RELATIONSHIP BETWEEN CONFUCIAN HERITAGE CULTURE AND PREFERENCE TO ACTIVE LEARNING AMONG CHINESE PRE-UNIVERSITY STUDENTS

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ABSTRACT

Educational borrowing of active learning into Asian countries, especially countries with a Confucian Heritage Culture (CHC) background, appears to have caused dilemmas which emerged from cross-cultural differences among teachers and students. Some students with CHC background are reported to resist active learning (AL). The present study aimed to conceptually define these two constructs and develop two scales, namely the Confucian Heritage Culture (CHC) Scale and the Preference to Active Learning (PtAL) Scale, which were used to predict the relationship between Confucian Heritage Culture and learning preference to active learning, by adopting philosophical, psychological, political science, and educational perspectives. In accordance with the research objectives, a correlational research design was adopted in the study. The study was conducted in two phases. In Phase 1, the scales were developed and validated, and these instruments were pre-tested. Then in Phase 2, the model put forward was validated, relationship was explored and theory was developed. Data for scale development was collected from 430 Chinese pre-university chemistry students, while data for partial least square analysis was collected from 441 Chinese pre-university chemistry students. Exploratory factor analysis (EFA) revealed that the constructed CHC Scale is four-dimensional, namely principled, dependence on teacher, harmony, and education, while the PtAL Scale is ten-dimensional, namely action, perceived values, application into life, examination, disappointed with self, uncomfortable, confidence, optimistic, embarrassment, and

unbothered. Partial least square analysis (PLS-SEM) revealed that CHC has a positive effect on PtAL. This means that if the CHC students perceived the culture that they experienced (as reflected in their beliefs and attitude), outweighed the costs and problems of engaging in AL, to be rewarding, they were more inclined towards AL, and vice versa. Thus, it is vital to have a deep cultural understanding and holistic perspectives into CHC.

Keywords: Confucian heritage culture (CHC), active learning (AL), science education, exploratory factor analysis (EFA), structural equation modeling (PLS-SEM)

HUBUNGAN ANTARA BUDAYA PEWARISAN KONFUCIUS DAN KECENDERUNGAN TERHADAP PEMBELAJARAN AKTIF DALAM KALANGAN PELAJAR CINA PRA-UNIVERSITI

ABSTRAK

Penggunaan strategi pembelajaran secara aktif di negara-negara Asia, terutamanya negara yang mempunyai Budaya Pewarisan Konfusius (CHC) telah mengalami dilema yang disebabkan oleh perbezaan antara budaya dalam kalangan pengajar dan pelajar. Kajian ini bertujuan untuk mengenal pasti definisi konseptual dan membangunkan dua skala, iaitu Skala 'Confucian Heritage Culture' (CHC) dan Skala 'Preference to Active Learning' (PtAL), serta juga mengkaji hubungan antara CHC dan PtAL dengan menggunakan perspektif dari psikologi, sains politik, dan pendidikan. Selaras dengan objektif kajian, satu pendekatan reka bentuk kuantitatif digunakan dalam kajian ini. Kajian ini dilaksanakan dalam dua fasa. Pada Fasa 1, dua skala dibangunkan dan disahkan. Pra-ujian bagi kesahihan instrumen kajian juga telah dijalankan. Dalam Fasa 2, model yang dikemukakan disahkan dan perhubungan prediktif diterokai dan teori dibangunkan. Data untuk pembangunan dan pengesahan skala diperoleh daripada 430 orang pelajar pra-universiti yang berbangsa Cina dan mempelajari kimia, manakala data untuk analisis 'partial least square' diperoleh daripada 441 orang pelajar pra-universiti yang berbangsa Cina dan mempelajari kimia. Dapatan daripada analisis faktor penerokaan (EFA) berjaya membangkitkan empat-dimensi untuk Skala CHC, manakala sepuluh-dimensi untuk Skala PtAL. Dapatan dari analisis 'partial least square' menunjukkan hubungan positif antara CHC dan PtAL. Implikasi terhadap teori, reka bentuk kajian, dan praktikal dihujahkan.

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CHC	:	Confucian Heritage Culture
PtAL	:	Preference to Active Learning
AL	:	Active learning
Res	:	Respect
Per	:	Perseverance
Dep	:	Dependence on Teacher
Har	:	Harmony
Edu	:	Education
RDI	:	Principled
ACT	:	Action
PER	:	Perceived Value
APP	:	Application into Life
EXM	:	Examination
DIS	:	Disappointed with Self
UNC	:	Uncomfortable
CON	:	Confidence
OPT	:	Optimistic
EMB	:	Embarrassment
UNB	:	Unbothered

Chapter 1 Introduction

Introduction

What would a Confucian Heritage Culture (CHC) Classroom snapshot look like? Imagine this,

> Sue–a dark-haired, Chinese, chemistry teacher who never forgets to wear her red pump shoes to class. It is ten o'clock in the morning and Sue enters an oddly quiet classroom. Seeing that most of her students are grasping a pen with head down doing their individual reading, she breaks the silence and says, "Class, we're going to do group work today." She then continues to explain about the objectives of the work, hoping that the students can understand her intention of doing it. Lim, a Chinese girl who has a dimple when she smiled, listens to Sue attentively. "Now, form groups of four, and here is your activity sheet," says Sue sternly. A few students get up, and happily form their groups with friends. While some, reluctantly, unhurriedly, drag their feet to form groups. After they all settled down, Sue says, "Discuss in your groups about the consequences of drug abuse." Lim is one of the few who feel very excited. She had never done any group work for chemistry, and she feels good, for Sue inspires a kind of respect she had never felt before. Lim's group begin their discussion and whisper among themselves softly. Sue observes that not all members in the group were participating, as one boy was playing with his pen and just nodding. Some groups remain silent, gazing up at the white ceiling of the classroom. By the time Sue asks the groups to present their ideas, the bell rings and the chemistry period comes to an end. Sue decides to ask the students to do further reading at home and submit a written report. Two days later, Sue heard from Lim that the inattentive boy in her group was not reading nor doing any work…

The above description of a CHC classroom is one of contrasts. What does this mean? There are students who respond positively, and there are some who do not. This is supported by Kember (2000) who said that students in CHC have been perceived to possess the following attributes, namely, rote learners, passive learners, resist innovative teachings, largely extrinsically motivated (which is usually regarded as negative). Nonetheless, the same students are also known to be high achievers, good at project work and willing to invest in education. Thus, despite the widespread

perceptions about Asian CHC students, there were some puzzling contrast in observations. However, Kember (2000) explained that the above attributes are a set of common misperceptions about Asian students (though Kember did not support with empirical evidence). It is common to portray that CHC students prefer rote learning, and prefer passive learning over active learning. A preference of passive learning are associated with poor academic achievement in Western universities (Biggs, 1988). Yet, CHC students were often recognised as high academic achievers.

The achievements of CHC students, and particularly Asian Chinese, are well documented. For example, in the Programme for International Student Assessment (PISA) test in 2015, run by the Organisation for Economic Cooperation and Development (OECD), Singapore students were top in mathematics, science, and reading. In fact, of the top 10 performers in mathematics and science, 70% were from countries having CHC (Singapore, Japan, Taiwan, Macao, Vietnam, Hong Kong, China, and Korea) (Davie, 2017).

Meanwhile, CHC countries such as South Korea, Taiwan, Singapore, and Hong Kong are referred as the "Four Asian Tigers" or "Four Little Dragons" or "Asian Economic Miracle" due to their astounding economic growth which underwent rapid industrialisation and maintained exceptionally high growth rate in the early 1960s and 1990, the post–World War II era (Slavicek, 2002). The four countries were inspired by Japan's stellar economic success. Economists then analysed what it was that these five prosperous East and Southeast Asian countries had in common, and found that all shared a strong CHC (Chia, 2011).

There was, then, ample evidence showing that CHC students are high academic achievers, and out-grown to be able to produce and maintain high economic growth of the country. Yet, there was a widespread view that CHC students have a preference to employ learning methods that produce low-level outcomes, such as passive learning over active learning. Would the values, beliefs, and attitudes embedded in CHC students affect their preference to active learning? It is perhaps good to know a little bit more about this culture first, and how it has evolved.

Confucianism. Historically, CHC is rooted in Confucianism, a system of thought rooted in the teachings of a Chinese philosopher, well known as Confucius, who lived about 2500 years ago. Confucius formed a set of guidelines for his disciples' moral development, and determined to create a civilised, harmonious, and orderly society. After his death, his disciples collected, compiled, and preserved his teachings, which then expanded and refined by other scholars and thinkers. For many years, Confucianism competed for the acceptance and approval of the Chinese people and political leaders with other rival religions and philosophies (Ivanhoe, 1990). Finally, under the Han dynasty, from 206 BCE to 220 CE, Confucianism's fortune changed by winning the backing of the Chinese government. Confucianism became China's official ideology and the central focus of its educational system around the same time as the beginning of Christianity. Confucianism influence also spurred to other East and Southeast Asia countries, particularly Korea, Japan, Vietnam and Malaysia.

However, during the 19th and 20th centuries, in China and other East and Southeast Asia countries, Confucianism lost its prevalent position in the political and

educational systems. Yet, the moral teachings that encompass the core of Confucianism has continued to mold the attitudes, behaviours and beliefs of many people, throughout the modern era, not only within East and Southeast Asia Chinese communities but also around the Western world. To determine the number of Confucians worldwide today, is impossible, because Confucianism has no formal church, temple or organised institution that can statistically determine the number.

Spread of Confucianism to Malaya and CHC. More importantly, the influence of Confucianism in Malaysia was first brought into Malaya by China immigrants (Malaysia was called as Malaya before independence in 1957). In the 18th century, colonial British ruled Malaya and required large number of labourers to develop the natural resources. The British then decided to recruit large number of labourers from China (and India) to help in the development (Yan, 2013). These Chinese labourers from China were mainly from Fujian, Guangdong, and Hainan provinces. The Chinese people from China who have been residing in Malaya were later known as 'overseas Chinese'. Their descendants inherited the CHC, and built upon the cultural foundation, forming an ethnic culture in Malaya (Zhong, 1995). Under the British colonial government, the Chinese were given the freedom to develop their own educational system (Gill, 2005). The Chinese started to build private (or independence) schools, as well as teaching Confucian ideologies and values.

Malaysian education system and influence of Confucianism in Malaysian Chinese vernacular education. However, the Chinese faced a lot of challenges when developing and maintaining their own vernacular school system under the British divide and rule policy due to the educational policies that were proposed since

Malaya's pre-independence. These policies included the 1) Barnes Report of 1951 that proposed a national system of schools in which either Malay or English to be used as the medium of instruction, 2) Rahman Talib Report of 1960 that made Malay as the compulsory medium of instruction in secondary schools and universities, 3) Education Act of 1961 that stopped financial aid from the government to Chinese secondary schools which continued to use the Chinese language as the main medium of instruction, and the 4) New Economic Policy which increased educational opportunities for Malay students compared to the Chinese and Indian students (Collins, 2006). Overall, the Malaysian government achieved its goal of using Malay as the medium of instruction at the secondary school level by 1978, and in the universities by mid-1980s. However, many Malaysian Chinese opined that these policies are intended to terminate Chinese vernacular education in Malaysia (Brown, 2007; Cangjin, 2006). Nonetheless, many protests, rallies, and joint memorandums by Chinese community upheld their national culture (Brown, 2007).

Having seen and experienced the challenges faced by their forefathers, many Malaysian Chinese continued to uphold the importance of education as it is regarded as an imperative element to preserve their cultural identity. As a result, about 85% of Malaysian Chinese today send their children to study at national-type (Chinese) primary schools rather than national primary schools (Centre for Public Policy, 2017; Segawa, 2007). National-type (Chinese) primary schools are primary schools which use Chinese, Malay, and English as medium of instruction, whereas national primary schools use Malay and English as medium of instruction. Both types of schools adopt a common standardised syllabus (Brown, 2007).

As have been pointed out earlier, that there are two types of national schools at the primary level in Malaysia, namely national-type schools and national schools. The other type of primary school is the private primary school. At the secondary level, there are three types of secondary schools, categorised as national, private, and vocational schools (Ministry of Education Malaysia, 2017). The private schools include Chinese independent schools, founded by overseas Chinese who migrated from China. At the tertiary higher education, there are three types of higher learning institutions in Malaysia, namely public universities, private institutions, and vocational institutions. Otherwise, students have the option to study overseas (Ministry of Education Malaysia, 2017).

Focusing on Malaysian Chinese, upon finishing six years of primary school, many of them opt to study either at national secondary school or Chinese independent school. Most of the Chinese independent school even national-type (Chinese) primary and secondary schools impose Chinese values and Confucianism philosophy such as *zhong* (loyalty 忠), *xiao* (filial piety 孝), *ren* (benevolence 任), *ai* (love 爱), *li* (courtesy 礼), *yi* (righteousness 义), *lian* (probity 廉), *chi* (sense of shame 耻) etc., as their school mottos. There are elements of preserving and promoting Chinese moral values and cultural legacy in the teaching syllabus, especially in Chinese independent school through Chinese language and history classes. Chinese independent schools are deemed to have better learning environment of Chinese traditional values which have been designed through the syllabus, and provide more extracurricular activities such as lion dance, 24 Seasons Drums, Chinese chess, Chinese calligraphy, Chinese orchestra and so on. Chinese independent schools also prioritise celebrations of Chinese festivals such as Lunar

New Year, Chap Goh Mei, Mooncake Festival, Qingming, Winter Solstice and so on. The emphasis of extracurricular activities and Chinese festivals celebrations provide platforms for students to understand and preserve Chinese traditional culture. Nevertheless, the preserving and promoting of cultural legacy have had been seen in many national-type (Chinese) primary school and national-type secondary school also.

Once the Chinese students have completed their secondary school, they must do a pre-university programme before they can embark in an undergraduate study. The choice of pre-university study is ample. They can opt to do Form-6, A-Level, Diploma, South Australian Matriculation, International Baccalaureate and so on. Many of these pre-university programmes are conducted at higher education learning institutions (Haji Ahmad, 1998).

Confucianism and CHC. Coming back to Confucianism, it emphasises personal and governmental morality, socially acceptable behaviours and sincerity. As the globalisation and modernisation in East and Southeast Asia, the Confucianism has evolved. There has been a critic on Confucianism that the "real" Confucianism (or pure doctrine) was not practiced by the society and oppressive government because the development of the "real" Confucianism was a threat for the political leaders to implement their political ideologies, in which the "real" Confucianism would advocate ideas of democracy and freedom of expressing disagreement in accordance to *li*. With the evolution of Confucianism and rapid social change in East and Southeast Asian, countries like Hong Kong, Japan, Korea, Vietnam and Malaysia inevitably have had shared Confucian heritage. Confucianism has had a great influence on education, economy, democracy, moral and cultural influence over the

lives of China's people and neighboring countries such as those in East and Southeast Asia countries, leaving its legacy in those countries.

These interpretations and discussions, thus far, are so much related to history, philosophy, and politics science. Returning to the question posted earlier "Would the values, beliefs, and attitudes embedded in CHC students affect their preference to active learning?" A further question arises from this: what is active learning and why does it matter?

Active learning. Cognitive theories suggest that only active processing of information and not just passive reception of that information, leads to meaningful learning (Frishkoff, Perfetti, & Westbury, 2009). This is because learning has to connect between what students already know with what they are going to learn (Bransford, Brown, & Cocking, 2000; Driscoll, 2005). Active learning (AL) is about being involved in the learning process in greater depth rather than just listening to lecture presentations in class; students must read, write, engage in discussions, use higher-order thinking skills to analyse, synthesise, and evaluate problems (Chickering & Gamson, 1987). Activities of AL classrooms include cooperative learning, collaborative learning, problem-based learning, discussion, role-play and others (Buckley, Bain, Luginbuhl, & Dyer, 2004; Persky & Pollack, 2010).

In relation to this, one must understand the importance of AL. The quality of students' college experiences is said to be determined by academic success, quality of relationships, and student's attitudes towards the college experiences (Johnson, Johnson, & Smith, 1998). The quality of relationships is dependent on quality of the relationships among students and between students and lecturers, and cohesiveness of all (Johnson et al., 1998; Sandi-Urena, Cooper, Gatlin, & Bhattacharyya, 2011). The

attitude towards college experiences is in turn, related to attitudes toward learning, the subject area, and the level of intrinsic and extrinsic motivation (Boekaerts, 1995; Johnson et al., 1998; Pintrich, 1999). Active learning instruction is reported to be effective in promoting quality of relationships (Park, Cha, Lim, & Jung, 2014; Springer, Stanne, & Donovan, 1999), more favourable attitudes towards learning (Park et al., 2014; Perkins, 1991; Springer et al., 1999), and increased persistence or retention towards science courses (Springer et al., 1999).

