUT5_4, OUTPUT5_5, OUTPUT5_6, OUTPUT5_7, OUTPUT5_8, OUTPUT6_1, OUTPUT6_2, OUTPUT6_3, OUTPUT6_4, OUTPUT6_5 and OUTPUT6_6) measuring the enhancement in teaching and learning. The initial CFA showed a poor fit (CFI=0.687; IFI=0.688; RMSEA=0.139) and therefore, factor loadings that were identified less than 0.5 were deleted. The CFA was conducted again until it showed a good fit (CFI=0.958; IFI=0.958; RMSEA=0.095). Eight items were determined as the most reliable items measuring the construct. The test for convergent

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validity (0.53) and the construct reliability was reliable (0.86). Tests for model fit for this construct (before and after) are shown in Figure 6 below:

Figure 6: CFA for enhancement in teaching and learning

(ii) Measurement Model

After the CFA analysis, the next test conducted was the measurement model test. The purpose of this test is to examine the model fit and discriminant validity (Hair *et al.*, 2010). The model fit can be assessed through fit indices and the individual factor loadings of each item in a construct while discriminant validity can be assessed through correlation and Average Variance Extracted (AVE) and r^2. Figure 7 illustrates the measurement model for this pilot study.

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Test of Model Fit
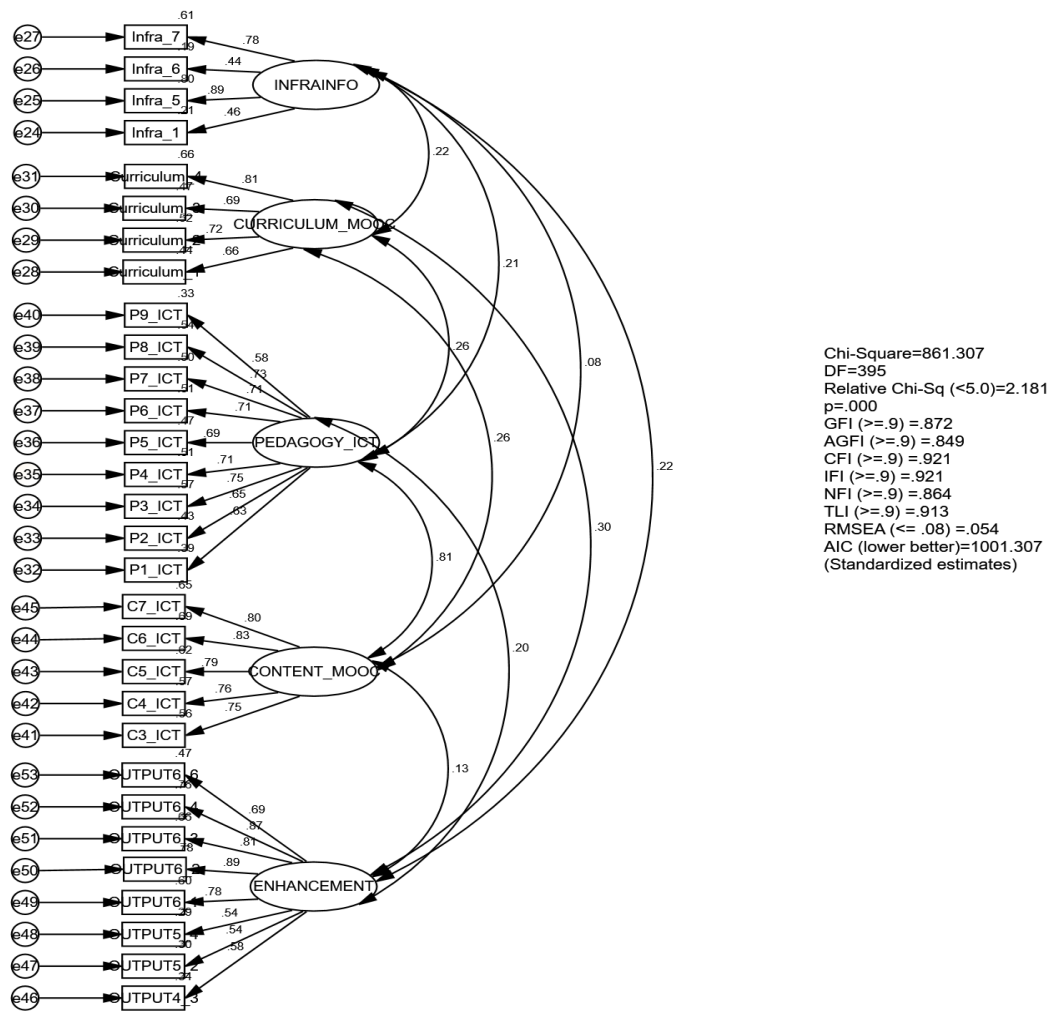Referring to Figure 7, findings show that five from the fit indices fulfilled the criteria for a proposed model to be fit (p=0.000; Relative Chi-Sq=2.181; GFI=0.921; IFI=0.913; RMSEA=0.054). Hair *et al.* (2010) suggested that if three or four of the fit indices criteria were fulfilled, it can be assume that the model is fit.

