

# A Structural Equation Model of Blended Learning

## Culture in the Classroom

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### Abstract

Higher education institutions are increasingly recognizing the importance of learning culture as a core factor for students' sustainable learning and development. While the development of blended learning environments in higher education institutions has been steadily increasing in recent years, but how to establish a blended learning culture in the classroom? The above problem can be solved when this study achieves its purpose to explore the factors of blended learning culture in the classroom. The focus of this study was to explore a structural equation model (SEM) of blended learning culture. A case study at the Hanoi University of Science and Technology (HUST), Vietnam was conducted and collected with a sample size large enough (339 students). The results of factor analysis have explored the core factors of the blended learning culture. The SEM analysis has achieved a first-order model of blended learning culture. And lastly, the SEM-values analysis for the existence of blended learning culture in the classroom has confirmed that they positively impact the acceptance of blended classrooms by students. Thus, a SEM of blended learning culture has provided a functional framework for educators to systematically cover all that create the success and sustainability of blended classroom culture in the classroom.

**Keywords:** attitudes toward blended learning, blended learning culture, blended learning environment, experiential learning, learning culture, structural equation model, reusable learning objects, virtual learning environment

### 1. Introduction

Higher education institutions are increasingly recognizing the importance of learning culture as a core factor for students' sustainable learning and development (Eid & Nuhu, 2009), because learning culture directly influences or inhibits the quality of learning (Szulanski, 1996). Hence, developing a positive learning culture is a dominant theme in the strategic plans of higher education institutions.

In the 21st century, higher education institutions are facing the challenge of integrating new technologies into education in a meaningful way. E-learning is expected to create a revolution to enhance individual learning. Despite the fact that e-learning exists for a relatively long time, but it still seems to be in its infancy by the debate about educational values, such as the lack of personality education in the e-learning environment. In the current context, blended learning is an effective choice for higher education institutions by evidence of its advantages over either online or classroom teaching alone (Eryilmaz, 2015; Jeffrey, Milne, Suddaby & Higgins, 2014). Blended learning is an approach to learning that combines traditional face-to-face and online learning experiences. Some previous studies have confirmed that students learn more effectively in a blended learning environment than an environment with only online or face to face learning (Eryilmaz, 2015); the improvement in student success and satisfaction when compared with face-to-face courses (Dziuban & Moskal, 2011). The combination of new technologies with traditional teaching methods has the potential to transform students' learning experiences / culture (Davis & Fill, 2007). Blended learning can break the walls of traditional classrooms and school campus by using social media culture (Vickers, Field & Melakoski, 2015). However, some other studies implies that the effect size of blended learning should be interpreted with caution where the impact is evaluated within a particular learning context (Dziuban, Graham, Moskal, Norberg, & Sicilia, 2018). The blended learning can sustain a bad culture or help create a new one, and if students lack the cultural values to guide learning effectively, their displacement towards a blended environment can backfire (Blended Learning Universe, 2014). In addition, culture is identified as a core factor that influences the success of different learning methods (Bulut, 2010). However, previous studies have not focused on

clarifying the factors of blended learning culture in the classroom.

The focus of this study was to explore a structural equation model (SEM) of blended learning culture in the classroom. Using a SEM analysis allows us to explain the relationships between unobserved factors of blended learning culture. We started by developing a conceptual model of blended learning culture in the classroom based on the literature studies. Then, a case study was conducted to explore the core factors of blended learning culture in the classroom. The factor analysis and SEM analysis were conducted to achieve a good fit model for blended learning culture in the classroom.

## 2. Theoretical Framework

### 2.1 What is Blended Learning Culture?

According to Johnston and Hawke (2002), organizations maintain and develop a learning culture that is responsive to the organization's sustainable development by continually improving products and services. The organizations understand and implement the concept of learning culture in two different ways or a combination of both (Johnston & Hawke, 2002). In some organizations, learning culture is expressed in the *commitment to learning* to ensure their sustainability in the competitive market (Johnston & Hawke, 2002). Some other organizations promote a more *open communication and teamwork environment* for individuals' willingness to share knowledge (Johnston & Hawke, 2002). Learning culture has a positive impact on the knowledge-sharing behavior of people in an organization (Eid & Nuhu, 2009). While the commitment to learning on the part of an organization and the learner should be required, which encourage learners to acquire new skills, to adopt new ways of practice, and to share knowledge (Johnston & Hawke, 2002). In some organizations this may be manifested by specific policies, corporate goals or documentation, and of leadership style (Johnston & Hawke, 2002). Learning culture was defined as "the existence of a set of *attitudes, values* and *practices* within an organization which support and encourage a continuing process of learning for the organization and/or its members" (Johnston & Hawke, 2002, p. 9). The learning culture is established by the combination of a commitment to learning, and a teamwork and open communication environment, in which the terms (encompassing formal and informal initiatives) of culture's attitudes, values and practices are activated (Johnston & Hawke, 2002). This shows that learning culture is a phenomenon of the social constructivist context.

The context of blended learning environment in higher education institutions is the design and delivery of high quality courses that blend new technologies with traditional teaching methods. Blended learning involves putting the major learning activities online while retaining traditional classroom teaching in a meaningful way (Lee & Hung, 2015). This implies that blended learning culture as a combination of positive culture of traditional classroom and online learning culture. Blended learning shows the usefulness in making learning more meaningful both at the personal level and at the social level (Maza, Lozano, Alarcón, Zuluaga & Fadul, 2016).