Active learning and the Malaysian higher education system. Active learning is in line with the Malaysian government's aspirations to transform the higher education system and to ensure that the Malaysian youth are holistically developed, and equipped with necessary values, knowledge, and skills to succeed in the competitive and uncertain world (Ministry of Education Malaysia, 2015). The Ministry of Education of Malaysia emphasises ethics and spirituality, leadership skills, national identity, language proficiency, thinking skills, and knowledge in the students' development during their higher education learning (Ministry of Education Malaysia, 2015). Specifically, the implementation of AL in higher learning institution is able to build around the *ethics and spirituality* when students become compassionate and caring towards their peers and teachers, *leadership skills* when students become emotionally intelligent, socially responsible, and effective communicator, *language proficiency* of Malay and English, and *knowledge* when they harness and apply knowledge learnt.

By now a brief foregrounding of Confucianism, CHC, AL, and higher education in Malaysia were given. Returning to the question, "Would the values,

beliefs, and attitudes embedded in CHC students affect their preference to active learning?" The present study seeks to address the question.

Problem Statement

Societies that are strongly influenced by the ideologies, practices, moral and cultural influences of Confucianism, are known as Confucian heritage culture (CHC) (Tu, 1996). To understand the transformation and evolution of CHC from the Confucianism, one can view from the perspectives of political science and history of Confucianism. Although the Confucianism has experienced dramatic rises and sidelines, it has inevitably shaped the sociocultural values and practices of the Chinese, not only in China but also in other parts of the world such as Vietnam, Korea and Japan, and other parts of Southeast Asia including overseas Chinese communities in Malaysia (Chen, 1995; "Rujia wen hua dui Dong Nan Ya guo jia de ying xiang [Influence of Confucianism toward Southeast Asia]," 2013; Zhong, 1995).

At many large colleges and institutions, lecturing to large groups of students seems to be the most widely practised instructional method, because faculties can share information with a large group of students and save cost. In the traditional lecture method, students passively absorb pre-processed information, and then regurgitate them in examinations. Such an environment prepares students to learn only at a surface (passive) level rather than at a deeper (active) level of involvement (Baeten, Kyndt, Struyven, & Dochy, 2010; Marton & Säljö, 1976).

Nevertheless there has been a paradigm change in institutions to urge lecturers to adapt AL in their instructional strategies (Abdullah, Abu Bakar, &

Mahbob, 2012; Hsu & Malkin, 2011; Lake, 2001; Revell & Wainwright, 2009), even in large classes (Bleske-Rechek, 2001; Wright, 1996); however this is not without problems. Even students from a non-CHC learning environment have reacted in different ways when AL and constructivist curricula are implemented, in that these students either reject or resist what is educationally good for them (Deeley & Brown, 2014; Lake, 2001; Poon, 2002; Sasikumar, 2014; Wesp & Miele, 2008). This educational borrowing of AL into Asian countries has caused numerous dilemmas which emerged from cross-cultural differences among teachers and students (Liu & Feng, 2015; Nguyen, Terlouw, & Pilot, 2006).

Students with a CHC background have been reported to resist indirect instruction pedagogy because they see AL as a sharp contrast to their very familiar passive listening role which they have become accustomed (Hurley, 2014; Izadi & Milner-Bolotin, 2014; Sasikumar, 2014). These students expect to be told what to learn and how to learn it, and they do not wish to explore learning on their own (Koh, Tan, Wang, Ee, & Liu, 2007; Suchman, Smith, Ahermae, Mcdowell, & Timpson, 2000; Tan, Sharan, & Lee, 2007). Therefore, there are students, especially Chinese learners with a CHC background who prefer passive learning over AL (Chu & Kim, 1999; Tan et al., 2007) because they perceive that the (a) amount learned, as well as course and lecturer effectiveness is lower in AL groups (Lake, 2001), (b) active learning does not significantly improve student learning (Goodman, Koster, & Redinius, 2005), and (c) need to spend more time in preparation (Tan et al., 2007).

Research on students' preference to AL as well as research on AL have been mostly conducted in Western countries (Akdemir & Arslan, 2012). However, the educational settings in the West are different from the Asian context, in particular

Malaysian classrooms in many ways such as differences in the curricula, pedagogy, teacher beliefs, student beliefs, and classroom contexts. Findings of studies done in the West cannot be generalised to the local context (Nguyen et al., 2006).

Echoing Rochester (2003), Gress, Fior, Hadwin, and Winne (2010) reported that systematic studies and analyses are necessary to examine complex interactions. As Covill (2011) noted, how students perceive a teaching approach can determine the success of the teaching approach itself. If students perceive that the traditional lecture method is educationally effective for them, they will resist changing to other methods, including AL (Covill, 2011; Elen & Lowyck, 2000). In addition, Kyndt (2013) noted that culture affects learning and has a strong impact on learning styles. Past research has also found that there is a close link between values (deep-level culture) and behaviours (surface-level culture) where values are viewed as the principal driver of individuals' behaviours (Hemingway & Maclagan, 2004; Siah, Ong, Tan, & Sim, 2015), and thus may affect the actions, perceived situations and decision making during AL activities. In particular, Sharan (2010) and Thanh et al. (2008) concluded that empirical studies of the role of AL in the CHC context are infrequent.

Chinese in the People's Republic of China, Hong Kong, Taiwan, Singapore, Korea, Japan (Watkins & Biggs, 1996), and Malaysian Chinese (Foong & Daniel, 2013) share a Confucian heritage culture (CHC) background. Students in CHC learning environments have been commonly reported as quiet, passive, submissive, and have minimum interaction with lecturers (Chu & Kim, 1999; Tan et al., 2007). In Malaysia, educators are exposed to more current educational trends, beliefs, values, and practices. Despite this, education in Malaysia is still influenced by traditional

beliefs, and traditional instructional pedagogy which still persists as the norm (Carmody, 2010), especially in schools and institutions which have CHC background. Nonetheless, students' resistant to global change and hindering from adopting to educational borrowing has proven to be significantly influenced by social culture (Liu & Feng, 2015; Zhang, 2008).

A Confucianism teaching and Chinese values in CHC determines the students' characteristics and perception in worldview, which could exist in any classroom settings. However, for the context of this study, the chemistry learning environment was the only focus. Applied to students' preference to a particular learning methodology in chemistry classroom learning, cultural factor in CHC may have a greater impact than other factors. Yet, most researchers in education have so far focused on the various types of AL activities and its outcome, overlooking the influence of CHC cultural factor and students' preference to AL. Thus, past literature overestimate the importance of the concept of CHC and preference to active learning (PtAL) from the perspective of philosophical, psychological, political science, and educational.

Still, existing research does not offer any measurement instrument that might help researchers and educators to compare the perceived characteristics of CHC and PtAL in chemistry learning classroom. These conceptual and methodological gaps positioned the present study.

Notwithstanding the appropriateness, little is done to attest the dimensionality of these constructs in forming the characteristics of Confucian heritage culture (CHC) and preference to active learning (PtAL), as well as predicting CHC towards PtAL in a single model. Additionally, CHC and PtAL studies are predominantly done

in the other Asian context especially in Hong Kong, Vietnam, and Singapore (Lam, Sui, Ho, & Wong, 2002; Nguyen, 2008; Tan et al., 2007). Such deficiency could lead to model misspecification especially in different context and settings, thus misinforming the theoretical implications and practical relevance of these research areas. However, with the advancement of algorithm in latent variable structural equation modeling (SEM) and the limitation of the first generation multivariate data analysis, the present study aimed to ascertain the dimensionality of the CHC and PtAL constructs and to explore the model in order to provide practical understanding towards preference to active learning among pre-university Chinese students in chemistry learning using partial least squares structural equation modeling (PLS-SEM). The purpose was to not only offer theoretical and methodological input to the study, but also provide understanding of pre-university Chinese students in the context of preference to active learning in chemistry learning.

The purpose of this study is to 1) conceptually define CHC construct, 2) conceptually define PtAL construct, 3) validate these higher order of constructs, 4) explore the relationship between CHC and PtAL.

Rationale of the Study

The aforementioned discussion was done is a chemistry learning environment because the researcher of the present study faced challenges, in particular with students who have a CHC background in terms of resistance to AL in learning pre-university chemistry. After years of teaching students who are mainly Chinese ethnic and with CHC background, the researcher finds this problem occur repeatedly. Therefore, the researcher would like to investigate whether the concept of AL that has been successfully implemented in the Western can be applied in the East, especially in Malaysia, as well as investigating whether the cultural effect of CHC has any relationship with students' preference to AL. Moreover, the researcher is also Chinese origin but has not been resisting AL and is therefore puzzled with the observation of her students resisting AL—this drives the desire and motivation to carry out the present study. The sample of chemistry students was because the researcher wants to investigate this prevalent problem within the institution she works in where there are a large number of Chinese students with a CHC background.

Scope of the Study

This study was an exploratory study, in which the CHC and PtAL constructs were derived from literature, upon which two scales were developed, through which the two constructs were investigated within the context of pre-university chemistry learning environment. This study was not an intervention study. Therefore, this study did not measure the outcome of students' active learning.

The sample in this study was a challenge but the researcher decided upon the specific criteria namely, that the sample must be (i) pre-university Chinese chemistry students who have enrolled into a pre-university science programme in a tertiary higher education institution, (ii) have attended national-type Chinese primary school and/or national-type secondary school/Chinese independent school, and (iii) parents must be able to speak and/or read Chinese. The identified criteria of the selected sample represented the general population of Malaysian Chinese students. This sample was deemed adequate as the study did not intend to investigate the origin of the proposed characteristics (sub-construct of CHC) among the Malaysian Chinese learners, nor whether or how the identified constructs of CHC have been influenced by various religions or ideologies in the present Malaysian context.

Research Objectives

The following objectives guided the research study:

1. To develop the dimensionality of a Confucian Heritage Culture Scale for the selected Chinese pre-university chemistry students.
2. To develop the dimensionality of a Preference to Active Learning Scale for the selected Chinese pre-university chemistry students.
3. To explore the relationship between Confucian Heritage Culture and Preference to Active Learning for the selected Chinese pre-university chemistry students.

Research Questions

The following questions guided the research study:

1. What are the underlying constructs of the Confucian Heritage Culture Scale for the selected Chinese pre-university chemistry students?
2. What are the underlying constructs of the Preference to Active Learning Scale for the selected Chinese pre-university chemistry student?
3. What is the relationship between Confucian Heritage Culture and Preference to Active Learning?

Hypotheses

The alternative hypotheses were stated as follows:

H_1: Respect, Perseverance, Dependence on Teacher, Harmony, and Education emerge as the constructs of the Confucian Heritage Culture Scale for the selected Chinese pre-university chemistry students.

H_2: Participation, Meaningful Learning, and Attitude emerge as the constructs of the Preference to Active Learning Scale for the selected Chinese pre-university chemistry students.

H_3: There is a significant relationship between Confucian Heritage Culture and Preference to Active Learning for the selected Chinese pre-university chemistry students.

Hypothesised Model

Based on the literature review and theoretical framework that was put forward in this study (see Chapter 2 Review of Literature, Chapter 3 Conceptualisation of the Study), the CHC construct includes 5 sub-constructs (or dimensions) of Respect, Perseverance, Dependence on Teacher, Harmony, and Education, and it is the interplay of these 5 components that contributes to students' PtAL. To represent the totality of CHC, the 5 sub-constructs are unified into an integrated single construct. Therefore, the present study developed an integrated formative second order construct inclusive of Respect, Perseverance, Dependence on Teacher, Harmony, and Education based on studies by Hofstede (2011), Siah et al. (2015), and Watkins & Biggs (2001). These 5 first order sub-constructs were assessed using indicators that were reflective of the qualities of the sub-constructs. First order constructs are those which are measured directly by observed indicators (Hair, Hult, Ringle, & Sarstedt, 2016). These first order sub-constructs go toward the creation of second order CHC as a reflective-formative second order construct (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

In addition, the PtAL construct based on 3 sub-constructs Participation, Meaningful Learning, and Attitude are unified into an integrated single construct. Therefore, these 3 sub-constructs formed PtAL as a formative second order construct based on studies by DeMonbrun et al. (2017), Finelli et al. (2014), Struyven et al. (2008), and Yudko et al. (2008). These first order sub-constructs were assessed using indicators that were reflective of the qualities of the sub-constructs. The first order sub-constructs go toward the creation of second order PtAL as a reflective-formative

second order construct. Figure 1.1 shows the hypothesised model for the present study.

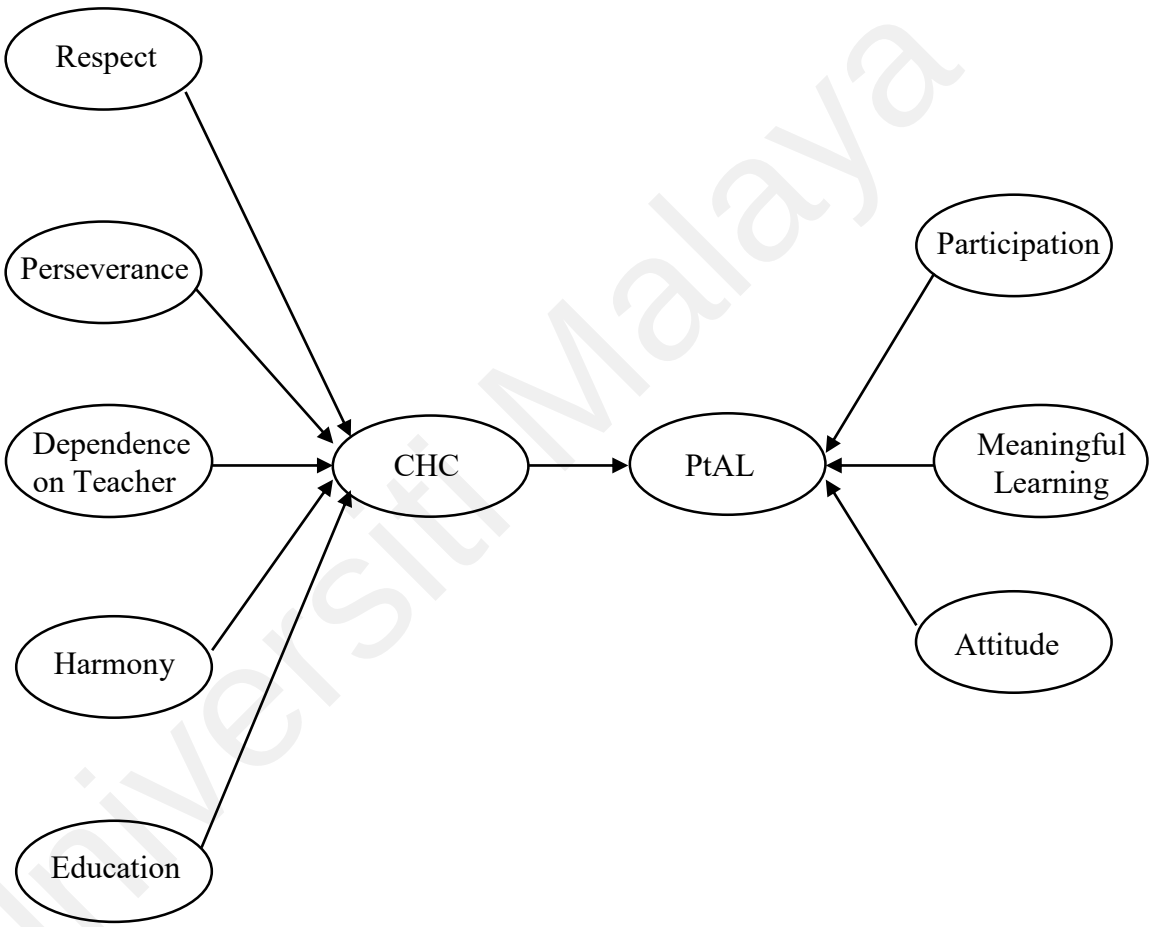


Figure 1.1 Hypothesised model

Significance of the Study

Doing research on the measurement of students' PtAL will make a significant contribution to the development of effective means of AL. First, as noted above, little attention has been paid to the creation of a valid and reliable measurement instrument of CHC students' application of Chinese values. The currently available instruments are questionable. A commonly existing problem in academic areas is, as Schwab (1980) argued, that measures are often used to empirically examine a hypothesised relationship between variables without adequate data supporting their reliability and validity. This problem causes difficulties in interpreting whether a statistical finding is reliable or not because the measures may generate invalid data (Churchill, 1979; Hinkin, 1995). The present study contributes to the validation of for the scale of CHC and PtAL with assured accuracy of measurement, which can be used as an research instrument in the future field studies conducted by other researchers.