The same set of criteria for fit indices as in CFA was used in this model (see Table 3). Therefore, it can be concluded that the measurement model for this pilot study is good and reliable.

Discriminant Validity Test
The discriminant validity refers to the extent in which a construct is truly distinct from other constructs. The correlation coefficient, r ≥ .90 indicates high correlation between two constructs and thus violates the discriminant validity. The AVE for two constructs is compared against the square of correlation coefficient between two constructs. To ensure that the model shows sufficient discriminant validity between two constructs, the AVE for the two constructs must be greater that their r^2 (AVE > r^2).

Figure 7 shows that correlation value between each construct is less than 0.90, thus exhibit sufficient discriminant validity. From the calculation, the AVE for infrastructure and info structure and curriculum were 0.273 and 0.280 and their r^2 was 0.048, and it can be concluded that the two constructs exhibited sufficient discriminant reliability. The AVE for pedagogy and content were 0.228 and 0.384 and their r^2 was 0.656, and it can be concluded that the two constructs exhibited insufficient discriminant reliability. Finally, the AVE for content and enhancement in teaching and learning were 0.384 and 0.312 and their r^2 was 0.017, thus it can be concluded that the two constructs exhibited insufficient discriminant reliability.

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Figure 7: The Measurement Model

(iii)   Structural Model

Structural model represents set of one or more dependence relationship linking the hypothesized model's constructs. This model is most useful in representing the interrelationships between exogenous and endogenous variables. The focus of structural model is to examine and test the relationship between exogenous and endogenous constructs and also to test direct and indirect effects. This structural model will analyze the proposed model into three aspects namely test for model fit, test hypotheses on individual path or regression weights, and coefficient of determination (R^2).

Test for Model Fit

Use to test the overall hypothesized model that refer to the regression model towards endogenous variable. The overall model fit shows that the proposed model is reliable or not. Findings in Figure 8 show that five from the fit indices fulfilled the criteria for a proposed model to be fit (p=0.000; Relative Chi-Sq=2.181; GFI=0.921; IFI=0.913; RMSEA=0.054). Hair *et al.*

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(2010) suggested that if three or four of the fit indices criteria were fulfilled, it can be assume that the model is fit. The same set of criteria for fit indices (as in CFA and measurement model) was used in this model (see Table 3).

Since validation of the structural model was convincing, the proposed model is good and reliable and the process of improving the model will not be conducted. The final model is illustrated in Figure 8 and it can be concluded that this model is total disaggregation model because only latent constructs are involve in this structural model.
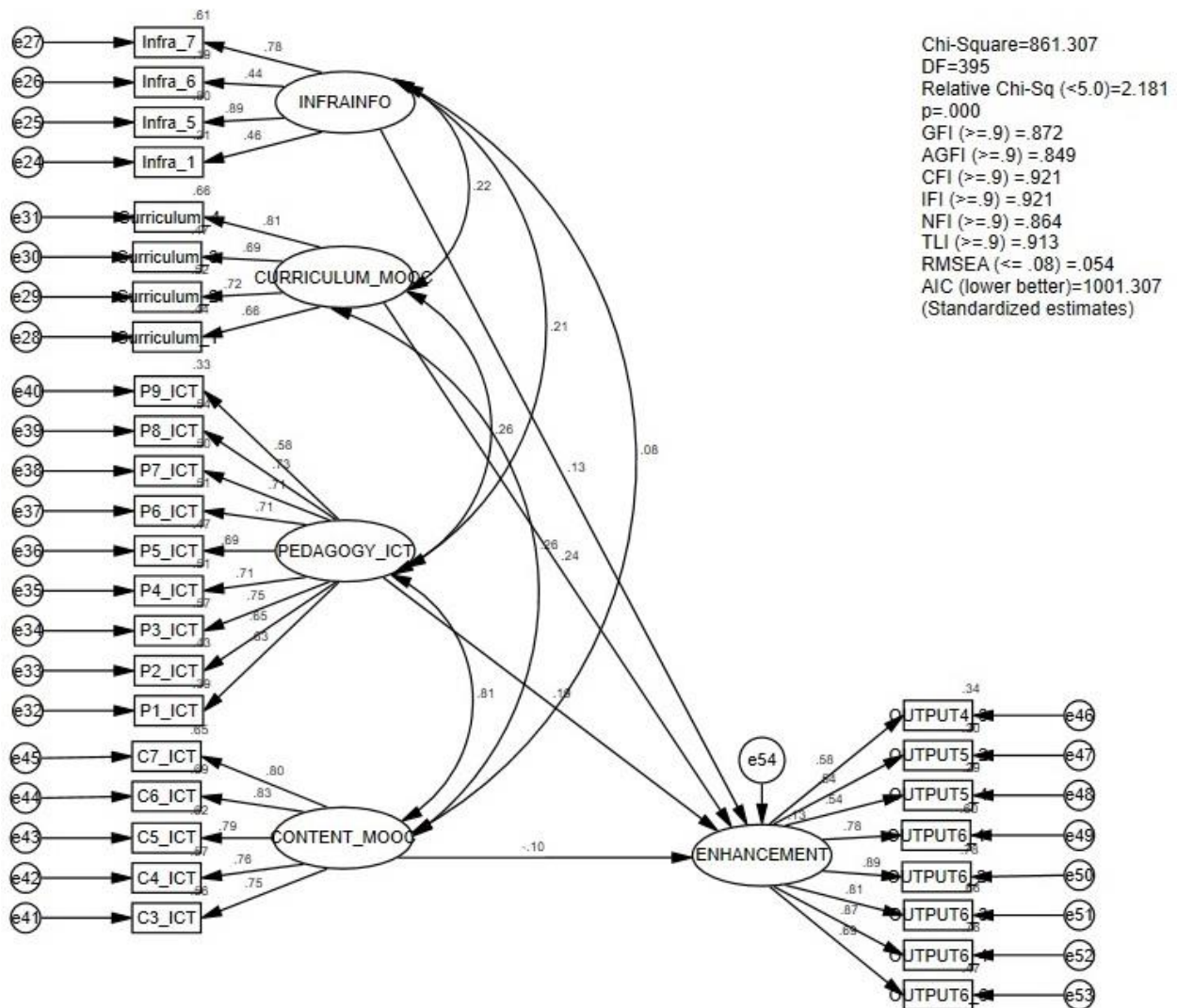
Figure 8: The Structural Equation Model