### 2.2 Attitudes toward Blended Learning

Although the learners' attitudes toward blended learning is decisive factors in the success of blended classrooms (Selim, 2007), but what settings (details about the open communication and teamwork environment, and the commitment to learning) are important to create their existence? According to AlAbdulkarim and Albararak (2015), *team based learning, students' interactions* with peers are highly preferred social constructivism tools by students, while the *digital information tools* are the most preferred component of the content. Teamwork and communication are also behavioral factors that are impacted by the *physical design of the classroom* (Gharaveis, Hamilton & Pati, 2018). The online interactive communication environment (*online course interface*) is an important online platform to attract e-learning activities of students (Ma, Li & Liang, 2019).

*Hypothesis 1 (H1): Team based learning, interactions, digital information tools, physical design of the classroom, and online course interface are factors that represent an open communication and teamwork environment in the blended classroom.*

According to Mart (2013), the commitment to learning is highly related to work performance of both teachers and students. Student achievement deeply depends on teacher commitment, in which the core element is *the quality of instructional methods* (Mart, 2013). The *internal motivation* is also a major factor created by a personal commitment to learning of students (Klein, Noe & Wang, 2006). In which, *interest, perceived competence, effort, pressure* and *usefulness* are the main elements of intrinsic motivation (Kintu, Zhu & Kagambe, 2017). Therefore, lecturers should start a blended course by clearly communicating with students about how they will learn and the corresponding learning outcome expectations, such as projects, teamwork, at-home assignments (Wojcicki, Izumi, & Chang, 2015). This work fosters the right attitudes in students, inside and outside the classroom.

*Hypothesis 2 (H2): The quality of instructional methods, and internal motivation are factors that represent a*

*commitment to learning of students in the blended classroom.*

### 2.3 The Core Values of Blended Learning Culture

According to Surjono, Muhtadi and Wahyuningsih (2017), the blended learning environment provides a new approach, which inherits the benefits of character education in the traditional classroom through promoting good student behaviors, such as ‘respect’, ‘trust’, ‘kindness’. While online learning can overcome the limitations of interaction and limited visualization of teaching materials (Surjono, Muhtadi & Wahyuningsih, 2017) by promoting student independence and cooperation in e-learning activities (Wahyuni, 2018). According to Wojcicki, Izumi and Chang (2015), *trust, respect, independence, collaboration and kindness* are the five core values of positive learning culture that need to be established in the blended classroom (See the detailed description in Table 1). Wojcicki, Izumi and Chang (2015) emphasized that computers, tablets and other electronic devices are not enough to transform the classroom. The human/culture factor is more important than the technology, which makes blended learning more effective (Coultas, Luckin & du Boulay, 2008).

Table 1. The activities for developing the core values of blended learning culture

<i>Core values</i>	<i>Description</i>	<i>Activities</i>
<b>Trust</b>	- Trust promotes students' willingness to share information (Jarvenpaa, Knoll & Leidner, 1998), positive impact on communication, teamwork, commitment to learning of students (Powell, Galvin & Piccoli, 2006), reduces the need for monitoring of lecturer (Stahl & Sitkin, 2005).	- Teamwork and responsible action for the trust of the team. - Group blog or website. - Giving students your phone number and e-mail. - Mistakes are part of life.
<b>Respect</b>	Respect creates close relationships, where the uniqueness of the student are treasured and passion (Van Niekerk & Schmidt, 2016).	- Setting of achievement levels, instructions to improve or correct the errors. - Giving students the opportunity and expectation.
<b>Independence</b>	Independence provides opportunities for students to pursue their curiosity, and choose individualized learning paths (Mulyono, 2017).	- The opportunity to pursue their own curiosity. - Writing assignment with an open topic.
<b>Collaboration</b>	Collaboration helps students develop relationships, trust and work together (McCarthy, 2012).	- Common project. - Responsible action with other students.
<b>Kindness</b>	Kindness helps people to be more tolerant of delays or mistakes (P. Greenberg, R. Greenberg & Antonucci, 2007).	- The consideration and tolerance. - Promoting students' motivation.

*Hypothesis 3 (H3): Trust, respect, independence, collaboration and kindness are factors that represent the core values of blended learning culture in the classroom.*

### 2.4 Cultural Practices in the Blended Learning Process

According to Thorne (2003), Kolb's learning cycle is one of the most enduring models that educators need to set blended learning in the classroom context. Kolb's learning cycle describes four key stages of learning, including: (1) experiencing, (2) reflecting and generalizing, (3) applying (Kolb, 1984). According to Stuart (2013), the Kolb's cycle was modified for the learning process in the web-based blended learning environment following four stages: (1) practical labs / classrooms, (2) theory lectures and lecture notes, (3) virtual learning environment (VLE) and reusable learning objects (RLOs), (4) physical planning. Figure 1 shows the Kolb's cycle modified for blended learning process.

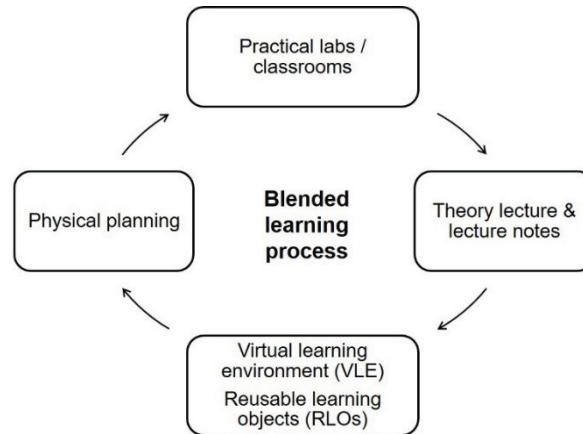


Figure 1. The Kolb's cycle modified for blended learning process

The quality of VLE and RLOs has the positive impact on the acceptance of online users (Jeffrey et al, 2014; Kurubacak, 2007), especially the RLOs (such as pdf, flash, sound, images, text, videos, games), which are extremely important in creating diverse educational contexts (Kurubacak, 2007). This means that the blended learning design features can significantly affect blended learning process of students. The blended learning process can transform the students' learning experience by using multimedia culture (Davis & Fill, 2007; Vickers et al, 2015). Online learning environments may include theory lectures using PowerPoint presentations, a series of embedded videos and lecture notes, which supports the different learning styles of students. Then, students are required to participate in asynchronous discussions within the VLE. The VLE is also used to host a series of RLOs which were designed to guide students to apply theoretical knowledge into real context.