Second, up till now, not much effort has been made to overcome participation and attitude issues relevant to resistance to AL in higher education institutions. If a higher education institution wants to encourage students' participation in AL, students' preference to AL should be explicitly recognised as part of the learner's performance domain and should be linked to cultural context. This study could help support the design and development of an effective way to overcome the resistance to AL and to successfully facilitate implementation of AL activities.

Additional investigation into the use of AL in Asian countries like Malaysia should prove useful particularly if more attention is given to the field of study. The findings of this study related to the cultural context could be useful in providing valuable insight into CHC learning environment, as well as beyond classroom

environment, since the present study can be easily modified to fit any situation, not just for education field.

As the Government of Malaysia aspire to develop a nation that has pride in Malaysia and will embrace diversity, the present study provides better and deeper understanding of one of the ethnic in Malaysia, that is the Chinese with CHC background.

In addition, the present study will be significant particularly to Ministry of Tourism and Culture, as well as Ministry of Unity, Culture, Arts and Heritage of Malaysia, or to any other organisation and/or countries who want to understand more about CHC and embrace the uniqueness of diversity in Malaysia better or to preserve the culture heritage of Confucianism.

Limitations of the Study

Despite the significance of this study, there were some limitations as well. The scope of the study may be spread out on a continuum. The sample in this study consisted of Chinese students who have grown up with various degrees of exposure to a CHC background (see Chapter 1 Scope of the Study). This was because these students were either from vernacular schools (which are also called as the National-Type Schools (i.e. SJK (C) and SMJK) or from Chinese Independent Schools or from National schools (i.e. SK, SMK), which could provide different levels of exposure to CHC. Additionally, the home backgrounds of Chinese students also vary. Thus, for this study, the selected sample must have parents who spoke Chinese or/and are able to read Chinese as well. These students could also have different experience toward various qualities of AL activities. This study was unable to completely isolate these different groups of students to represent the different range of CHC and AL. To identify Chinese students who have gone through national-type (Chinese) primary school education, followed by secondary Chinese school education until tertiary higher education, throughout his or her entire education life is unlikely possible. This very real practical issue is beyond the scope of this study and difficult to handle. Thus, no tighter selection criterion was applied because the population of Malaysian Chinese students is as such.

In addition, the study was an exploratory study and as such getting an overall idea of the whole population of Chinese students as a group in relation to the dimensionalities of the developed scales was the intent, as well as to investigate what encompasses them in general, justifying why a broader and looser sampling criterion was used.

The selected sample was meant to represent the whole population of Malaysian Chinese student (who possess Confucian heritage culture). However, since the population of the Chinese students in Malaysia is not available, the non-probability sampling method was used to select the targeted sample for this study. The targeted population was predicted to consist of 17258 Chinese pre-university chemistry students in year 2018 (CIA World Factbook, 2018; Educational Data Sector, Educational Planning and Research Division, 2018; Nasa, 2015).

Another aspect is that as a whole, the Malaysian education system can be related to Confucianism principle (Al-Hudawi, Lai, Musah, & Mohd Tahir, 2014; Cheah, Yusof, & Ahmad, 2014; Md Aroff, 2014). The majority of the Chinese pre-university students have followed the Malaysian education system which has been influenced by Confucianism, Christianity, and Islamic philosophy. In view of this, Malaysian Chinese students whatever their background, are believed to have inherited or have been ingrained with CHC elements (Slavicek, 2002; Yan, 2013). Although the CHC evolved from Confucianism, it doesn't mean it is to be in the original form of Confucianism. The globalisation and rapid social change has influenced and shaped the Chinese community in CHC countries. Therefore, the present study is only able to capture the present profile of CHC.

Furthermore, this study did not consider other variables such as the teachers' characteristics, students' learning style and such.

Definition of Terminologies

The following terminologies are defined before conducting factor analysis. After the factor analysis and structural equation modeling were conducted, some of the terminologies were reviewed accordingly.

Active learning (AL): In the context of this study, AL referred to instructional approaches which promotes students' meaningful learning in chemistry learning. Students were engaged in chemistry classroom activities and take partial ownership for their own chemistry learning through actively participating in class activities of written exercises, games, problem-based learning, debates, class discussions, etc. Active learning is student-centred.

Passive learning: In the context of this study, passive learning referred to a lack of active student participation especially during traditional didactic instructional approaches as in a teacher-centred classroom setting, in which the teacher defines and delivers tightly structured courses, whereas the students were passive listeners in chemistry learning.

Preference to active learning (PtAL): This study focused on the analysis of PtAL because students' resistance can be a major barrier to the adoption of AL in chemistry classrooms (Cutler, Borrego, Prince, Henderson, & Froyd, 2012). In this study, PtAL was initially defined into the constructs of participation and engagement in classroom activities, transforming these activities into meaningful learning, and

the attitude demonstrated when engaging in these chemistry activities, which can contribute to the ultimate effectiveness of one's chemistry learning. PtAL in this study were measured by (1) Participation, (2) Meaningful Learning, and (3) Attitude subscales. Later, upon the model has been validated, the definition of PtAL was reviewed. Thus PtAL can be measured by the subscales of (1) Action, (2) Perceived Values, (3) Application into Life, (4) Examinations, (5) Self-disappointments, (6) Comfort, (7) Confidence, (8) Optimism, (9) Embarassment, and (10) Concerns. PtAL is then defined as the extent to which a student possesses qualities such as action qualities, perceived values, life applications, examinations, self-disappointments, comfort, confidence, optimism, embarrassment, and concerns when engaging in AL activities in a chemistry classroom. In the context of the present study, the developed PtAL Inventory was used to measure the PtAL construct (see Methodology).

***Participation*:** In the context of this study, participation was the first construct of PtAL. Participation was equivalent to the behavioral engagement in the student engagement literature, and was an observable outcome of engagement (Chasteen, 2014; Shekhar et al., 2015) and motivation where motivation was greatly impacted toward the AL task (Credé & Phillips, 2011; Hart, Stewart, & Jimerson, 2011; Vaughan, 2014). Thus, participation in the present study was defined as the behavioral engagement towards the AL activities in chemistry learning.

***Meaningful learning*:** In the context of this study, Meaningful Learning was the second construct of PtAL. It was an aspect of emotional engagement identified from the review of literature of student engagement, and was built through thoughts, beliefs, culture, and expectations; it was also supported by cognitive and socio-cognitive theories of motivation (Trowler, 2010). Thus, Meaningful Learning was

defined as the beliefs and thoughts about the *importance* of the AL activities, *time and effort* spent in the AL activities, *knowledge and skills* that can be learnt and *applied* into daily life in chemistry learning.

***Attitude*:** In the context of this study, Attitude was the third construct of PtAL. It was another aspect of student engagement covered emotional engagement that related to the students' experience with the AL task and with the teacher in chemistry learning. This emotional engagement was largely impacted by the cognitive and socio-cognitive theories of motivation. Note that this emotional engagement was also impacted by the attitude construct discussed by cognitive dissonance theory (Elliot & Devine, 1994; Martinie, Olive, Milland, Joule, & Capa, 2013). In this study, the term attitude was used rather than emotional engagement. Attitude was defined as the state of dissonance related to the *likes or dislikes* and *responses* to students' experience with the AL task in chemistry learning.

Confucian heritage culture background (CHC): In this context of study, CHC background was the setting of an ethnically Chinese social value system derived from the Confucian ethos, which can be measured by (1) Respect, (2) Perseverance, (3) Dependence on Teacher, (4) Harmony, and (5) Education sub-constructs. Later, upon the validation of the model, the definition of CHC was reviewed, thus CHC can be measured by the sub-consructs of (1) Principled, (2) Dependence on Teacher, (3) Harmony, and (4) Education. CHC is defined as the extent of experienced culture (beliefs and attitude) to which people of Chinese origin have shared strong Confucian heritage possess characteristics such as being principled, dependence on teacher, harmony, and education. In the context of the present study, the developed CHC Inventory was used to measure CHC construct (see Methodology).

Respect: In the context of this study, Respect can be categorised as (1) respect to teacher, (2) respect to peers/mutual understanding between peers. Respect to teacher was defined as showing good manners, being polite and/or following the instructions or orders of teachers, who was capable to teach or guide the students. Whereas respect to peers or showing mutual understanding was defined as showing tolerance, support within the group to ensure the success of a group.

Perseverance: In the context of this study, perseverance focused on one's ability to push on ahead even under extreme circumstances forgoing immediate gratification in favor of delayed gratification, with the delayed gratification bringing a better reward.

Dependence on teacher**:** In the context of this study, dependence on teacher can be categorised as dependence on the teacher as being the ultimate source of knowledge.

Harmony: In the context of this study, maintaining harmony was to save one's face or to avoid conflict which could be due to (1) lack of confidence in being right, (2) lack of confidence in self due to a shy personality, or (3) avoid humiliating others.

Education**:** In the context of this study, education in a Chinese family was the ability to utilize what has been learnt successfully. Education was highly valued in a Chinese family as proof of their social status.

Chapter Summary

Educational borrowing of AL into Asian countries has never been an easy process, especially to countries that has CHC influence. Students with a CHC background have been resisting AL. Hence, the urgency to study the dimensionality of CHC and PtAL constructs, and explore the relationship between them are essential.

The present study planned to develop two scales; one to measure the characteristics of CHC Chinese students, another one to measure the preference of CHC Chinese students towards AL, as well as to confirm the underlying latent constructs and explore the relationship between CHC and PtAL within the context of chemistry learning environment. The present study would help to inform professionals who work with Chinese students and families. It brings insights regarding Confucian influence and its values and how it is influencing students' choice and preference to AL.

Chapter 2 Review of Literature

Introduction

As the core of this present study is about Confucian heritage culture (CHC) that has evolved from Confucianism, and determining its relationship with students' preference to active learning (PtAL). In this chapter, the literature on the history of Confucianism, evolution of CHC were detailed from the perspectives of history, philosophy, and politics science. Literature on PtAL and literature related to both of CHC and PtAL are also reviewed. Lastly, the literature on chemistry education are reviewed.

Confucianism

Societies that are strongly influenced by Confucian ideologies, practices, moral and cultural influences, such as Malaysia, Vietnam, Japan, Korea, Taiwan, and Singapore, are known as Confucian heritage culture (CHC) (Tu, 1996). Since the notion of "Confucian heritage" has been repeatedly stressed, the ideology of Confucianism is reviewed and discussed here, so that a more holistic view looking from the perspective of historical, philosophical, and political science are integrated into this interdisciplinary research study.

In some circumstances, selected verses in its original form written in Chinese are selected from the books of Confucianism teachings. These verses are translated by the researcher and provided together with the Chinese version. Verses selected

from *Analects* are provided together with its chapter number such as 13.3, which means Chapter 13, part 3 in the *Analects*.

Confucius' Life. Tracing back to the history of Confucianism, Confucianism is rooted in the teachings of the Chinese scholar Confucius. The name Confucius was the Latinised version of *Kongfuzi* (孔夫子). In Chinese society today he is called *Kongzi* (孔子) in short. *Kong* being his family name (surname) and the *Zi* means "Teacher" or "Master". However, the Western convention of Confucius is used in this present study because it is most familiar to English speakers, but his real name should begin by knowing. His real name is *Kong Qiu* (孔丘).

Confucius grew up in the Spring and Autumn Period (c. 722–468 BCE), a period with political and social chaos due to the rulers of different states striving for power and corruption was rampant. Confucius hoped to restore civility and harmony and replaced the prevailing harsh rule by law and punishment with rule by virtue. He was reviving the ancient practices and doctrine of the sage-kings from the Zhou Dynasty, known as the Mandate of Heaven. In other words, the Confucianism is not founded by Confucius, but is a tradition that began before Confucius (Rainey, 2010). However, he has articulated the tradition best.

How Confucius wanted to restore his country to achieve civility, peace, and honesty? The solution is to lay education, firmly believed by Confucius. He became determined to teach his disciples on the accumulated wisdom of the past, trained the moral values, rituals, and culture set forth in the ancient Chinese classics to the rising generation. Once his disciples had mastered the wisdom, they were sent to their

troubled nation to reform it. Confucius hoped his fellow students would pass on the knowledge and moral values they had learned to other after being a government officials, parents, or community members.

For Confucius, he firmly believed that the purpose of education was not merely something to be acquired only for the betterment of the individual learner but it was something to be used for the improvement of society as a whole. Thus, in the very first chapter of *Analects* 《论语・学而》, the following verse has articulated it well:

> 1 子曰："学而时习之，不亦说乎？有朋自远方来，不亦乐乎？人不知而不愠，不亦君子乎？”
> Confucius asked, “To learn, and put what you have learned into practice…isn’t that a great pleasure?”

Confucius' Influence. Many of the Confucius' influence can be seen from the perspective of history and political science. Confucius' teachings were further propagated by Mencius and Xunzi. Meanwhile, Confucius' teachings faced competition from a whole host of other religions and philosophies such as Legalism, Moism, Daoism, and Buddhism in ancient China (Ivanhoe, 1990). Confucianism had been sidelined when the Qin rulers (c. 221–207 BCE) endorsed Legalism that promoted strict legal and punishment over ruling by virtue as advocated by Confucius.

During the Han dynasty (206 BCE–220 CE), Confucianism's fortune changed when *Analects* was included as one of the *Four Book* which ancient scholars must study to pass the civil competitive examination to become government officials (Rainey, 2010). Even, academy was established where the ancient students could study the classics and texts to sit for the civil service examination. The influence of Confucianism remained prominent in subsequent dynasties after the Han dynasty, but continued to face stiff competition from Buddhism and Daoism. During the Song dynasty (960–1279 CE) Confucianism reached another apex when Neo-Confucianism (宋明理学) is formed (Slavicek, 2002). Neo-Confucianism is a fusion of Confucianism with Buddhist and Daoist ideas, with the desire to develop the Confucius' teachings into a more complete school of thought, where one is capable to answer the questions regarding the universe and man's destiny in it; in which have been addressed by both Buddhism and Daosim, but had all been ignored by Confucius. During this period, Confucianism dominated almost every aspect of ordinary people's life and behaviours, as well as on the government and education system. The far-reaching influence of Confucianism has also put down its deep roots

in other East Asian countries such as Korea, Japan, and Vietnam (Berthrong & Berthrong, 2014).

Outside of China, during the period of the twentieth century, Confucianism also experienced times of great strength as well as profound weakness. In Vietnam, under the country's last ruling family, the Nguyens, Confucianism reached the triumph of its influence, then began a steady downward after the country became a French colony in the late 1800s until the Communist triumph in 1975 (Rainey, 2010). In Korea, with the fall of the Choson dynasty and the traditional Korean state in the early twentieth century, Confucianism was disestablished (Slavicek, 2002). However, Confucianism retained much of its deep influence over Korean social attitudes and practices, towards their family, teachers, as well as international affair (Rainey, 2010).

In Japan, before Japan was modernising, the influence of Confucianism could be seen when the rich and powerful Japanese families set up their own academies so that the students will be trained to sit for civil service examination. The result of this were the stiff competition among these families and the disputes among the Confucian scholars at their academies (O'Dwyer, 2016). When the nation was rapidly modernising, at the same time it has lost its emphasis on traditional learning and rituals advocated by Confucianism. However, later, during the 1930s until the end of World War II, the Japanese government promoted Confucian values such as loyalty and filial piety so that its citizen become obedient to the state and social stability (Yan, 2013). After the defeat of Japan in 1945, the Japan government again sidelined Confucianism. Until the final decades of the century, when Japan rebuilt its economic powers and became one of the world's leading economy, another sea of

change occurred in Japanese Confucianism. Confucianism in Japan reemerged as an important force in the national education system, and thus, the Japanese learners' phenomena due to the Confucian heritage culture has become the topic of intense study and debate by scholars (Slavicek, 2002). It is also to be noted that the influence of Japanese Confucianism in Malaysia may occur during the Japanese Invasion of Malaya and Japanese Occupation of Malaya from 1941 to 1945. Nevertheless, the moral virtues such as loyalty and filial piety from Confucianism ideologies are continued throughout the 20th century and still be taught in Japanese schools.

The influence of Confucianism can be seen in Southeast Asia. In Singapore, its statesman Lee Kuan Yew, Singapore was determined to produce first-class education system, top-ranking engineers, computer programmers, medical researches, and fully graduates. His plan was indeed successful. However, to Lee's dismay, he has also created a generation that has no clear sense of morality and ethics despite these young graduates were highly educated (Campbell, 1982; Chia, 2011). The government, in the 1970s, has invoked Confucian values at all levels in the schools (Hang, 2011; "Rujia wen hua zai Dong Nan Ya de liu bo ji qi ben tu hua [Spread of Confucianism and its influence in Southeast Asia]," 2014). Values of filial piety, integrity, proper sense of shame, fraternity, and decorum were reasserted into the curriculum (Campbell, 1982).