Individual path/ regression weights and coefficient of determination (R^2)
The overall model fit indicates the existence of influence on endogenous variable. Thus, this section focus on the influence for each construct (individual path/ regression weights) and

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overall model contribution (coefficient of determination, R^2) towards enhancement in teaching and learning.

The final model in Figure 8 shows that the overall contribution of this model was 13% towards enhancement in teaching and learning. Findings in Table 4 indicates that only curriculum is significantly influence enhancement in teaching and learning (β=0.244; $p<0.01$). This means that an increase of one standard deviation in curriculum will increase 0.244 unit of standard deviation in enhancement in teaching and learning. From the research question, it can be concluded that curriculum significantly influence enhancement in teaching and learning in MOOC.

Table 4: Standardized Regression Weights

Construct	B	SE	Beta	CR	p
Infrastructure and info structure	0.081	0.037	0.131	2.192	0.028
Curriculum	0.198	0.051	0.244	3.880	0.000
Pedagogy	0.212	0.126	0.189	1.690	0.091
Content	-0.062	0.069	-0.098	-0.901	0.368

Conclusions and Discussion

This pilot study focuses on determining the influence of four aspects of input for the MOOCs deployment, namely infrastructure and info structure, curriculum, pedagogy, and content with the enhancement of teaching and learning. Based on the results, all the variables were significantly correlated with each other.

To identify the influence for each construct to enhancement in teaching and learning, SEM analysis was used through three procedures namely (i) Confirmatory Factor Analysis (CFA); (ii) Measurement Model; and (iii) Structural Model.

CFA for each construct was met the criteria for fit indices for the model fit after the unnecessary factor loadings were deleted as well as test for convergent validity and construct reliability were valid and reliable. The results for measurement model indicate that the model was fit and AVE for each two constructs in this model exhibit sufficient discriminant validity test except for AVE for pedagogy and content. Findings from the structural model show that the proposed model is good and reliable and process of improving the model will not be conducted. The overall contribution of this model managed to indicate that 13% of the variance towards enhancement in teaching and learning. Only curriculum was identified significantly influence enhancement in teaching and learning (β=0.244; $p<0.01$).

This indicates that curriculum did play an important role in enhancing the teaching and learning in MOOCs. In regard, it is important to make sure that the contents of MOOC course meet the requirement of the syllabus, as well as making sure a balance between the learning activity and

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content is sufficient in helping students in their learning. Equally important, the aspect of learning schedule such as course plan/lesson plan should also be easily followed by students and the learning activities help them to understand the content better.

Curriculum is considered vital in making sure the success of MOOCs deployment in Malaysian Public Universities. A clear and well-planned curriculum gives a positive impact on students' enhancement in teaching and learning. It is hope that this pilot study will lead to the new findings in the real study after this.

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