*Hypothesis 4 (H4): Theory lecture and lecture notes, VLE and RLOs, physical planning and practical labs / classrooms are factors that represent the cultural practices in the blended learning process.*

#### 2.5 Theoretical Approach and Conceptual Model

To explore a SEM of blended learning culture in the classroom, the researchers used self-perception theory of Daryl Bem (1972). Daryl Bem's theory describes the process in which people, lacking initial attitudes or emotional responses, develop them by observing their own behavior and concluding what attitudes must have caused it (Bem, 1972). But why did we approach self-perception theory and not other theories? The reasons come from the current applications of this theory in "therapy" and "persuasion". The reasons come from the aspect of "therapy" when reasoning behavior results in the change of attitudes, and ultimately a more lasting change in behavior (David, 2015). Therefore, *the cultural practices in the blended learning process have a positive impact on an open communication and teamwork environment in the blended classroom (Hypothesis 5 – "H5")*; and *the cultural practices in the blended learning process have a positive impact on the students' commitment to learning (Hypothesis 6 – "H6")*. The second reason comes from the aspect of "persuasion" when educators can persuade students to do something relatively small (such as a small commitment, mistakes are part of life...) that can lead to the person altering their self-image to explain the larger commitments (David, 2015). Therefore, *the core values of blended learning culture have a positive impact on an open communication and teamwork environment in the blended classroom (Hypothesis 7 – "H7")*, and *the core values of blended learning culture have a positive impact on the students' commitment to learning (Hypothesis 8 – "H8")*. The self-perception theory allowed researchers to focus on attitude formation and change of student participants in a web-based blended learning environment. Such a theoretical lens allows us to examine the attitudes toward blended learning caused by their own new experiences in the context of blended learning culture. This means that the students' attitudes toward blended learning is a dependent variable of the core values of blended learning culture, and cultural practices in the blended learning process of students. The conceptual model of this study was presented in Figure 2.

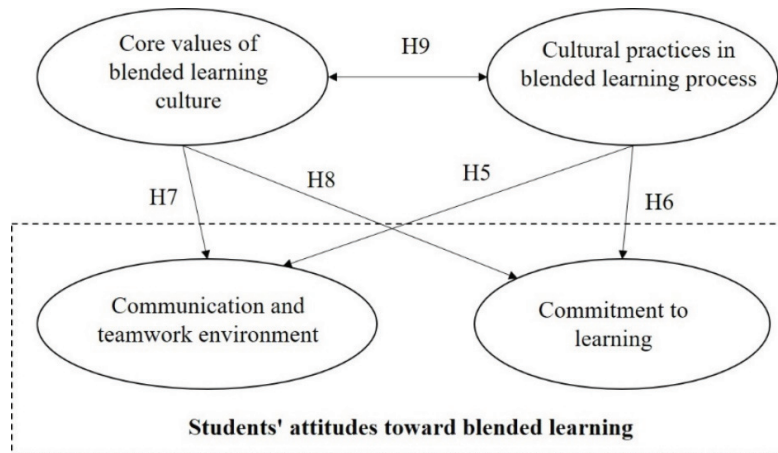


Figure 2. The conceptual model of SEM

Based on the conceptual model, additional hypotheses were defined including:

- Hypothesis 9 (H9): The core values of blended learning culture are positively correlated with the cultural practices in the blended learning process.
- Hypothesis 10 (H10): The existence of blended learning culture has a positive impact on the acceptance of blended classroom by students.
- Hypothesis 11 (H11): The factors of blended learning culture in the classroom are ranked equally by the students' opinions.

### 3. Materials and Methods

#### 3.1 Materials Information

This study was based on the premise of blended courses at the Hanoi University of Science and Technology (HUST), Vietnam. HUST is a leading university of science and technology in Vietnam (top 1.000 rankings of Times Higher Education, 2019), with more than 2.000 staff and 35.000 students. Like other universities in Vietnam, HUST is facing growing pressure to integrate technology into the classroom in a meaningful way. In 2010, HUST became a member of the ACU (Asean Cyber University) project with the goal to transform from traditional learning to blended learning. The ACU project has supported HUST to build infrastructure for e-learning materials development, such as recording studios, server and workstations, and websites. It has also supported HUST to develop human resources for creating online lectures. In 2012, HUST started implementing the first blended learning courses and about 5000 students took these courses each year. The HUST online learning environment has been designed in the form of online material sharing, forum, quiz, text, picture and video lectures. It has been distributed through <http://lms.hust.edu.vn>.

To make a successful long-term blended learning initiative, many policy changing efforts have been being made by HUST leaders to build a blended school culture because they want to weave the best of face-to-face with online learning to cultivate the skills students need to be successful in university and careers. HUST emphasized that the shift from traditional learning to blended learning must be a shared journey, in which all stakeholders were engaged, including leaders, lecturers, IT staff and students. In particular, this shift was a daunting prospect for lecturers, who will actually be implementing the blended learning models. Although this change was a time-consuming process, most of the lecturers were excited about the new online technologies and social constructivist approach to teaching and learning that will bring more benefits to their students. Blended learning has so far been implemented in HUST for 8 years, and HUST is still aiming at a vision of blended school culture.