More importantly, the influence of Confucianism in Southeast Asia is seen in Malaysia (Chen, 1995; Zhong, 1995). Malaysia was known as Malaya before independence in 1957. Confucianism influence started when the China immigrants arrived in Malaya when the British ruled the Malaya in the 18th century, and brought large number of Chinese labourers from China in order to develop the natural

resources (Yan, 2013). These Chinese immigrants are later known as 'overseas Chinese'. The development of Confucianism in Malaysia and its influence is very much related to the development of Chinese school and education in Malaysia (Han, 2013). When these overseas Chinese had settled upon their economic and life in Malaya, they started to build Chinese private (or independent) schools, associations based on family surnames, temples, teach Confucian ideologies and values using Three Character Classic《三字经》along with Hundred Family Surnames《百家姓》, Thousand Character Classic《千文字》, Four Books and Five Classics 四书五经 (Liu, 2015). In order to protect their Chinese traditional culture and cultural identity, especially the Confucianism culture, the overseas Chinese in Malaya also built Confucianism association (Han, 2013; Yan, 2013). Inevitable, the influence of Confucianism in Malaysia was strengthened and spread by the development of Chinese education and the spirit of protecting cultural roots among the Chinese people.

Back to China, over time Confucianism had risen, sidelined and castigated following the 1911 revolution. Especially, during the May Fourth Movement in 1919 under the slogans like "Anti Confucius and Criticise Confucianism" (反孔批儒) or "Down with Confucius and sons" (打倒孔家店), Confucianism was blamed for impeding China's modernisation by the new intellectuals (Universiteit Leiden, 2010). In respect to this, there has been debates on the misinterpretation of relating the slogans "Down with Confucius and sons" with the May Fourth Movement. It was said that the slogan has never been used in the May Fourth Movement (He, 2010; Li, 2006).

Nonetheless, in the twentieth century has also witnessed the rise of New-Confucianism or Modern New Confucianism (新儒家，又称现代新儒家). New-Confucianism was aimed to interact between the Chinese tradition and Western learning by carrying on the Neo-Confucian *dao tong* or tradition of the *Way* (道统) to modernise Chinese culture for economic success (Tu, 1996).

Throughout the dramatic ups and downs which experienced by Confucianism, it has inevitably shaped the sociocultural values and practices of the Chinese, not only in China but also in other parts of the world such as Vietnam, Korea and Japan, and other parts of Southeast Asia including overseas Chinese communities in Malaysia (Han, 2013; Yan, 2013). Societies that are strongly influenced by Confucian ideologies, practices, moral and cultural influences, such as Malaysia, Vietnam, Japan, Korea, Taiwan, and Singapore, are known as Confucian heritage culture (CHC) ("Rujia wen hua zai Dong Nan Ya de liu bo ji qi ben tu hua [Spread of Confucianism and its influence in Southeast Asia]," 2014; Tu, 1996).

The Concept of *Li*. *Li* (礼) has been widely discussed in the *Analects*, and is one of the mostly cited and discussed Confucian concepts in the literature. Therefore, it will be more appropriate to discuss the concept of *li* first. Confucius intended *li* to encompass specific human behaviours that are widely upheld as "proper", "acceptable", "good" and "prescriptive". *Li* has been normally translated by most scholars as "rites", "ritual", "ceremony", and "propriety". However, to Confucius, *li* is regarded as filial piety, feelings of respect for parents including serve them, bury them, offer sacrifice to them (monetary material as a form of *li*), as well as appropriate values, attitudes and dispositions to one's parents in all aspects of one's life. In other words, *Li* is regarded as a totality of socially acceptable behaviors that are accompanied with values and attitudes in all aspects of one's life (Tan, 2013; Yu, 1998). In the two verses taken from *Analects*, Confucius has articulated his idea clearly:

> 2.5 孟懿子问孝。子曰:'无违。'
> 樊迟御，子告之曰：'孟孙问孝与我，我对曰，无违。'
> 樊迟曰：'何谓也？'
> 子曰：'生，事之以礼；死，葬之以礼，祭之以礼。'
> Meng Yizi was curious about filial piety and asked the Master. To which the Master replied, "Do not violate."
> The Master told Fan Chi about Meng Yizi's query about filial piety and his reply to Meng Yizi.
> Fan Chi in turn asked the Master, "What does that mean?"
> The Master replied, "There are many different types of *li*. While your parents are alive, you need to serve and respect them according to *li*. When they are dead bury them according to *li*, and offer sacrifices to them according to *li*."

> 2.7 子游问孝。子曰：'今之孝者，是谓能养。至於犬马，皆能有养；不敬，何以别乎？'
> When Ziyou asked about filial piety.
> The Master answered him, "If it is just a matter of taking care of the parents, it is no difference like taking care of dogs and horses. What kind of filial piety is that?"

Nevertheless, Confucius' *li* encompasses a wide spectrum that differs from scope, structure, and degree of individual improvisation, forming a continuum or wide spectrum of Confucius' *li* (Tan, 2013). Although having many types of *li* along the continuum, utilisation of *li* must be in accordance to its desirable attitudes and values, involving appropriate engagement and ethical considerations. In another incident, Zilu, a disciple of Confucius, talked on what Zilu was able to achieve if he was given the opportunity to govern a state:

> 11.26 子路曰：'千乘之国，摄乎大国之间，加之以师旅，因之以饥馑；由也为之，比及三年，且知方也。'
> 子曰：'为国以礼，其言不让，是故哂之。'
> Zilu proclaimed that even if he is governing a state situated among great neighbouring state, coupled with the threat of invading foreign armies and famine in his state, he is still able at the end of three years to give the people courage and realisation of the right direction.
> To which the Master responded by smiling and being silent, a sign of displeasure.
> The Master later while conversing with another disciple, explained his cryptic response to Zilu saying, "In governing a state, you need to observe *li*, yet there was no difference in his speech, or there was no difference in his claim."

In the above verse, Confucius has remarked the point clearly that the essence of *li* must also integrate appropriate attitudes and values as well as appropriate behaviors and actions.

Respect, being an essential part of the teaching of *li*, has been articulated by Confucius. He has also deepened his teaching that one's actions, thoughts and feelings are interwined; if one's actions violate *li*, one will likely to be deficient in certain desirable attitude and values. In an episode, Confucius inferred a disciple that he lacked respect and modesty, and extrapolated his potential development that he would not be able to contribute much to society and live a graceful life with dignity,

and therefore will be a burden to society like a thief (14.43 原壤夷俟。子曰：‘幼而不孙弟，长而无述焉，老而不死，是为贼。’以仗叩其胫。).

The Concept of *Dao* and *He.* The concept of *li* has been discussed in the above section that *li* refers to the totality of socially acceptable behaviors that are accompanied with values and attitudes in all aspects of one's life. Hence, the 'socially acceptable' is an ideal pattern and discourse that guides people in their daily lives. But what exactly is this 'socially acceptable' advocated by Confucius? *Dao* and *He* **(**Way and harmony**)**, the other two Confucian concepts, have bridged the connection with *li*.

As mentioned in Tan (2013), the 'socially acceptable' for *li* is Zhou *li*. It is the mandate of heaven, that rulers, governments, and individuals must understand and follow, expressed in the past by sage-kings who lived before Confucius' time and the early rulers in the Zhou dynasty so that the *dao* might prevail on earth. Since the *dao* has not prevailed during the Confucius' time, where control of power and chaos happened in various states, Confucius' mission is to restore the *dao* by educating his followers. To broaden the *dao* is to achieve *he* through the observance of *li*. Confucius advocated that it is the human beings that broaden the *dao*, not the *dao* that broaden human beings. In other words, one must practice, observe, and find joy in the practice of *li* as a lifelong learning, to achieve internal and external harmony, that is finding joy and peace within ourselves and with surrounding people.

The achievement of *he* (harmony), has been the most important function in *li*, as highlighted in the verse below:

> 1.12 有子曰：‘礼之用，和为贵。先王之道，斯为美；大小由之。’
> According to Master You, "Most uses of *li* is to promote and maintain harmony. This is the most beautiful method used by the Former Kings to reach Way (*Dao*) and is usable in most great and small occasions."

However, one should be aware that *Analects* is not the only text used by the Confucians. The other text is called *Book of Rites* (礼记) is also used to teach the followers of Confucianism. The following verse selected from the second chapter of *Doctrine of the Mean* in *Book of Rites*《礼记·中庸》 has highlighted the importance of controls one's emotion appropriately to live in a state that strike balance and harmony to the universe:

> 喜怒哀乐之未发，谓之中；发而皆中节，谓之和。中也者，天下之大本也，和也者，天下之达道也。致中和，天地位焉，万物育焉。
> When pleasure, anger, sorrow, and joy are not aroused, they are said to be in a state of balance/mean. When they are aroused appropriately in due time, they are said to be in a state of harmony. The state of balance is the supreme foundation of the world, whereas harmony is the path of the universe. If balance and harmony are achieved, everything under the Heaven and Earth maintain their roles and positions, all things are nourished.

The Concept of Ren. As described in the previous sections, that *li* refers to the totality of socially acceptable behaviours, integrated with attitudes and values in all aspects of one's life. The concept of *li* is based on sage-kings who lived before Confucius' time and the rulers of Zhou dynasty. The most important function of *li* is to achieve joy and harmony, internally and externally. But what specific behaviours, attitudes, and values that is required by one when observing *li*? *Ren* (仁), is the key to the question.

In Chinese character, 仁 (*ren*) signifies co-humanity, which is formed by two Chinese character—'human being' (人) and 'two' (二). As we can see in the *Analects*, it is loaded with the verse of Confucius communicating and interacting with other people.

Ren has been related to *li*, and other Confucius' concepts. It is therefore crucial to understand the concept of *ren* so to understand Confucius' philosophy. *Ren* has been normally translated by most scholars as "benovelence", "perfect virtue", "humanity" etc. Tan (2013) has described the concepts of *li* and *ren* well—the observance of *li* and *ren* are complementary—the observance of *li* provides the foundation for one to continuously cultivate *ren* as the goal; meanwhile, the practice of *ren* is also the evidence of one faithfully observing *li* in all aspects of life. *Ren* comprises respect, tolerance, diligence, reverence, sincerity, empathy and dutifulness etc. and these will be shown in their actions.

The value of respect and tolerance has been numerously linked to *li* and *ren* in *Analects*. The following verse has articulated the importance of respect, *li* and *ren*—one who possess *ren* truthfully will genuinely observe *li*.

3.26 子曰：‘居上不宽，为礼不敬，临丧不哀，吾何以观之哉？’
The Master said, “A person who is a high ranking official is intolerant, who is observing *li* reluctantly, and does not grief during mourning, does not deserve to be looked upon respectfully.”

The essence of *ren* is to ‘love others’. But how does one love others? Confucius has mentioned many qualities with loving others, however, four qualities stand out i.e. *zhi* (知 wisdom), *shu* (恕 empathy and reciprocity), *zhengming* (正名 rectification of names) and *xiao* (孝 filial piety)。

Zhi refers to wisdom. As conveyed in the following verse on the importance of education and wisdom:

6.20 子曰：‘知之者不如好之者，好之者不如乐之者。’
The Master said, “Knowing to learn is not better than love to learn, love to learn is not better than joy to learn.”

However, Confucius’ *zhi* is more than a cognitive awareness of intellectual process because it is also closely related to *ren* and loving others, as conveyed in the following verses:

4.1 子曰：‘里仁为美。择不处仁，焉得知？’
The Master said, “It is good to live at a place that has *ren*. If choosing not to live with *ren*, how can the person be determined as wise?”

4.2 子曰：‘不仁者，不可以久处约，不可以长处乐。仁者安人，知者利人。’
The Master said, “A person who are not *ren* will not be changed even by poverty or a comfortable life. A person who practices *ren* feels contented. A wise person follows *ren* and will get benefitted.

The essence of *ren* is to 'love others' and establish the relationship between *ren* and other qualities such as *zhi* (知 wisdom), *shu* (恕 empathy and reciprocity), *zhengming* (正名 rectification of names) and *xiao* (孝 filial piety). In order to manifest these qualities, the importance of harmonising our thoughts, feelings, and actions by regulating *li* is emphasised.

Two other qualities mentioned by Confucius are *shu* (empathy and reciprocity) and *zhengming* (rectification of names) when discussing *ren*; both qualities are inter-related.

Shu has stressed the need of putting oneself in other person's shoes (empathy) and offering mutual help when the others needed (reciprocity). A *ren* person is courageous strong and decisive to exercise empathy and reciprocity in her daily life. However, exercising *shu* does not mean that we have to love everyone in the same way and to the same extent. This is stressed in Confucius advocate on *zhengming* where we extend our love based on differentiated hierarchy, social roles and relationships.

> 12.11 齐景公问政於孔子。孔子对曰：'君君，臣臣，父父，子子。'
> 景公曰：'善哉！信如君不君，臣不臣，父不父，子不子，虽有栗，吾得而食诸？'
> Duke Jing of Qi asked the Master about governing. The Master replied, "ruler, minister, father, son." The Duke said, "Wonderful! If the ruler doesn't be like a ruler, the minister doesn't be like a minister, the father doesn't be like a father, the son doesn't be like a son, then even if there were food, would I get to eat?"

Referring to another verse mentioned by Confucius in the *Chapter 13 of Analects*:

> 13.3 子路曰：‘卫军待子而为政，子将奚先？’
> 子曰：‘必也正名乎！’子路曰：‘有是哉，子之迂也！奚其正？’
> 子曰：‘野哉，由也！君子於其所不知，蓋阙如也。名不正，则言不顺；言不顺，则事不成；事不成，则礼乐不兴；礼乐不兴，则刑罚不中；刑罚不中，则民无所措手足。故君子名之必可言也，言之必可行也。君子於其言，无所苟而已矣。’
> Zilu asked the Master, "What would you [the Master] do if the Duke of Wei waits for you to govern his state? What would be the first thing you would do?"
> To which the Master replied, "It is definitely *zhengming* (rectification of names)."
> Zilu enquired on the reasoning of why *zhengming* and accused the Master of being pedantic.
> The Master replied angrily, claiming Zilu to be uncouth.
> The Master said, "A *junzi* should only discuss on matters that he understands and be silent on matters that he does not understand. When names are not correct, what is said will not be used effectively; when what is said is not used effectively, matters will not be accomplished; when matters are not accomplished, *li* and music will not flourish; when *li* and music do not flourish, punishments will miss the mark; when punishments miss the mark, the people will not know what to do with themselves. Thus the *junzi* is very careful with his choice of words, and he is responsible when his words are being taken in action.

In the verse above (13.3), Confucius has conveyed his message on the importance of hierarchy, names, social roles, and governing when he said that the flourishing of *li* and music requires social orders and guided ethical through the proper regulation of conducts between ruler and the people in their assigned tasks. If people fail to live up their names or fail to fulfill their responsibilities, social breakdown will occur, where punishments are incorrectly executed (which are excessively executed by governing officials for their personal power and controls) and thereafter confused the people.

The fourth quality that has been mentioned frequently when discussing about *ren* in Confucius' teaching is the *xiao* (filial piety). As has been mentioned earlier under the Concept of *Li*, *xiao* is related to *ren* as well as *li*. The intertwined relationship is seen in the following verse:

> 8.2 子曰：'恭而无礼则劳，慎而无礼则葸，勇而无礼则乱，直而无礼则绞。君子笃於亲，则民兴於仁。故旧不遗，则民不偷。'
> The Master said, "Tiredness will be experienced when one only observe respect and was not regulated by *li*. Intimidation will be experienced when one is too cautious and was not regulated by *li*. Chaos may be the result when one is moving forward without careful consideration and was not regulated by *li*. Rudeness will be perceived when one is being too open and straightforward. When the official has treated his parents and elders sincerely, the people will be inspired towards *ren*. When the official who holds loyalty and friendship, the people will be inspired to practice the good values.

It has been mentioned clearly in the above verse that there is a direct relationship between filial piety and *ren*, and the regulation of *ren* is directed by *li*. As discussed in the Chapter of The Concept of *Li*, the practice of *li* must start with one's parents and elders, that does not mean providing monetary needs but also including affection and respect towards one's parents, which mean integrating one's behaviours and actions with attitudes and values towards one's parents. In other words, being filial to parents, is to relate one's *ren's* behaviours, attitudes and values in accordance with *li* towards one's parents. Then gradually, the extend of loving parents can be extended and performed similarly to loving other people around her such as friends, colleague and one in society. It becomes a progression of loving other people outside of family context through respect and filial piety as noted in the following verse:

1.6 子曰：‘弟子入则孝，出则悌，谨而信，泛爱众，而亲仁。行有余力，则以学文。’
The Master said, “A young man should be filial and respect to parents at home, obey and respectful to elders in public, be cautious but with trustworthy, interact with and love the people, and be close to those who are *ren*. If there is energy left after practicing the above, use it to study culture and improve oneself.