#### 3.2 Design

This study was a quantitative design in which the questionnaire method was used to investigate the factors of blended learning culture in the classroom by students' perspective. Based on the conceptual model of research (Figure 2), a questionnaire was designed with three main groups including:

- (1) To what extent were the core values of learning culture that you observe in your blended classroom?
- (2) Indicate to what extent you actively participated in the blended learning process?

(3) What results did you feel satisfied in the blended classroom when compared to the traditional classroom?

The survey asked the students to rank the items using a 5-point Likert-type scale from "1" to "5". The purpose of the first group was for students to confirm the level of existence of the core values of blended learning culture in the classroom. The second group was for students to confirm the level of active participation in the blended learning process, because this can transform students' learning experience / culture (Davis & Fill, 2007). Through a lens by self-perception theory, attitudes toward blended learning as a result of learners was predicted by the core cultural values and cultural practices in the blended classroom. Therefore, the third group was for students to confirm their satisfaction on the results of blended courses when compared to the traditional classroom. In addition, two additional yes / no questions were also used to collect information about blended learning experience before and gender of students in blended classrooms.

In the HUST, the plan of each blended course usually requires about 15 weeks. Researchers selected elective courses as research subjects, because they contain features, including: (1) a wide variety of majors from any student in the school, (2) the interference of learning culture among students who were exposed for the first time and more in the blended classroom, (3) students experience teamwork with unknown people. Therefore, the survey results could be clearly reflected on the factors of blended learning culture. The questionnaires were hand-delivered to the undergraduates on week 13 of 15 when the students had submitted their assignments on the VLE.

### *3.3 Participants*

A total of 400 questionnaires was delivered to students (corresponding to three blended courses), and 339 questionnaires with complete data have been collected, there was no questions left blank. There were 143 students (42.2%) who participated in the blended classrooms before, others were never. There were 220 male students (64.9%) and 119 females (35.1%). This number of responses corresponds to a minimum size of 100 elements for each subgroup (including: blended classrooms before, gender) in the sample, which is sufficient for the rigorous analysis such as comparison, variance, and correlation (Sudman, 1976, cited by Israel, 1992).

### *3.4 Reliability of Instrument*

Three Cronbach Alpha tests in SPSS were performed to determine the reliability of data by questionnaires (Table 2). According to Cortina (1993), the Cronbach's alpha value of higher than 0.70 really does reflect internal consistency instead of irrelevancies like the number of items. The results show that the Cronbach's Alpha value was greater than "0.7" in all cases. For all items, the Corrected Item - Total Correlation values were greater than "0.3", and the Cronbach's Alpha if Item Deleted values were less than the Cronbach's Alpha value, so there were acceptable internal consistency reliabilities on all the scales.

Table 2. The reliability of instrument

<i>Items</i>	<i>Corrected Item-Total Correlation</i>	<i>Cronbach's Alpha if Item Deleted</i>	<i>Cronbach's Alpha</i>
<i>(1) Core values</i>			
Trust	0.769	0.877	
Respect	0.762	0.879	
Independence	0.703	0.891	0.902
Collaboration	0.760	0.879	
Kindness	0.783	0.874	
<i>(2) Blended learning process</i>			
Theory lecture and lecture notes	0.684	0.737	
VLE and RLOs	0.623	0.766	0.811
Physical planning	0.616	0.769	
Practical labs / classrooms	0.595	0.780	
<i>(3) Attitudes toward blended learning</i>			
<i>(3.1) Communication and teamwork environment</i>			
Team based learning	0.697	0.845	0.870
Interactions	0.631	0.854	
Digital information tools	0.637	0.853	
Physical design of the classroom	0.656	0.850	
Online course interface	0.776	0.838	
<i>(3.2) Commitment to learning</i>			
The quality of instructional methods	0.607	0.857	
Internal motivation ( <i>interest, effort, pressure, perceived competence, usefulness</i> )	0.557	0.865	

### 3.5 Data Analysis

The task of data analysis was performed in third steps. The first step, the Exploratory Factor Analysis (EFA) in SPSS were conducted for five factors representing an open communication and teamwork environment, for two factors representing the commitment to learning of students, for five factors representing the core values of blended learning culture, for four factors representing the cultural practices in the blended learning process. Researchers used the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. A cut-off point of 0.45 of KMO value was used to select items for a factor (Cohen, 2013). Although there has been a long-standing controversy regarding whether the Likert scale data is converted to numbers, and can be processed as interval data (Carifio & Perla, 2008). However, "if there is an adequate sample size and if the data are normally distributed (or nearly normal), parametric tests can be used with Likert scale ordinal data" (Sullivan & Artino Jr, p. 542). When EFA was statistically significant, the Confirmatory Factor Analysis (CFA) in AMOS version 20 software was conducted to examine the fit of a measurement model. A good model fit of CFA was considered to be achieved when they meet the criteria as in the SEM analysis presented in the second step. Four proposed hypotheses were tested through factor analysis results including H1, H2, H3 and H4.

The second step, in AMOS software, a SEM was analyzed to examine the five proposed hypotheses including H5, H6, H7, H8 and H9. A guideline for determining model fit of a SEM is developed by Hooper, Coughlan and Mullen (2008), which we have used in this study. In the Chi-Square test ( $\chi^2$ ), the SEM is acceptable if  $p > 0.05$ . However, a p-value is usually less than 0.05 due to the  $\chi^2$  value being sensitive to sample size and model complexity. This would lead to a well-fitting model being rejected if  $p < 0.05$  (Anderson & Gerbing, 1988). Thus, a ratio of  $\chi^2/df$  ranging

from as high as 5.0 used to assess a model fit for a sample  $N > 200$  (Hooper, Coughlan & Mullen, 2008). Several other indices, including RMSEA (Root Mean Square Error of Approximation), GFI (Goodness-of-fit statistic), AGFI (Adjusted Goodness-of-Fit), SRMR (Standardised Root Mean square Residual), NFI (Normed-Fit Index), CFI (Comparative Fit Index) and TLI (the Tucker–Lewis Index) should also be used to judge a model fit (Hooper, Coughlan & Mullen, 2008). A RMSEA value ranging from 0.05 to 0.07 indicates a good fit (Hooper, Coughlan & Mullen, 2008). For a larger sample size ( $N > 200$ ), a higher cut-off of 0.90 is appropriate for GFI and NFI (Hooper, Coughlan & Mullen, 2008). As with the GFI, the AGFI is generally accepted that values of 0.90 or greater indicate well fitting models (Hooper, Coughlan & Mullen, 2008). The SRMR values ranging from as high as 0.08 were deemed acceptable, while a SRMR of 0 indicates perfect fit (Hooper, Coughlan & Mullen, 2008). Finally, a higher cut-off of 0.95 is appropriate for CFI and TLI (Hooper, Coughlan & Mullen, 2008).

The third step, the researchers conducted a SEM-value analysis in a case study at HUST. Two Mann – Whitney tests in SPSS were conducted to examine the acceptance of blended classroom by students on the branch of blended learning experience before and gender. A value of  $p < 0.05$  indicated that the data of blended learning culture was different between groups related to the gender and blended learning experience before of students. Then, three Friedman tests in SPSS were conducted to rank factors. In addition, descriptive statistics were conducted with a 5-point Likert scale to examine the success of the blended learning culture. The following scoring system designed by Sarrafzadeh, Martin and Hazeri (2010), including: mean 1–1.44 = Not Successful; mean 1.45–2.44 = Minor Successful; mean 2.45–3.44 = Moderately Successful; mean 3.45–4.44 = Successful; mean 4.45–5 = Very Successful. A mean value of 3.45 was fixed as the cut-off point (Nazim & Mukherjee, 2016), meaning that a factor would be considered "Successful" if it received a mean score of 3.45 or more (Hanh, 2018; Sarrafzadeh, Martin & Hazeri, 2010). The mean score of 4.45 was determined as the most positive meaning of the blended learning culture in the classroom (Nazim & Mukherjee, 2016; Sarrafzadeh, Martin & Hazeri, 2010). From there, the researchers tested H10 and H11.

## **4. Results**

### *4.1 Factor Analysis*

Four Exploratory Factor Analysis (EFA) in SPSS were conducted to examine the statistical significance for SEM of four factor subgroups, including: (1) open communication and teamwork environment, (2) students' commitment to learning, (3) the core values of blended learning culture, and (4) the cultural practices in the blended learning process (Table 3).



Table 3. The EFA results for the factors of blended learning culture in the classroom

Code	Groups	KMO	p-value	Eigenvalues		Unrotated Factor
				Total	Cumulative %	
<b>F1</b>	Factor 1: Core values	0.86	0.00	3.25	64.89	
F1.1	Trust					0.820
F1.2	Respect					0.814
F1.3	Independence					0.745
F1.4	Collaboration					0.809
F1.5	Kindness					0.837
<b>F2</b>	Factor 2: Blended learning process	0.73	0.00	2.087	52.19	
F2.1	Theory lecture and lecture notes					0.798
F2.2	VLE and RLOs					0.726
F2.3	Physical planning					0.690
F2.4	Practical labs / classrooms					0.668
<b>F3</b>	Factor 3: Communication and teamwork environment.	0.84	0.00	2.791	55.82	
F3.1	Team based learning					0.757
F3.2	Interactions					0.684
F3.3	Digital information tools					0.714
F3.4	Physical design of the classroom					0.727
F3.5	Online course interface					0.843
<b>F4</b>	Factor 4: Commitment to learning	0.50	0.00	1.025	51.23	
F4.1	The quality of instructional methods					0.716
F4.2	Internal motivation					0.716

With  $N=339$ ,  $KMO > 0.45$ ,  $p < 0.05$ .

*In all cases, only one component was extracted and rotated methods cannot be applied.*

In all cases, the KMO values were greater than "0.45", the p-values were less than "0.05" (for Bartlett's test of sphericity), the Eigenvalues values in column "Total" were greater than "1.00", the Cumulative values were greater than "50%" of total variance (Table 3). In addition, all factor loading EFA were greater than 0.5, and only one latent factor was extracted in each subgroup, indicating that all measured variables were kept unchanged, and this variables also seems to represent a latent factor in each subgroup.

In AMOS software, the Confirmatory Factor Analysis (CFA) was conducted to examine the fit of a measurement model. But a good model fit of CFA was achieved when covariance links were added between error variances of "collaboration" and "kindness", and "theory lecture and lecture notes" and "VLE and RLOs", regarding the modification indices (MI) were high (Figure 3).