The above verse has articulated the importance of education, respect, filial piety and *ren* in the Confucius teaching. The progression of loving others outside of family context needs the knowledge of interaction skills which can be obtained through the education of Zhou *li* (observance of *li*), one’s *ren* behaviours, attitudes and values, forming the totality of social acceptance that has been passed down through the generations.

Although Confucius stressed the importance of filial piety starting with one’s family, however, Confucius advises children to articulate their disagreements with their parents appropriately with the observance of *li*, as mentioned in the following verse:

4.18 子曰：‘事父母几谏，见志不从，又敬不违，劳而不怨。’
The Master said, “When you noticed the mistakes of your parents during serving them, explain and advise to them accordingly, if your parents do not agree, you still need to be respectful, and continue serving them without blames and complains.

The Concepts of *Junzi*, *Xue*, *Wen* and *Si*. A *junzi* cultivates herself in *ren* behaviours, attitudes and values because she treasures *ren* and is motivated to attain it. To attain *ren*, a *junzi* must devote to learning (love learning 好学) and culture learning (学文).

However, learning, in Confucius teaching, does not mean factual memorisation and attainment of knowledge just for academic pursuits, learning must be lead to the realisation of the Way, otherwise, such a specialist will remain as a petty person (Tan, 2013). Learning should not be rote learning, it should be active, reflective and action-driven by a love in learning, to Confucius.

> 6.13 子谓子夏曰：‘女为君子儒！无为小人儒！’
> The Master said, "You must become a *junzi* specialist that has self-cultivation, can govern the state, and educate the people, not a specialist like a petty person without critical reflections!"

Besides, a *junzi* cultivates herself, respectful to her superiors, which can be seen in the following verse. It is also to be noted that the hierarchical social roles are seen too in the verse:

> 5.16 子谓子产，‘有君子之道四焉：其行己也恭，其事上也敬，其养民也惠，其使民也义。’
> The Master talked about Zichan, "He possessed four qualities of *junzi*: he was polite in his conducts, respectful in serving his ruler and superiors, caring and generous in governing his people, and his conducts are appropriate for his people.

Everyone has the potential and should aspire to be a *junzi*, the attainment of becoming a *junzi* should be done whole-heartedly, devoted lifelong, as well as love learning and education. Inevitably, what have been stressed in Confucius teaching

and Confucianism are respect, learning and education, express disagreements appropriately and many other good qualities and values.

Confucius' notion of learning and education is more than knowledge transmission and spoon feeding. Education in Confucius teaching entails formal and informal education (in the terms advocated by the modern educationists) which includes bringing up a person's thoughts, feelings and actions in accordance with *li*, encapsulated by the higher quality of *ren*. An educated person, is whom who possess the regulation of *li* and *ren* in their thoughts, feelings and actions, to broaden the Way. Such an educated person is called a *junzi*. The 'bringing up' in the student is instilled through *xue* (学 learning), *wen* (文 culture) and *si* (思 thinking). So, one need to apply what one has learned through thinking.

The importance of *xue* (learning) is stressed by Confucius himself. He said that he was determined to learn at the age of fifteen (吾十有五而志于学) (2.4). In another verse advocated by Confucius on the importance of integrating learning and thinking can be seen in the following verses:

> 2.15 子曰：'学而不思则罔，思而不学则殆。'
> The Master said, "Study without thinking will become lost and confused. Think without learning will become tired and has no outcome.

> 19.6 子夏曰：'博学而笃志，切问而近思，仁在其中矣。'
> The student of Confucius said, "Learn broadly and hold fast to your aspirations, ask sincerely and think deeply, then *ren* will be found.

17.7 好仁不好学，其蔽也愚；好知不好学，其蔽也荡；好信不好学；其蔽也贼；好直不好学，其蔽也绞，好勇不好学，其蔽也乱；好刚不好学，其蔽也狂。
To love *ren* without loving learning will result in foolishness; to love wisdom without loving learning will result in a lack of self-restraint; to love trustworthiness without loving learning will result in harm; to love frankness without loving learning will result in acrimony; to love courage without loving learning will result in unruliness; to love firmness without loving learning will result in recklessness.

In addition, the importance of *si* (thinking), that is to actively reflect, ask and seek answer with the accordance of *li*, is stressed in the following verse:

3.15 子入太庙，每事问。或曰：‘孰谓鄹人之子知礼乎？入太庙，每事问。’
子闻之，曰：‘是礼也。’
When the Master entered the Grand Ancestral Hall, he asked many questions. Someone said, “Are you sure this person from Zou village understand *li* when he asked so many questions?”
When the Master heard it, he replied, “This is according to *li*.”

The way that Confucius reply is obvious that one should reflect and ask questions to learn about *li*. In the following verse, Confucius has articulated that *si* (thinking) involves learning through higher-order thinking. That is applying what one has learned, as well as processing and organising what one has learned into a coherent whole through personal thinking and reflection:

15.3 子曰：‘赐也，女以予为学多学而识之者与？’
对曰：‘然，非与？’
曰：‘非也，予一以贯之。’
The Master asked, “Zigong, do you think that I learn broadly and memorised them?”
Zigong replied, “Yes, don’t you?’
The Master replied, “No, I don’t. I organised and reflected on what I have learned into a coherent one using a thread.”

Besides, Confucius also stressed on the importance of independent learning, self-motivated, and not dependent to teacher during learning. A teacher should only prompt the student to make their own conclusions. Confucius highlighted this:

> 15.3 子曰：‘不愤不启，不悱不发。举一隅不以三隅反，则不复也。’
> The Master said, “Do not enlighten a person who has not thought independently to strive to understand. Do not provide a person with the words who struggle to express her without thinking. Do not teach a person who cannot provide more examples (corners) when an example is pointed out.”

Confucius has extended his notion of learning through the concept on thinking. A student need to extend what he has learned, draw inferences and apply into other situation. To be able to do that, a student must be motivated and love learning, and having the right attitude in learning. Spoon-feeding and relying on teacher were not advocated by Confucius.

Critics of Confucianism. As has been discussed earlier in the Confucius' Influence section, a student demonstrations/movement called as the May Fourth Movement occurred. It was a more of a cultural movement led by novelists, newspaper and journal writers, poets and academics during the 1920s and 1930s (Rainey, 2010; Tan, 2013). They have a strong sense of patriotism and desired to have a change in Chinese society, government and culture.

Confucianism was thought to be the cause of all the failures of Chinese society and government. The students who led the movement viewed Confucianism as maintaining superstitious ceremonies and rituals, blind loyalty leading to fossilised society, filial piety made people becoming responsible but subservience and dependence, oppressed women and young, as well as blaming Confucianism for opposing freedom of thought and democracy. Confucianism was seen to be responsible for everything evil in the old China, from the foot-binding to young marriages to lack of science development (He, 2010). Confucianism was blamed for almost everything.

Tu Meiming (杜维明), a New-Confucianism and Chinese American scholar believed that the root of all Chinese culture is rooted in Confucianism. However, one may question: if Confucianism is the core of all Chinese culture, and Confucianism is a good thing, why terrible things happened in imperial China when Confucianism was in charge? The answer given by the New-Confucianism is that the "real" Confucianism (or pure doctrine) was not practiced by the backward society and oppressive government, in fact, the development of the "real" Confucianism was stopped by them, as the "real" Confucianism would advocate ideas of democracy and expressing disagreement in accordance of *li* (as have been discussed earlier in The

Concept of Ren). The May Fourth Movement's criticism was a critic on the social and political Confucianism, not on the "real" Confucianism. The message and teaching in the "real" Confucianism differ with the institutionalised Confucianism that was practiced in imperial China by the people who did not understand fully on Confucianism had caused the radical difference and problems.

Another issue of Confucianism is that, in imperial China, people memorised the classics and texts to pass the examinations. However, the "real" Confucianism advocated that the Way (*dao*) must be experienced, reflected, and transformed by oneself. Once again, this show the radical difference between the "real" teaching of Confucianism with the institutionalised Confucianism that was practiced by the people who did not understand fully or have misinterpreted Confucianism ideologies. There has been another form of statement about this topic, especially on the competitive examination culture happened around Asian countries, some scholars believed that the competitive examination culture in Asian countries was due to the rapid modernisation and social change in societies.

Confucian Heritage Culture (CHC)

Confucianism has permeated Chinese culture, finding a Chinese cultural roots is finding Confucianism (Tu, 1996). However, this saying has led to a debate about the role of Confucian thought and its values play in Southeast and East Asian society (O'Dwyer, 2016). It has also led to the problem of differentiating "Confucian" and "Chinese" values. Such arguments were based on the extent of the explanatory value onto the CHC leaners' phenomena and their characteristics, where the effects of rapid social change and modernisation in Southeast Asia and East Asia that has diverse cultural identity within and between contemporary Asian societies were ignored. Therefore, a more holistic view looking from the perspective of historical, philosophical, and political scientific were suggested to be adopted into intercultural education theory and to understand the CHC learners, based on interdisciplinary approach.

However, it is to be noted that the interest of this study was not to investigate the origin of the values (which has been put forward as the characteristics of the learners as the sub-construct of CHC) come from which religions or ideologies but to investigate the situation among a specific group of learners.

Research related to Confucian heritage culture has been centered around learning approaches i.e. surface, achieving, and deep approaches (Biggs, 1988; Dennehy, 2014; Penfold & van der Veen, 2014), learning style (Hing, 2013; Tran, 2013), impact of Confucian values onto educational and/or business leadership (Cheah et al., 2014; McDonald, 2012; Pearson & Entrekin, 2001), parents' belief in education, learning motivation (Kember, 2000; Lin, McKeachie, & Yung, 2003; Tran, 2012; Zheng, 2010). Research have moved from finding cultural explanations

(Confucianism vs. Buddhism) (Barrett, 1992; Guang, 2013; Nguyen, 2010; Tang, 2015) to the identification of characteristics of the CHC and then to the search for good practices that could enrich and enhance learning and teaching in CHC learning environment, regardless of the cultural origins (Dennehy, 2014; Hing, 2013; Wong, 2008).

In addition, numerous literature have also offered explanations to reveal the paradox and misconceptions to CHC Chinese learners (Biggs, 1996; Kember, 2000; Saravanamuthu, 2008; Tran, 2013; Watkins & Biggs, 2001), in hope of giving a true picture of CHC learners.

However, there has been counter-arguments that such associations of trying to explain the cultural causal relationship and its explanation to be "over-Confucianisation" especially when one tries to portray CHC learners in this light (Wong, 2008). It has been cautioned that the Asian/Chinese culture should not be identified as Confucianism solely and should not be also equating Confucianism with Confucius teaching alone (Huang, 2008). This is because the CHC was also influenced by Buddhism, Mohism, Daoism, and also other religions and teachings, besides, the Confucianism has different school of thoughts and ideologies at different historical periods (Berthrong & Berthrong, 2014).

Nevertheless, it has been found that as a whole, the Malaysian education system can be related to Confucianism principle (Al-Hudawi, Lai, Musah, & Mohd Tahir, 2014; Cheah, Yusof, & Ahmad, 2014; Md Aroff, 2014). As majority of the Chinese pre-university students have had followed Malaysian education system which has been influenced by Confucianism, Christianity, and Islamic philosophy, in

view of this, Malaysian Chinese students whatever their background, are believed to have inherited or have been ingrained with CHC elements.

Although the CHC evolved from Confucianism, it doesn't mean it is to be in the original form of Confucianism. The globalisation and rapid social change has influenced and shaped the Chinese community in CHC countries. Therefore, the present study is only able to capture the whatever characteristic of the Chinese students as it is now in the CHC country.

In addition, the interest of this study was not to investigate the origin culture of the proposed characteristics of the learners, whether the identified constructs of CHC were originated from, nor been influenced by which religions or ideologies.

Since the notion of "Confucian heritage" has been repeatedly stressed in the literature, the ideology of Confucianism has been reviewed and discussed at the previous section.

The missing link, is that the CHC construct in this study has not been compiled and attested quantitatively in a single model, despite many of the constructs has been revealed and/or discussed in other scholar's findings and were proposed to conduct further investigation on these constructs. The following discussion will unfold how these constructs are identified from the literature.

Respect. As we have seen in the above discussion that hierarchy and social order were stressed by Confucius and Confucian. As pointed out by Knapp (2005), the notion of filial piety and ritual rites stressed in Confucianism allowed the parents to held the authority over the children. Just as a minister loyal to the ruler; the young are obedient and respectful to the elders. However, it has also been misused by some of the masses as a form of controlling the power and fortune of the family by not letting the outsiders who are not having the same family name as well as the wives and women to take over the wealth. The reason behind this was because the elite families found that maintaining a large extended family gave them additional power, economic strength, protection, and political influence. Hierarchy and social roles is needed to maintain this extended family in order. The result is a family hierarchy based on generation, age, and gender.

Hierarchy with existential inequality has been linked to high Power Distance Index (PDI) in Hofstede's study (2010). PDI is the degree of acceptance by the less powerful people on the unequal distribution of power. Malaysia, Singapore and China is having score of 100, 74, 80 (mean = 57) in PDI; Malaysia being large power distance (However, it is to be highlighted that the scoring for Malaysia is shown in a collective way, comprising of various ethnics in Malaysia including Malay, Chinese, Indians and others.) (Hofstede et al., 2010). Hofstede's study indicated that the power distance difference among countries is rooted in the family. In the large-power-distance situation, such as at school, the parent-child inequality is replaced by a teacher-student inequality, but basic values and behaviors are carried forward from family into the school situation (Hofstede et al., 2010). Respect for teachers and other elders is considered a basic virtue. Students treat teachers with respect, even outside of classrooms; Students stand up and greet the teacher when the teacher enters the

class. Students can only speak when they are permitted to do so (Hofstede, 2001). Tran (2013) conducted an interview with CHC students, the students agreed that the teachers should be respected. Interestingly, the students in the interview also noted that the act of respecting teachers does not mean they are passive or obedient students.

Chinese students regard the teacher as the authority of knowledge. There have been studies comparing Asian students with all other American, European and Anglo-Saxon countries, and reported that Asian students regard the teachers as the authority of knowledge which could be due to the family virtue that children were always told by their parents to be submissive to the requirements and teachings of teachers (Liu & Feng, 2015; Stork & Hartley, 2011). If the authority of teacher is challenged, students are perceived as offensive and without respect for their teachers (Foong & Daniel, 2013). Consequently, teacher as the authority of knowledge has resulted in the hierarchical difference between the teachers and students in the Chinese society (Liu & Feng, 2015).

Hierarchy is very strongly embedded in Asian values which emphasises *respect*. In particular CHC learners must not only show respect to their elders (teachers), but they must also show respect to people who are on par or even not on par with them, with the elders serving as good role models. Rooted in CHC family, the leader of a family unit is the father. In the classroom unit, the leader of the classroom is the teacher. In a class, there is a class monitor. In every table with three to five students, there is a sub-leader. A strong hierarchical rule is seen in Chinese learning environment (Nguyen, Terlouw, & Pilot, 2005).

In a group work environment (which is a form of AL activity), students working in such a constructivist environment may have the knowledge that exceeds knowledge of their teachers, but hold back from revealing their knowledge due to respect of the teacher or elder (Nguyen, Terlouw, & Pilot, 2006). The question here is, does *respect* contribute to students with a CHC background resist active learning?

Education. Zhu Xi (朱熹), is known as one of the scholar during Neo-Confucianism. He has stressed the importance of education and learning so that one can understand the principle (human nature) and *qi*. He has related his teaching of the *School of Principle* (理学) with the *Great Learning* in *Book of Rites* 《礼记・大学》

> 物格而后知至；之至而后意诚；意诚而后心正；心正而后身修；身修而后家齐；家齐而后国治；国治而后天下平；自天子以至于庶人。
> Extending knowledge and investigating things to obtain knowledge and education, then to sincerity, then to a right mind and heart, to the cultivation of the person, to the taking care of the family, and governing of the people properly, and peace for all will be achieved.

Confucianism stressed the importance of education and self-cultivation in its teachings. Grounded in Confucian values, CHC continued to highly value education. In a paper review on higher education in East Asia and Singapore, tuition costs that are funded by households rather than the state has been increasing, indicating on the high attention given by the family on education (Marginson, 2011). This high attention on education is influenced by the "one-chance" examination competition, and thus influence the goal of education. Many of the families commit themselves in this examination mechanism hoping that exceptional diligence at school could earn

them an honoured place on the upper rung of the social ladder and thus bring pride to the family (Liu & Feng, 2015; Marginson, 2011; Yuen, Park, Chen, & Cheng, 2017).

Consequently, there have been debate over the motivational drive i.e. extrinsic motivation, intrinsic motivation of CHC students, however, CHC students are more appropriately regarded as possessing achievement motivation (Liu & Feng, 2015; Saravanamuthu, 2008; Watkins & Biggs, 2001).