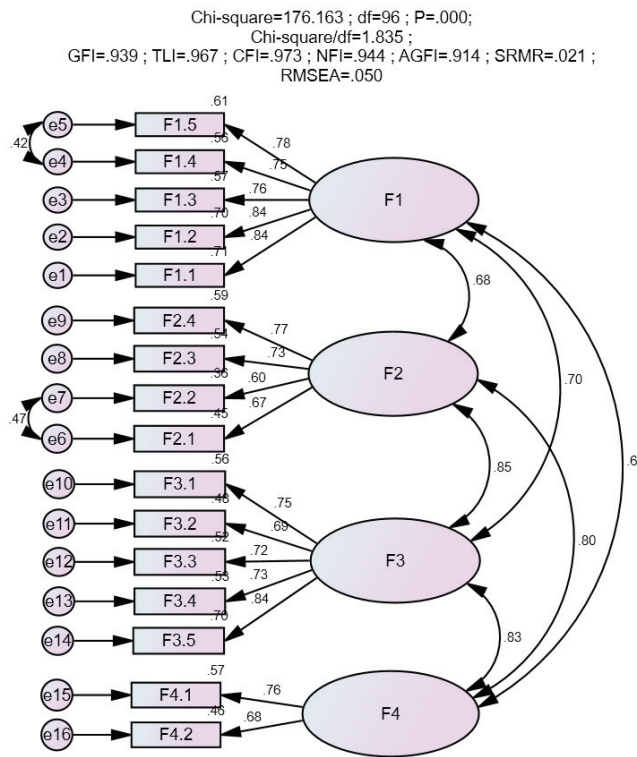


Figure 3. The CFA results for the factors of blended learning culture in the classroom

The goodness-of-fit statistics indicating the measurement model was a good fit to the data:  $\chi^2 = 176.163$ ,  $df = 96$ ,  $\chi^2/df = 1.835$ ,  $RMSEA = 0.050$ ,  $GFI = 0.939$ ,  $SRMR = 0.021$ ,  $NFI = 0.944$ ,  $CFI = 0.973$  and  $TLI = 0.967$ . Hence, H1, H2, H3 and H4 were fully supported, meaning that:

- Team based learning, interactions, digital information tools, physical design of the classroom, and online course interface are used as observed variables to measure on an open communication and teamwork environment in the blended classroom.
- The quality of instructional methods, and internal motivation are used as observed variables to measure the students' commitment to learning in the blended classroom.
- Trust, respect, independence, collaboration and kindness are used as observed variables to measure the core values of blended learning culture.
- Theory lecture and lecture notes, VLE and RLOs, physical planning and practical labs / classrooms are used as observed variables to measure the cultural practices in the blended learning process.

Furthermore, the direct correlations between the four latent factor were high, indicating that a first-order model was a good fit. In general, the measurement model achieves a good fit for the data collected. In other words, all factors of blended learning culture have a positive contribution to the SEM analysis.

#### 4.2 SEM Analysis

In AMOS software, a SEM was developed with arrows as shown in the conceptual model in Figure 2. But this resulted in a poor model fit. A good model fit of SEM was achieved when covariance links between error variances of "collaboration" and "kindness", and "theory lecture and lecture notes" and "VLE and RLOs" were kept in the model (Figure 4).

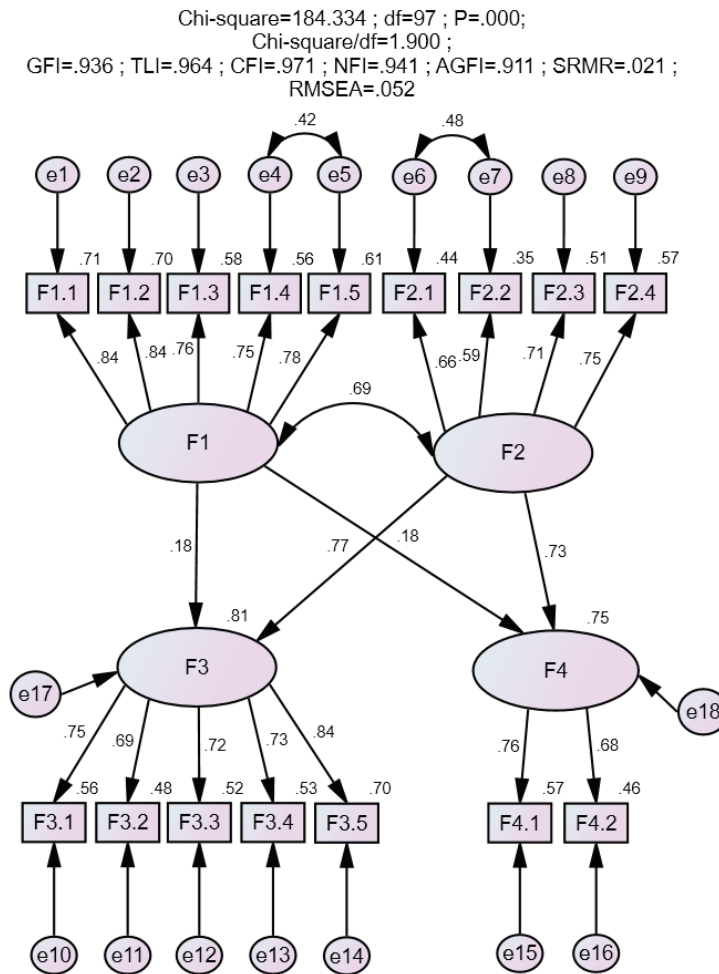


Figure 4. A SEM of blended learning culture in the classroom

Although the p value for the model was less than 0.05, but other indices indicated a good model fit. The fit of the conceptual model was:  $\chi^2 = 184.334$ ,  $df = 97$ ,  $\chi^2/df = 1.900$ ,  $RMSEA = 0.052$ ,  $GFI = 0.936$ ,  $AGFI = 0.911$ ,  $SRMR = 0.021$ ,  $NFI = 0.941$ ,  $CFI = 0.971$  and  $TLI = 0.964$  (Figure 4). Interestingly, the core cultural values and cultural practices in the blended classroom are positively related to the students' attitudes toward blended learning. Specifically, the core values of blended learning culture have a positive impact on the open communication and teamwork environment ( $r = 0.18$ ,  $p = 0.013$ ), and the students' commitment to learning ( $r = 0.18$ ,  $p = 0.049$ ). The cultural practices in the blended learning process have a positive impact on the open communication and teamwork environment ( $r = 0.77$ ,  $p < 0.001$ ), and the students' commitment to learning ( $r = 0.73$ ,  $p < 0.001$ ). Thus, H5, H6, H7 and H8 were supported. In addition, a covariance link was found between the core cultural values and cultural practices in the blended classroom ( $r = 0.69$ ,  $p < 0.001$ ). Thus, H9 was supported.