Through the re-examination of the complexities of the Chinese education system in feudal dynasties (as described in Confucianism section) as well as the contemporary China and rapid social change in Asian societies, the examination heritage has been revealed as playing dominant role (Wang, 2013), however there has been debate whether the influence of Confucianism or the influence of mass examination system due to modernisation that has caused the examination competition (Clark & Gieve, 2006; Kember, 2000; Marginson, 2011; O'Dwyer, 2016; Wong, 2008). One is reminded not to "over-confucianised" over the research area of CHC.

Perseverance. Inevitably, Zhuxi and other Confucians advocate education and self-cultivation, which can be achieved through the right attitude of perseverance. (Rainey, 2010).

Perseverance to a Chinese student is very important because it shows a Chinese student's ability to push him/herself to be a better person. Perseverance is an important aspect in virtue according to Confucianism with it being one of the key aspects for one to succeed in life. A person needs perseverance to see through

whatever tasks being undertaken. Even under extreme circumstances (lack of materials or supports), perseverance is a highly valued trait for them to succeed.

Chinese students who possess the ability to persevere mostly have the patience for delayed gratification as opposed to students who lack the perseverance and look for immediate gratification and quick results (Marambe, Vermunt, & Boshuizen, 2011; Yuen et al., 2017).

Various scholars has depicted that CHC student used achieving learning approaches in their learning due to the overemphasised competitive examination system. Despite the different learning approach (deep, achieving, surface learning approaches), Chinese learners need to persevere to strive through the examinations. In Chinese societies, parental influence grounded in Confucian teachings emphasise virtues of diligence, perseverance, self-reliance, and duty (Yuen et al., 2017). As emphasised also in Confucian tradition that the success or failure of education does not account on one's innate ability, but one's effort, determination, perseverance, and patience are viewed as the determinants of educational achievements (Biggs, 1996). There is a strong belief in Chinese society that everyone is educable and capable of attaining perfection, although differences in intelligence and abilities may be varied, however there is "no distinctions should be made in dispensing education" (*you jiao wu lei* 有教无类).

Empirical evidence from the research of Helmke and Tuyet (1999) indicated that CHC students when faced with academic problem, began to solve the problem with great perseverance. The Western researcher agreed that perseverance is rooted in Confucian values.

Most Japanese educational practice (which is a CHC society) adopted molding-through-repetition and the sticky-probe approach in their classroom practice. This two approaches share a feature in common—Students must be compliant, work hard, persistent, and patience (Hess & Azuma, 1991). In the study conducted by Hess and Azuma, they found a correlation between persistence and achievement in Japanese children but not American children.

Perseverance as one of the Chinese values used in the Chinese Value Survey is related to the Long Term Orientation (LTO) used by Hofstede and it is on the long-term orientation pole. It is to be noted that Hofstede regards Bond's Chinese values as Confucian values (Hofstede, 2001). LTO is the degree of fostering of virtues oriented toward future rewards. Malaysia, Singapore and China is having score of 41, 72, 87 (mean = 57) in LTO; Malaysia being low in LTO (Hofstede et al., 2010). In other words, Malaysia shows Short Term Orientation (However, it is to be highlighted that the scoring for Malaysia is shown in a collective way, comprising of various ethnics in Malaysia including Malay, Chinese, Indians and others). However, countries like Singapore which has large population of Chinese as well as China are having long-term orientation (Hofstede et al., 2010). Long-term orientation are regarded as possessing perseverance, sustained efforts toward slow results, having a sense of shame, respect for circumstances, and others, which is in line with past literature's findings (Helmke & Tuyet, 1999; Hofstede et al., 2010; Nguyen, 2008; Saravanamuthu, 2008). Perseverance is in the high LTO pole reflects the Confucian teachings.

The question that can be asked here is, does perseverance in students with a CHC background result in resistance to AL or not?

Dependence on Teacher. The other major influence or by-product due to the influence of Confucianism, is the examination culture, where the candidates are required to show their knowledge of a classis or texts, and if they passed the examination they will be offered with a position in the government. The examinations were held at district, provincial, and national levels. This culture has been elaborated and extended to later dynasties. Although the Chinese examination system had changed and adapted over the year, however the general form remained the same. Yet, the Chinese examination system is said to influence the Western where the similar civil service examination system was adopted by France in 1791, Germany around 1800 (Wang, 2013).

Although the civil service examinations were, in theory, opened to all men of the class, however, it was most of the elite families or the families who could afford to buy the books or texts and tutors, to have the chance to study and therefore participate in the examination. Despite of there were students from poorer background who were sponsored occasionally, the examination system was a way for the rich and powerful to maintain their riches and power. Division of inheritance was among the sons, however, the family's wealth could be used up within two or three generations. Therefore, it has been the hope of the family members to wish their sons to do well in the examination system so that they could reach to the higher positions of the imperial service and then the extended family could rise with them.

Past literature showed that CHC students are dependent on teachers (Foong & Daniel, 2013; Liu & Feng, 2015; Nguyen et al., 2005; Tran, 2013). Chinese students prefer to be spoon-fed by their teachers and they lack the initiative to explore the knowledge by themselves (Foong & Daniel, 2013). Hofstede has related the

passiveness of students in exploring knowledge and rote learning with high power distance. Hofstede's study is in line with most of the past literature on the preference of CHC students on teacher-centred teaching style and their reluctance to participate in group discussion (Liu & Feng, 2015; Tan, Sharan, & Lee, 2007).

The dependence of teachers can also be seen from how students regard teachers as the authority of knowledge. In a qualitative research conducted by Liu and Feng (2015), teachers, elder persons or even textbooks are regarded as the authority of knowledge. It has been deeply ingrained in the minds of students that the right answers can only exist from teaches or in books. In the classroom discussion, students pay no attention to the views of their fellow classmates. Besides, Nguyen et al. (2005) has also reported a similar findings.

However, there are also counter arguments that students can become independent in thinking and not reliant on teachers if they are guided and given opportunities (Foong & Daniel, 2013; Tran, 2013). In an interview conducted by Tran (2013), the Chinese students studying in overseas agreed that they have been passive learners when they were in their own country. In their own country, they were provided with reading materials, and are asked to listen and jot down notes. But when they studied in Western country, they have to do lots of readings as well as finding the reading materials by themselves, which they were struggled but managed to do.

Students with a CHC background rely highly upon teachers. A teacher is supposed to take the lead in teaching, and students passively listen to gain knowledge (Hofstede, Hofstede, & Minkov, 1997; Hofstede, 2011). The teacher is seen as the ultimate source of knowledge in the classroom (Maley, 1983). The knowledge is

passed on in a one-way direction from teacher to students. Whereas in AL activities, regardless of whether it is group work, cooperative and/or collaborative learning, reflective writing and etc. knowledge is co-constructed (Tan et al., 2007). In these AL activities, students are required to construct and synthesise information individually, and also within the group together with the teacher. The role of teachers moves from the 'sage on the stage' to a facilitator, who plays the role of guiding and motivating. Hence, the next question is, does *dependence on teacher* affect students with a CHC background in resisting AL?

Harmony. The concept of *maintaining harmony*, avoiding conflict, and saving fac*e* was revealed in literature as reflected to CHC (Baker & Clark, 2010; Matthews, 2000; Merriam & Mohamad, 2000; Nguyen et al., 2006; Pearson & Entrekin, 2001; Thanh, Gillies, & Renshaw, 2008). Asian students are seen to avoid conflict so that social harmony is maintained especially in face-to-face classroom environment (Chiu, 2009). This social culture has also lead to hierarchical relationship between teacher and students. Students tend to accept and compliant with the answers given by the teacher without questioning and challenging her. Therefore, students lack the opportunities and courage to speak up in order to communicate fully with the teacher (Liu & Feng, 2015). In addition, teachers also do not rely on students to provide innovative ideas. Teachers expected students to memorise the correct answers and follow the arranged procedures (Liu & Feng, 2015).

Although most of the literature is showing that Chinese students did not speak up for the truth, however, it is worth highlighted that this is not the teaching of

Confucian. Confucian advocates learning through the concept on thinking, and asking of questions it itself *li*. In other words, Confucius advocates learning through actively reflecting, asking and seeking answers to questions. Spoon-feeding and relying on teacher were not advocated by Confucius.

In an interview with students conducted by Tran (2013), face-saving has been mentioned by the student in the interview. The student acknowledged the importance of saving teacher's face, resulted him not to confront with the teacher in the middle of class, rather discussed with peers to confirm her understanding or talk with the teacher after the class.

Harmony has been linked to low Individualism (IDV) in Hofstede's study (Hofstede et al., 2010). IDV is the societies in which the individuals of the society has loose ties—everyone is expected to look for him- or herself and his or her immediate family only. Malaysia, Singapore and China is having score of 26, 20, 20 (mean = 53) in IDV; Malaysia being low in IDV (Hofstede et al., 2010). In other words, Malaysia is a collectivism society (However, it is to be highlighted that the scoring for Malaysia is shown by different ethics in Malaysia including Malay, Chinese, Indians and others). Singapore and China are also collectivism countries. Characteristics of collectivism countries are harmony and saving face, students will not speak up in class or large groups, students' individual initiatives are discouraged, and have strong family ties, which is in line with past literature's findings (Helmke & Tuyet, 1999; Hofstede et al., 2010; Nguyen, 2008; Saravanamuthu, 2008).

Hofstede's (2010) study also measure Uncertainty Avoidance Index (UAI), that is the degree of tolerance of each individuals for uncertain situations (Hofstede et al., 2010; Tehseen, Sajilan, Gadar, & Ramayah, 2017). Malaysia, Singapore and

China scores 36, 8, and 30 on the UAI, with the mean of 65 (Hofstede, 2011; Hofstede et al., 2010). These countries are having relatively low UAI (tolerance for ambiguity), and thus are having resistance to changes, has lower anxiety level, and students expect open-ended learning situations and good discussions at school (Hofstede, 2001).

In view of the IDV and UAI scores of these three countries (collectivism and tolerance for ambiguity), it seems the findings of the majority of literature on CHC learners have been contradicting with Hofstede's study, especially on the case of Singapore and China (Dennehy, 2014; Lin, Deng, Chai, & Tsai, 2013; Saravanamuthu, 2008; Tan et al., 2007; Thanh et al., 2008; Zheng, 2010).

Everybody has their own way of thinking, opinions, and own way of doing things, which would result in conflicts within a group and possibly results in hindering learning. Studies have shown that the fear of being ridiculed has hindered students from AL (Cocroft & Ting-Toomey, 1994; Tjong & Yong, 2004). Furthermore shyness and a lack of confidence in one's own ability to protest publicly can also hinder AL (Li & Campbell, 2008; Oetzel & Ting-Toomey, 2003). Besides, fear of asking (due to language barrier or unfamiliar context and not being confident) has resulted one to maintain harmony and avoid conflict (Tran, 2013). Closely related to this aspect of CHC are the issues of *respect* and the *dependence on teacher* which can influence students to be passive in order to maintain harmony by avoiding conflict and saving face with their teachers and peers (Nguyen et al., 2006; Tan et al., 2007). Thus, the question here is does the aspect of *harmony* influence AL among students with a CHC background?

Preference to Active Learning

Most of the past literature on active learning (AL) has focused on the (a) effectiveness of AL (e.g. academic achievement, communication skills, retention of information etc.)(AbuSeileek, 2012; Ahmed Gubbad, 2010; Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013; Ebrahim, 2012; Lavasani, Afzali, Borhanzadeh, Afzali, & Davoodi, 2011; Lewis, 2011; Mathias, 2014; Tan et al., 2007), (b) moderating effects of variables (e.g. help seeking skill, class size etc.) (Johnson, 2010; Mäkitalo-Siegl, Kohnle, & Fischer, 2011; Roll, Aleven, McLaren, & Koedinger, 2011), (c) faculty barriers in implementing AL (i.e. faculty resistance to change to AL, methods to implement AL) (Abrahamson, 2008; Armstrong, 2011; Bell, 2013; Chaffee, 2010; McMahon, 2010; Michael, 2007; Mohd Yusof, Harun, & Abu, 2004; Smith, 2014; Tagg, 2012), and (d) preference to AL (i.e. conceptual papers on ways to overcome students' resistance to AL, empirical research) (DeMonbrun et al., 2017; Finelli et al., 2014; Gilbert, 2012; Nguyen, 2015; Recabarren, Alvarez, & Díaz, 2015; Weimer, 2002, 2013).

Also, studies that relate students' preference in instruction to certain input variables, such as the teachers' attributes and her teaching method, student factors, and educational setting (e.g. task, assessment, media etc.) are omnipresent (Baeten et al., 2010; Hänze & Berger, 2007; Kiguwa & Silva, 2007; Kyndt et al., 2013; Loftin, Davis, & Hartin, 2010; Michou, Mouratidis, Lens, & Vansteenkiste, 2013; Mustapha, Nik Abd Rahman, & Md.Yunus, 2010; Othman, Asshaari, Bahaludin, Tawil, & Ismail, 2012; Sand-Jecklin, 2007; Trigwell, Prosser, & Taylor, 1994). Results from literature are presented below. The missing link, however, is the availability of an

instrument that measures students' preference to AL using the Participation, Meaningful Learning, and Attitude constructs.

Empirical data has ratified the relationship of teachers' attribute and the role of faculty with students' preference to AL. Trigwell (1994) explored the intentions and motives which associated in teachers' teaching strategies, and argued that the approaches ranges from transmission of information to those that has intention to develop conceptual change in students' learning. Consequently, it is no surprise that Tsai (2010) find significant higher grades in students who received teachers' initiation and assistance than those without. In addition, Mustapha (2010) provided evidence that lecturer traits such as encouraging, understanding and approachable, influence students' participation and their perception to AL.

Regarding the student factors that influence students' preference to AL, Othman (2012) found differences for age or maturity, with regard to students' experience in cooperative learning. In addition, Baeten (2010) investigated students' personality trait with the adoption of deep approaches in learning. Students whose personality characterised by extraversion, openness to new experience, conscientiousness, and emotional stability tended to adopt deep approach. Besides, other variables such as students' prior knowledge and skills, cognitive abilities, metacognition, motivation, students' expectations have been identified to influence students' preference to AL (Covill, 2011; Kiguwa & Silva, 2007; Sandi-Urena, Cooper, & Stevens, 2011; Syed Abd Latif & Subramaniam, 2008; Tas, Brown, Esen-Danaci, Lysaker, & Brüne, 2012; Wolter & Mueller, 2010).

Finally, the following studies put emphasis on contextual variables and highlight the properties of tasks, and educational setting that influence the students'

preference to AL. The relationship of cultural influence onto students' preference to active learning can be seen from the study of Tran (2013). Although the students think they responded differently, but the cultural factor have indeed influence them. In an interview conducted with students by Tran (2013), the students against strongly on the allegation that they are passive learners; they against the idea that cultural influences their preference to active learning, what the students think is that they are just responding to the situation differently; they respect teachers therefore they choose not to ask question in the class. Besides, a large number of research related students' perceptions and learning outcome to the use of innovative computer technologies in classroom (Barros-Castro, Córdoba-Pachón, & Pinzón-Salcedo, 2014; DeWitt, Alias, & Siraj, 2014; Porcaro & Al Musawi, 2011; Prieto et al., 2014). Interestingly, students viewed exam performance was the most valued of all be it active, collaborative or traditional learning (Machemer & Crawford, 2007; Ooi & Teoh, 2011).

Meanwhile, research on students' preference to AL has been comparing their perception on student-centred learning and passive (or traditional) learning. In this respect, Struyven (2008) argued that students in lecture-taught setting (traditional learning) perceived that they have significantly benefited from their learning compared to students in assignment-activating group (active learning). Struyven measured students' perception of the learning environment using Course Experience Questionnaire that measure 6 constructs namely good teaching, clear goals and standards, appropriate assessment, appropriate workload (see Chapter 4 Methodology for more discussion on the development of the instrument). However, two of the constructs in CEQ has low reliability, <0.60 (α=0.570 and 0.461 for generic skills and independence constructs).

A similar set of study was conducted by DeMonbrun et al. (2017) to measure students' preference to AL, measured using participation, value of investment, emotional engagement, global course satisfaction constructs. Results indicated that students have significantly higher global course satisfaction level and emotional in AL class.

These results tend to comply with the qualitative findings of Shekhar et al. (2015). Findings of this study indicated that students do not prefer AL, disengaged from AL activities. Similarly, Pan (2010) and Goodman (2005) also revealed the similar conclusion with the former study.

As a result, the central questions in the present study are "Do students' prefer AL?" and in particular – "How is this preference of AL measured by Participation, Meaningful Learning, and Attitude?"

The missing link, is that the preference to AL construct in this study has not been compiled and attested quantitatively in a single model, despite many of the constructs has been revealed and/or discussed in other scholar's findings and were proposed to conduct further investigation on these constructs. The following discussion will unfold how these constructs are identified and unfolded from the literature.