The variance of the latent factor "F3" (open communication and teamwork environment) was 81% influenced by the core cultural values and cultural practices in the blended classroom. Whereas, the rest (19%) was influenced by other factors. Similarly, the variance of the latent factor "F4" (students' commitment to learning) was 75% influenced by the core cultural values and cultural practices in the blended classroom. Whereas, the rest (25%) was influenced by other factors. In addition, larger correlation coefficients indicate that the cultural practices in the blended learning process have a stronger effect on the students' attitudes toward blended learning when compared to the core values of blended learning culture.

#### 4.3 SEM-Value Analysis in a Case Study at HUST

Two Mann-Whitney tests in SPSS were conducted to examine the acceptance of blended classroom by students on

the branch of blended learning experience before and gender (Table 4).

Table 4. The Mann-Whitney test for the factors of blended learning culture in the classroom

<i>Items</i>	<i>p-value</i> <i>(blended learning experience before)</i>	<i>p-value</i> <i>(Gender)</i>
<b>(1) Core values</b>		
Trust	0.19	0.89
Respect	0.61	0.91
Independence	0.08	0.37
Collaboration	0.68	0.21
Kindness	0.12	0.90
<b>(2) Blended learning process</b>		
Theory lecture and lecture notes	0.57	0.63
VLE and RLOs	0.40	0.66
Physical planning	0.54	0.74
Practical labs / classrooms	0.13	0.40
<b>(3) Communication and teamwork environment</b>		
Team based learning	0.66	0.81
Interactions	0.13	0.90
Digital information tools	0.25	0.73
Physical design of the classroom	0.79	0.89
Online course interface	0.13	0.81
<b>(4) Commitment to learning</b>		
The quality of instructional methods	0.33	0.60
Internal motivation	0.24	0.40

In the results of Table 4,  $p > 0.05$  in all cases indicated that the data of blended learning culture was not different between groups related to the gender and blended learning experience before of students. This means that the existence of blended learning culture has a positive effect on the acceptance of students for the blended classroom (or at least true at HUST). Thus, H10 was supported.

In order to analyze SEM-value, three Friedman tests in SPSS were conducted to examine the mean score rankings for the factors of blended learning culture in the classroom, thereby revealing SEM-values (Table 5).

Table 5. The Friedman test for the factors of blended learning culture in the classroom

<i>Items</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>Ranking in groups</i>	<i>p<sup>d</sup></i>
<b>(1) Core values<sup>a</sup></b>				
Trust	3.92	0.76	5	0.00
Respect	4.07	0.78	3	
Independence	3.95	0.80	4	
Collaboration	4.09	0.80	1	
Kindness	4.08	0.82	2	
<b>(2) Blended learning process<sup>b</sup></b>				
Theory lecture and lecture notes	3.79	0.78	3	0.00
VLE and RLOs	3.65	0.82	4	
Physical planning	4.07	0.78	2	
Practical labs / classrooms	4.16	0.82	1	
<b>(3) Attitudes toward blended learning<sup>c</sup></b>				
Team based learning	3.79	0.83	6	0.00
Interactions	3.79	0.87	7	
Digital information tools	3.87	0.84	4	
Physical design of the classroom	3.95	0.80	3	
Online course interface	4.05	0.68	2	
The quality of instructional methods	4.29	0.71	1	
Internal motivation	3.81	0.86	5	

<sup>a</sup>Strongly disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly agree = 5

<sup>b</sup>Very inefficient = 1, Ineffective = 2, Somewhat effective = 3, Effective = 4, Very effective = 5

<sup>c</sup>Very dissatisfied = 1, Dissatisfied = 2, Neutral = 3, Satisfied = 4, Very satisfied = 5

<sup>d</sup>Friedman test (N=339)

In the results of Table 5, p = 0.00 in all cases indicated that there were differences in the mean scores between the factors of blended learning culture by students' opinions. Thus, H11 were rejected. The mean score for all items were greater than the minimum score of "3.45" which indicates the success of blended learning culture in the classroom. Thus, H10 was fully supported. But there was no item above the average score of "4.45" (very successful level). Although there were differences in the mean scores, but the differences were not large. The ranking order of items in each group can lead to pyramid models of the size of SEM-values of blended learning culture in the classroom (Figure 5).