Participation. Students' participation or engagement has received growing interest in educational research, there has been considerable variation in how this construct has been coneptualised over time, including the number of sub-constructs of engagement. Some scholars have proposed a two-dimensional (two-sub-

constructs) model of engagement which includes behavior (e.g. participation, positive conduct, and effort) and emotion (e.g interest, value, and positive emotions) (Skinner, Kindermann, & Furrer, 2009). While others have outlined a three-dimensional (three-sub-constructs) model of engagement which includes behavior, emotion, and cognitive dimension (e.g. strategy used, self-regulation etc.) (Fredricks & McColskey, 2012; Fredricks, Blumenfeld, & Paris, 2004; Wigfield et al., 2008). Even more, other scholars have conceptualised engagement as a four-dimensional model comprising of academic (e.g. time on task, homework completion), behavioral, cognitive and affective engagement (Appleton, Christenson, Kim, & Reschly, 2006). Despite the myriad of conceptualisation of engagement, one commonality in the construct is multidimensionality. Consequently, Fredricks and McColskey (2012) has suggested to determine the extent of accuracy of how these different number of sub-constructs describe the construct of student engagement.

Literature about engagement has also differentiated engagement from motivation, although the terms are sometimes used interchangeably. In respect to this, Fredricks and McColskey (2012) argued that the distinctions and differences between them are very important. In short, motivation refers to the reasons or motives for a given behavior and are normally conceptualised in terms of the intensity, quality and persistence of one's energies. Motivation sub-construct such as intrinsic/extrinsic/achievement motivation, expectancy-value models) have been proliferating the literature (Deci & Ryan, 1985; Kong, Kwok, & Fang, 2012; Wigfield & Eccles, 2002). In contrast, engagement is regarded as an action or behavior, emotion, cognitive manifested from motivation (Skinner et al., 2009).

Regarding the students' in-class participation, Herrmann (2013) found that the in-class participation has increased after the introduction of cooperative learning (a form of AL) in classroom. However, Herrmann also pinpointed that although the students' learning behavior are seeming positively affected after working cooperatively, however, their attitude towards cooperative learning were remain negative. Similarly, Mustapha, Nik Abd. Rahman and Md. Yunus (2010) echoed on the importance of measuring students' participation from the students' perspective because this will provide a firsthand information on their perspectives on how this perspectives influence their reality experience in classroom. Interestingly, Mustapha, Nik Abd. Rahman and Md. Yunus (2010) highlighted that the investigation on Malaysian classroom participation is scarce.

Meaningful Learning. As described in the Participation Section, Herrmann (2013) found that the students' attitude remain negative after the implementation of cooperative learning. Some students valued the opportunity to have class discussion, but many of the students were frustrated on the lesser teaching time spent by teachers, not getting the right answer, and fewer lecture notes. Thus, it is important to measure students' perception on the conception of meaningful learning, which will then affect the quality of interaction and satisfaction with their learning.

As pointed earlier when reviewing the literature on participation or engagement, emotional engagement being identified as one of the dimension of students' engagement (Trowler, 2010). Interest, value, effort spent which are built through thoughts, beliefs and culture over time.

Attitude. Research related to attitude and AL has been investigated by Pundak, Herscovitz, Shacham and Wiser-Biton (2009), particularly on instructors' attitudes toward AL. It is not surprise to revealed that big differences between 'active instructors' attitudes and 'traditional instructors' attitudes were found. The attitudes of 'active instructors' are ensuring most of the students have reached an adequate level of understanding rather than prioritizing to complete the course studies even if student do not properly understand the material, as well as believing in social process and productive discussion even in large-size class (more than 50 students). From the study of Pundak et al., one should be able to understand that the attitude of everyone is different.

On the other hand, Littlejohn and Foss (2009, 2010) argued that the attitude or opinions or perceptions about anything defines a cognitive. While, a cognitive system is a complex and integrated system of attitude, opinions or perceptions that affect or affected by behavior (or action). Clearly this pinpointed that the preference to AL is the perception of students integrated and demonstrated in their attitude toward AL which affects their or affected by their action and behavior.

There have been studies that provide theoretical considerations on attitude (Martinie, Milland, & Olive, 2013), and attitudes toward classroom learning (Jalil, Abu Sbeih, Boujettif, & Barakat, 2009; Parisi, 2009; Piburn & Baker, 1993; Shibley & Zimmaro, 2002; Yudko et al., 2008). Lovelace and Brickman (2013) cautioned the researcher to provide a valid and reliable instrument and interpreting the data when measuring students' attitude.

Confucian Heritage Culture and Preference to Active Learning

Literature includes China, Hong Kong, Taiwan, Singapore, Korea, Japan, and Malaysia as countries with a Confucian heritage culture (CHC) (Cheah et al., 2014; Foong & Daniel, 2013; Slavicek, 2002; Watkins & Biggs, 1996).

Meanwhile, a prickly problem of terminology on 'Chinese Learner' existed in the literature. It will be worthwhile to discuss the inherently problematic label before discussing CHC and students' preference to AL. Saravanamuthu (2008) described that while scientists have not been able to genetically explain the variations in personalities, choices, and personal preferences, anthropologists also proclaimed that there is no such thing as race. In other words, according to Saravanamuthu, the personality characteristics, and thus its learning implication, cannot be coded by race into individuals. Hofstede (2010) argued that society characteristics does exist, and the personality of an individual are inherited and shared with any other human being, in fact many scholars have successfully explored the society characteristics up to the individual level using statistical analysis tool. On the other hand, political and philosopher like Fukuyama (1989) would advocate that consumerist monoculture will be formed when western civilisation and globalisation unleash socio-economic forces which will dilute cultural identities and thus western democracy of human government as the final form will be formed.

So, who is Chinese learner? While some scholars mentioned that Chinese learners are learners whose ethnicity is Chinese and received most of the moral values and teachings originated from Confucianism but at the same time has received other religions' teachings or become more westernised, but many scholars have also ignored the important part of globalisation and rapid social change and blanket

reference to the Chinese culture (Clark & Gieve, 2006; Nguyen et al., 2006; O'Dwyer, 2016; Wong, 2008). Similarly, Watkins and Biggs (2001) admitted that China has becoming more westernised in their beliefs and practices, and thus the Chinese learners characteristics should be used in caution. Instead, the characteristics of Chinese learners specific to each Confucian heritage community should be identified (Saravanamuthu, 2008).

Many of the studies has pointed out that CHC students resisted AL. Empirical studies on the comparison of Chinese learners and American students has drawn on the following conclusion that Chinese learners prefer teacher-centred learning environment:

> Chinese students expect and accept a teacher-centered learning environment. American students expect a student-centered learning environment. But both expect an environment conducive to learning and accomplishing the educational goals of the culture. (Stork & Hartley, 2011, p. 7)

The relationship of cultural factor on students learning can be seen from Biggs' study (Biggs, 1988). Biggs provide a 3P model framework integrating students' perspective of learning and showing the relation of cultural context in students' learning (Saravanamuthu, 2008; Watkins & Biggs, 1996). Presage (students' home background, personality, IQ, abilities and prior knowledge), situational (subject area, teaching method, time on task, course structure), process (motive-strategy combinations comprise the approaches of learning), and product performance (examinations, grades, self-set goals, satisfaction) are included in his model. In addition, Biggs has related that the presage or personal factors will impact indirectly onto approach of learning, and impact directly onto students' product performance. However, much of the research related to Biggs model are focused on

measuring students' approach to learning i.e. deep, surface, achieving approach (Dennehy, 2014; Penfold & van der Veen, 2014).

Tan et al.'s study (2007) shows that CHC students resisted AL and students gave negative comments on group investigation method learning. Students from Singapore in Tan et al. study preferred traditional lesson. Despite the cultural factor pointed out by most of the scholars that could affect students' preference to instruction, Tan et al. also added that other factors like personality trait of students, learning style, learning approach, motivation, and exposure to the instruction, could also affect one's choice of preferred learning instruction.

While many scholar's findings depicted that CHC students do not prefer AL (Tan et al., 2007; Thanh, 2013), Hallinger and Lu (2013) argued that AL methods could be implemented in East Asian education institution where these countries also possess CHC background. Their findings revealed that AL have impacted positively on students' engagement, and most importantly, students perceived that they have been consistently and strongly engaged in AL. In other words, there is no strong evidence from prior literature showing that the association of CHC onto students' PtAL is likely to occur in positive or negative direction, since there are both positive and negative relationship between CHC and PtAL in the past literature. In light of this, the third hypothesis, H_3, is written in non-directional form of hypothesis.

In respect to the argument whether students' ethnicity will affect their preferred pedagogy, Winch (2016) suggested to disseminate more study on this matter so that learners across the world could be benefitted. The findings in Winch's study revealed that students' preferences in pedagogy are altered and influenced by

the British educational culture regardless of students' former educational culture. Thus, it is evident that culture does affect students' preferences in pedagogy.

In a study conducted by Loh and Teo (2017) aimed to understand the role of CHC culture in influencing Asian students in their learning in terms of learning styles and learning strategies, the researchers conducted a survey and the results supported the premise that culture does influence learning. The analysis of their study also challenged the conventional perspective of CHC being resistant towards group learning. The respondents in their study were positive in group learning environment whereby they expressed their opinion in front of the whole class. Besides, their study also showed that these respondents from CHC preferred assignment assessment than examination type questions. The overall result of their study indicated that CHC does influence students' learning, particularly in countries that have characteristics of collectivism, high power distance and masculinity. They explained further that the students in such countries preferred teacher-centred learning and regarded teachers highly and teachers' authority is not to be challenged. Due to the collectivism characteristic, students tend to prefer group learning (a form of active learning) so that they could seek security from fellow groupmates. However, they also noted that the cultural influence is also subjected to environment changes, particularly if students have been away from their home country for some time, as the influence of home culture will have been diluted. Thus, one may ask, "Could the cultural values of Confucianism present in the society of CHC have been diluted?"

Literature related to CHC and AL has been centred around finding the relationship of CHC and the academic achievement of implementing AL in the classroom. For instance, Kutnick et al. (2017) assessed CHC students' academic

achievement upon implementing group work (a form of AL). The analysis showed that students' academic achievement improved through implementing group work. They concluded that the group learning approach can be integrated with Hong Kong's curriculum, and thus highly recommended a change in classroom pedagogy based on such learning approach.

Literature also points out that other than culture, many other factors could also influence PtAL, such as whether teachers practice non-traditional pedagogy, peer interaction, situational motivation etc. (Coll, Rochera, & de Gispert, 2014; Hodges, 1999; Nguyen, 2015; Preszler, 2009; Sung & Hwang, 2013)

The above literature review provides a number of contradictory views and inconsistent results on students' preference to AL, especially students from a CHC background. It is therefore important to carry out research that determines the relationship of CHC and PtAL.

As mentioned earlier, CHC construct includes 5 sub-constructs (or dimensions) of Respect, Perseverance, Dependence on Teacher, Harmony, and Education, and it is the interplay of these 5 components that contributes to students' PtAL. To represent the totality of CHC, the 5 sub-constructs are unified into an integrated single construct. Therefore, the present study developed an integrated formative second order construct inclusive of Respect, Perseverance, Dependence on Teacher, Harmony, and Education based on studies by Hofstede (2011), Siah et al. (2015) and Watkins & Biggs (2001). These 5 first order sub-constructs were assessed using indicators that were reflective of the qualities of the sub-constructs. First order constructs are those which are measured directly by observed indicators (Hair, Hult, Ringle, & Sarstedt, 2016). These first order sub-constructs go toward the creation of

second order CHC as a reflective-formative second order construct. Higher order constructs, such as second order or third order etc., are constructs whose associated indicators are lower order constructs and not observed indicators (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

In addition, the PtAL construct based on 3 sub-constructs Participation, Meaningful Learning, and Attitude are unified into an integrated single construct. Therefore, these 3 sub-constructs formed PtAL as a formative second order construct based on studies by DeMonbrun et al. (2017), Finelli et al. (2014), Struyven et al. (2008), and Yudko et al. (2008). These first order sub-constructs were assessed using indicators that were reflective of the qualities of the sub-constructs. The first order sub-constructs go toward the creation of second order PtAL as a reflective-formative second order construct. Figure 1.1 in Chapter 1 Introduction shows the hypothesised model for the present study.

Chemistry Education

Much of the research in chemistry education have focused on the effectiveness of AL in class including chemistry laboratory classes, for example, using collaborative learning in chemistry classroom lessons (Carr, 2013; Glaser & Poole, 1999; Peters, 2005; Spaeth & Black, 2012), cooperative and/or collaborative learning in chemistry practical classes (Cooper & Hixson, 1994; Sandi-Urena, Cooper, & Stevens, 2012; Shibley & Zimmaro, 2002), and small-group learning in chemistry classes (Lyon & Lagowski, 2008; Towns, Kreke, & Fields, 2000). Research about chemistry students and their preference to AL is lacking (DeMonbrun et al., 2017; Miller, 2015; Sharan, 2010).

As mentioned by Hodges (1999), students in a chemistry class seems to be less tolerant to AL. When students are assigned an article related to chemistry that would require them to discuss at the following chemistry class, these students rarely knew where to begin in sorting out the information, and students had no incentive to tackle the information in the article prior to class. Furthermore, many of these researchers noted that chemistry students need to learn how to work and study together, and to do additional further reading as well as critically review the information which they have gathered when they work on AL activities (Glaser & Poole, 1999). Thus, literature points out that CHC students are highly dependent upon teacher (Foong & Daniel, 2013; Liu & Feng, 2015; Tran, 2013). Therefore, would CHC chemistry students prefer AL?

Chapter Summary

In this chapter, the researcher has first reviewed the ideologies and practices of Confucianism by first explaining the more important Confucian concepts (i.e. *li*, *Dao* and *he*, *ren*, *junzi*, *xue*, *wen* and *si*), as well as its influence in China, East and Southeast Asia countries, from the perspectives of history, political science, and philosophy. A brief summary on the Confucian concepts will be given below as it is rather more complex to comprehend.

The first concept of Confucianism that has been discussed is *li*. *Li* is regarded as a totality of socially acceptable behaviors that are accompanied with values and attitudes in all aspects of one's life. Respect (being one of the sub-constructs of CHC Scale in the present study) is an essential part of *Li*.

The second concept of Confucianism that has been discussed is *Dao* and *he*. *Dao* and *he* have bridged the connection with *Li*. In Confucius teaching, to broaden the *Dao* is to achieve *he* through observance of *li*.

The third concept of Confucianism that has been discussed is *ren*. *Ren* is the specific behaviors, attitudes, and values that are required by one when observing *li*. The function of *li* is to practice, observed and achieve joy and harmony, internally and externally (*Dao* and *he*). Respect, hierarchy, education, and articulation of disagreements appropriately (some key terms that are relevant to the present study) have been discussed in the concept of *ren* (i.e. *zhi*, *shu*, *zhengming*, *xiao*).

The last concepts that are discussed are *junzi*, *xue*, *wen*, and *si*. To attain *ren*, everyone can and should aspire to become a *junzi*. A *junzi* cultivates oneself, respectful to superiors, follows hierarchical social roles, expresses disagreements

appropriately, integrates learning and thinking, practices active and reflecting learning (AL), practices independent learning (not dependent to teacher), and possess the right attitude in learning. These are being discussed in the concepts of *junzi*, *xue*, *wen*, and *si*.

The researcher has also explained the evolution and transformation of CHC from Confucianism. Although Southeast Asia has diverse cultural identity and have been influenced by various religions and teachings, however, finding the origin of the proposed characteristics of the CHC learners (Respect, Education, Perseverance, Dependent on teacher, and Harmony) is not the interest of this study. The researcher views these characteristics as the by-products of Confucianism due to the evolution of the culture over time.

Besides, the derivation of Respect, Education, Perseverance, Dependent on teacher, Harmony constructs from Confucian concepts, and their relevant literature have been reviewed. In addition, the derivation of Participation, Meaningful Learning, Attitude constructs, and their relevant literature have also been reviewed. Lastly, the connection between CHC and PtAL, as well as chemistry education were reviewed also. The above review of literature was done from the perspectives of history, political science, philosophy, and science education.

In the present study, due to the need to fulfill the researcher's personal motivation of conducting this study (who is a chemistry teacher), as well as considering the inclusion criteria (more will be discussed in the section of Sample in Chapter 4 Methodology), only one particular subject which is the chemistry subject is being investigated.

The next chapter will discuss the conceptualisation of the present study by showing the identified gaps, and discuss the theories that underpinned the present study.

Chapter 3 Conceptualisation of the Study

Introduction

In accordance to the research problem that Chinese students are resisting active learning (AL), the research objectives and research questions that are put forward at the previous chapters are grounded by the research gaps being presented in the Conceptual Framework of this chapter. Besides, this chapter also explained the theories that underpinned the present study.