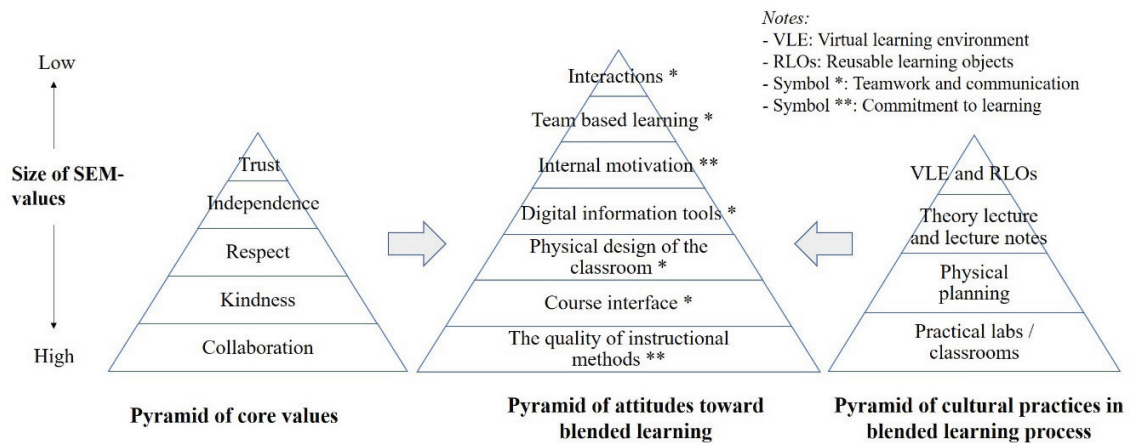


Figure 5. The size of SEM-values of blended learning culture in the classroom

Students responded that trust was the smallest size in the core values of blended learning culture. The practical labs / classrooms (face-to-face instruction) were the largest size while the VLE and RLOs were the smallest of cultural practices in the blended learning process. It seems that students still prefer face-to-face instruction activities a little more than the virtual / online learning environment. The quality of instructional methods was a positive contribution in students' attitudes toward blended learning.

In general, the meaning of these pyramids was to create highlights of the SEM-values of blended learning culture in a real classroom setting, such as HUST was a typical one. But why were the sizes of SEM-values not the same? What caused this difference? Could this be true on a large scale, or only at HUST? These questions we hope to be able to answer in future studies.

## 5. Discussion

In this study, we explored the factors of blended learning culture in the classroom by using the self-perception theory of Daryl Bem (1972). From there, at least three findings from this study were worthy of discussion. First, results from factor analyses reveal two key factors as the two exogenous variables of blended learning culture in the classroom, including the core values of blended learning culture, and cultural practices in the blended learning process. In addition, all endogenous variables corresponding to exogenous variables were also clearly confirmed through factor analysis. This finding corroborated the core factors of blended learning culture in the classroom, which has not been found in other studies. This initial result helped educators cover all latent factors that contribute positively to the success and sustainability of the blended classroom culture.

Second, there is a debate about whether to use an "open communication and teamwork environment" or "commitment to learning" to establish learning culture in organizations (Johnston & Hawke, 2002). This also leads to a heterogeneous understanding of learning culture, and how to establish a learning culture in higher education organizations. However, this debate may be closed (or end?) when this study indicated that both open communication and teamwork environment, and students' commitment to learning reflect the effects of the core cultural values and cultural practices in the blended classroom (see Figure 4). These two endogenous variables are indispensable to establish students' attitudes toward blended learning. The results of SEM analysis allow us to affirm that the core values of blended learning culture and cultural practices in blended learning process are the basic premise for the sustainability of attitudes toward blended learning. In our conclusion, this was partly supported by similar conclusions of other studies, such as: the blended learning process can transform the students' learning experience/ culture (Davis & Fill, 2007); technologies are not enough to transform the classroom, because the change in the core values of learning culture creates positive learning effects (Wojcicki et al, 2015); the learners' attitudes toward blended learning are success factors in the blended learning environment (Selim, 2007). We hope that providing an initial SEM of of blended learning culture can lead to interesting debates, and outline the ways of thinking, policies and practices related to blended learning.

Thirdly, and lastly, we analyzed the SEM-value for the existence of blended learning culture in the classroom. Two interesting conclusions are drawn. First, the existence of blended learning culture was not affected by factors related to gender and blended learning experience before of students. This conclusion was supported by similar conclusions of other studies, such as: "blended learning performance by gender shows a balance with no statistical differences between male and female" (Kintu et al, 2017, p. 16); blended course modality does not impact the dimensionality by which students evaluate their course experiences (Dziuban & Moskal, 2011). Second, there are differences in the size of value for the factors of blended learning culture by students' opinions (Figure 5). Although the value disparity is negligible, the pyramids of SEM-value analysis provide the highlights of the blended learning culture in real classroom contexts. This supports a claim that learning culture is a phenomenon of the social constructivist context (Johnston & Hawke, 2002). Collaboration, practical labs / classrooms (face-to-face instruction) and the quality of instructional methods were the largest size of SEM-value, at least true at HUST. This conclusion was supported by similar conclusions of other studies, such as: "the instructor characteristics construct as a critical factor of blended acceptance by students" (Selim, 2007, p. 404), collaboration was the most meaningful core value of blended learning culture in the classroom (Rovai & Jordan, 2004); in the initial stages of experiencing blended learning, students still preferred the traditional teaching and learning culture approaches than online/blended activities (Ng, 2010).

## 6. Conclusion

Starting with a definition of learning culture by Johnston and Hawke (2002), the focus of this article was to explore a SEM of blended learning culture in the classroom. The results of factor analysis (EFA and CFA) have explored the core factors of the blended learning culture. The result of SEM analysis has achieved a first-order model of blended learning culture in the classroom. And lastly, the SEM-values analysis for the existence of blended learning culture in

the classroom has confirmed that they positively impact the acceptance of blended classrooms by students.

Implications for education: a SEM of blended learning culture was explored to provide a functional framework for educators to systematically cover all that constitutes the success of blended classroom culture in the classroom. The researchers hope this model will assist and encourage educators to become blended teachers, promote further discussion of teaching roles, ideas for teaching design, and systematic selection of classroom activities.

One of the main limitations is that national cultural factors have not been mentioned, because national culture has been confirmed to have an impact on the success of blended learning (Renner, Laumer & Weitzel, 2015). We recommend that the pyramids of SEM-value analysis should be further explained in different blended classroom contexts.

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