Conceptual Framework

This section of Conceptual Framework shows the positioning of the present study and indicates the gaps being investigated.

Positioning of Confucian heritage culture. In this study, the term of Confucian heritage culture is referring to the culture experienced by Chinese descendants who has shared a strong Confucian heritage, however, these Chinese people could have also assimilated other cultures and teachings such as Daoism, Buddhism, Christianity, and others in their life.

Human cultural traits transmitted and evolved over the time. Therefore, the 'Confucianism teaching' perceived by Chinese people in CHC may not be reflected from the true teachings of Confucianism or people may have misinterpret the true teaching. When the researcher started the journey in this study, she was not so clear

about the historical and philosophical perspective of Confucianism and hence these five constructs of CHC namely 1) Respect, 2) Competitive Learning, 3) Dependence on Teacher, 4) Harmony, and 5) Extrinsic Motivation were identified by the researcher from reviewing and understanding the literature. As time progress and the feedback rose by the experts, she realized that competitive, external reward, and doing well in examination have not been advocated by Confucianism. Certain experts were very strong in their opinion that some constructs have not reflected Confucianism.

Exploring and delving into the historical, philosophical and studies of Southeast Asian, the researcher realised and agreed that the knowledge and values that have been infused into modern Chinese society in CHC countries could have been the influence of mass examination culture, and rapid social cultural change or misinterpret by the people. After the twists and turns, the researcher has nonetheless decided on the five constructs of CHC to be 1) Respect, 2) Perseverance, 3) Dependence on Teacher, 4) Harmony, and 5) Education, which has then confirmed by the experts again. Regardless whether renaming the competitive learning to perseverance, and extrinsic motivation to education, the researcher interpreted these as the by-products existed in the modern society of CHC. Therefore, the characteristics or constructs identified in CHC of this study are the by-products of Confucian heritage. These constructs have formed the CHC. They are not exhaustive but are found to be most relevant to this study. These constructs have nothing negative as it is look upon as negative; although many people deemed it as negative, but it is not.

The research gaps. As described earlier, past research carried out related to Confucian heritage culture has centred around learning approaches i.e. surface, achieving, and deep approaches (Biggs, 1988; Dennehy, 2014; Penfold & van der Veen, 2014), learning style (Hing, 2013; Tran, 2013), impact of Confucian values onto educational and/or business leadership (Cheah et al., 2014; McDonald, 2012; Pearson & Entrekin, 2001), parents' belief in education, learning motivation (Kember, 2000; Lin, McKeachie, & Yung, 2003; Tran, 2012; Zheng, 2010). Research have moved from finding cultural explanations (Confucianism vs. Buddhism) (Barrett, 1992; Guang, 2013; Nguyen, 2010; Tang, 2015) to the identification of characteristics of the CHC and then to the search for good practices that could enrich and enhance learning and teaching in CHC learning environment, regardless of the cultural origins (Dennehy, 2014; Hing, 2013; Wong, 2008).

In addition, numerous literature have also offered explanations to reveal the paradox and misconceptions to CHC Chinese learners (Biggs, 1996; Kember, 2000; Saravanamuthu, 2008; Tran, 2013; Watkins & Biggs, 2001), in hope of giving a true picture on CHC learners. The missing link, however, is the availability of an instrument that conceptually defines and measures the characteristics of Chinese students who come from a CHC using the Respect, Perseverance, Dependence on Teacher, Harmony, and Education constructs. In addition, the other missing link, is that the CHC construct in this study has not been compiled and attested quantitatively in a single model, despite many of the constructs has been revealed and/or discussed in other scholar's findings and were proposed to conduct further investigation on these constructs.

As described earlier, past research carried out related to students' preference in instruction to certain input variables, such as the teachers' attributes and her teaching method, student factors, and educational setting (e.g. task, assessment, media etc.) are omnipresent (Baeten et al., 2010; Hänze & Berger, 2007; Kiguwa & Silva, 2007; Kyndt et al., 2013; Loftin et al., 2010; Michou et al., 2013; Mustapha, Nik Abd Rahman, et al., 2010; Othman et al., 2012; Sand-Jecklin, 2007; Trigwell et al., 1994). The missing link, however, is the availability of an instrument that conceptually defines and measures students' preference to AL using the Participation, Meaningful Learning, and Attitude constructs. In addition, the other missing link, is that the preference to AL construct in this study has not been compiled and attested quantitatively in a single model, despite many of the constructs has been revealed and/or discussed in other scholar's findings and were proposed to conduct further investigation on these constructs.

Besides, a careful study of the literature also revealed that the cultural factor influence students' preference to AL. However, there is no reliable statistical evidence that showing the relationship between CHC and PtAL.

As aforementioned, most of the past research on CHC have been conducted in other part of Asian countries, research on Chinese students from Southeast Asia, particularly from Malaysia is still lacking. There have been relatively even lesser studies investigating on Malaysian Chinese students and their preference to AL. That is to say, there is no reliable statistical analysis which has measured the extent of CHC related to PtAL among Chinese pre-university chemistry students, especially in the context of Malaysia.

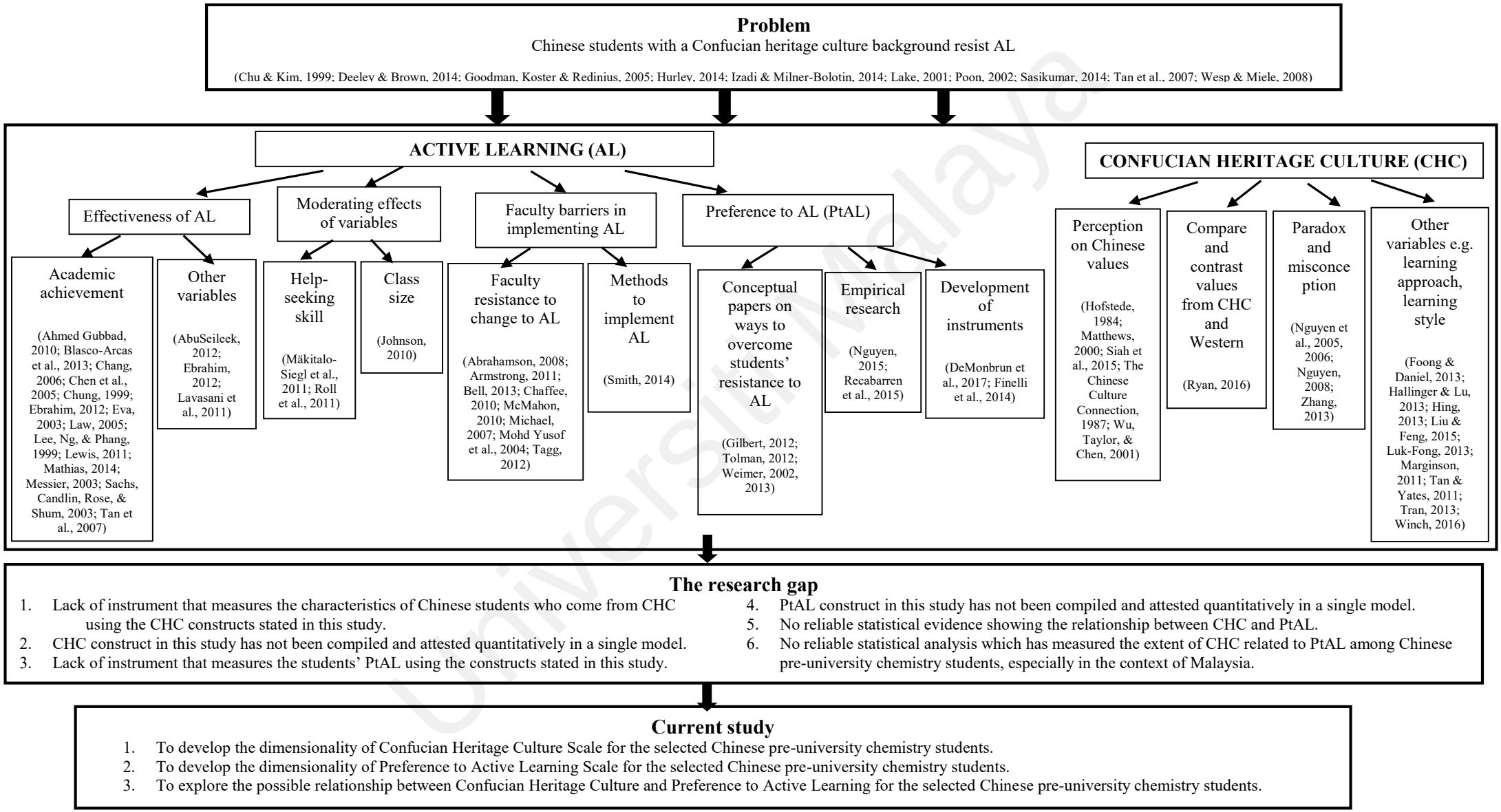


Figure 3.1 The conceptual framework for this present study is to show the gap in knowledge and to position the present study

Theoretical Framework

Confucian Heritage Culture (CHC). From the perspective of CHC, learners with a CHC background not only demonstrate inclination towards group learning (Chan & Watkins, 1994; Park, 2002; Tang, 1996), but in some specific contexts, it has been shown that CHC learners studying in Western countries could do better in groups (Hofstede et al., 1997) and thus cooperative learning is unequivocally proposed for CHC learners (Salili, 1996). It appears that researchers have come to an accord and settled upon the decision that group attributes and characteristics are underlined by the collectivist mentality, which somehow, ensures group achievement. However, empirical studies does not show concurrence (Eva, 2003; Mustapha, Nik Abd Rahman, & Md.Yunus, 2010a, 2010b; Tan et al., 2007).

In countries where learners have a CHC background, the teachers are the models of conduct and correct behavior. Students are required to stand up and show respect whenever a teacher enters or leaves the classroom. A teacher is respected when in school and this respect mostly remains after leaving school. When conducting lessons, students speak only when they are invited to do so. Seldom will students challenge a teacher (Scollon & Scollon, 1995). Hence, an unequal relationship is maintained by the stability of society which in this case refers to the relationship of the teacher and the student. In this case the only source of knowledge for a student in a classroom is the teacher (Maley, 1983).

Working in a group in a social constructivist environment where students are able to discuss and share information, which might exceed any knowledge shared by the teacher, inadvertently, brings the knowledge of the teacher into question. Teachers are offended when a student spots their mistakes instead of accepting it

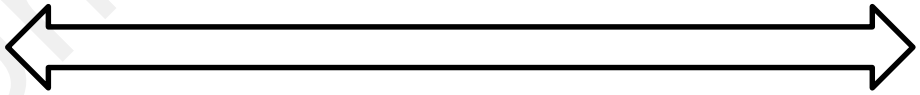
(Nguyen, Terlouw, & Pilot, 2005; Trevor, personal communication, April 30, 2014). Clearly, in countries where CHC is prevalent, the teacher rules in the classroom and evidence clearly depicts that students are very dependent on the teacher (Chan & Sally, 1999; Chan, 2008; Samuelowicz, 1987), even when engaged in group learning. Therefore, the researcher in this research investigated the students from a CHC background in relation to their resistance to AL.

From the individualism-collectivism perspective, the individualism index shows countries with CHC background with low scores. In a comparison conducted among four Asian countries: Malaysia scored highest with a score of 26 (Hofstede et al., 2010), Hong Kong second with a score of 25, Singapore third with a score of 20 and lastly Taiwan with a score of 17, indicating high potential in the collectivist domain on countries with low scores. Malaysia with a score of 26 is considered as a collectivistic society, meaning a strong sense of group cohesion and group learning. However, there is research evidence showing the opposite—individuality does exist in some CHC learners (Kee & Wong, 2004; Park, 2002). Park (2002) found that Korean students prefer to work individually compared to group learning. In the study by Kee and Wong (2004), which focused on CHC learners from a higher education in South Australia, it was found that although the CHC learners participated in competitive learning in the classroom, they preferred working individually so that they can be in total control of the final product. Similarly, Agelasto (1998) mentioned that competition is valued more than cooperative learning in China.

In a collectivistic society, shame and loss of face are avoided. Nonetheless, saving face is also a very important element in CHC countries. Loss of face is drastically avoided in order to not damage personal image. Applied in a classroom,

this eventually ends with the majority of CHC learners losing out on the opportunity of presenting or coming up with fantastic ideas for fear of resentment, humiliation, and of being ridiculed (Cocroft & Ting-Toomey, 1994; Oetzel & Ting-Toomey, 2003; Ooi & Teoh, 2011). They would rather keep their mouths shut than telling the truth. To manage conflict among CHC learners, some researchers suggested omitting the need of face-to-face meetings (Zhang, 2013); but there are still signs of reluctance on contribution to the discussion (Ooi & Teoh, 2011, cited in Nguyen et al. 2005; Tjong & Yong, 2004). Circumstances like these are due to personal barriers such as the lack of confidence, lack of self-esteem, keeping harmony, avoiding conflict and shyness.

CHC is a continuum. The range of CHC inherited by Chinese people can be illustrated in a continuum as below (Figure 3.2), ranging from the narrow and limited, to broad and extensive scope. Example of CHC that is narrow and limited, is the limited practice of values and teachings in CHC Chinese students.



narrow and limited broad and extensive

Figure 3.2 Continuum of Confucian heritage culture

Purposive Behaviourism. The system of psychology by Edward Tolman (1932), purposive behaviourism, challenged the traditional view in behaviorism. Many consider his theory as an intermediate step between behaviorism and cognitivism. Tolman put forward that individuals do not merely respond to external stimuli but that actions are based upon *beliefs* and *attitudes* as they strive towards their goals (Olson & Hergenhahn, 2015). These actions are the result of *mental processes* which are the internal representations acquired from the experiences in the external environment. If this theory is interpreted in the present research, it can be put forward that the external environment is the active learning (AL) environment, the actions towards this external stimuli is dependent upon the beliefs and attitudes resulting from a Confucian heritage culture (Figure 3.3). The theoretical constructs of purposive behaviorism theory are beliefs and attitudes. These beliefs and attitudes give rise to mental processes and actions towards external stimuli.

The conceptual constructs that shape students' beliefs have been identified as Respect and Harmony, and that which shape attitude have been influenced by Perseverance, Dependence on Teacher, and Education.

These beliefs and attitudes that have been shaped by CHC conceptual constructs give rise to students' preference to AL which affects participatory action towards the AL environment.

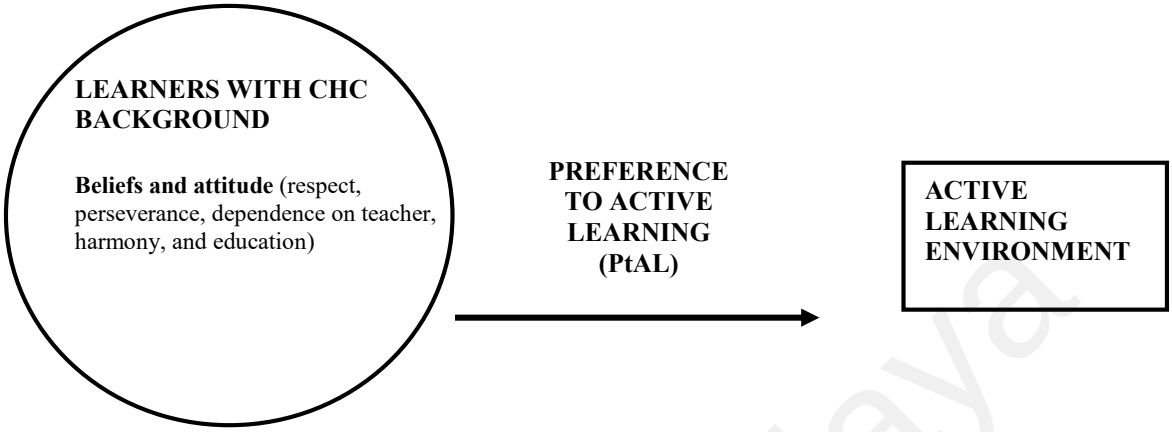


Figure 3.3 Interpretation of Tolman's Purposive Behaviourism

Constructivism. Active learning is rooted in constructivism. Although there are many types of constructivism in the literature (cognitive constructivism, social constructivism), all expounds the basic principle of constructivism—learning needs students to actively interpret and impose meaning through their existing learning structure, instead of passively receiving and recording information (Anthony, 1996; Liu & Ju, 2010). That is, constructivism involves the students interacting with the physical and social world (Fosnot, 1996).

Jean Piaget's cognitive constructivism (2013) expounds that individuals must construct their own knowledge to understand and build their knowledge through learning experiences. Whereas Lev Vygotsky's social constructivism (1978) supports Piaget's theory, but places emphasis on the social context of learning (Syed Abd Latif & Subramaniam, 2008). Vygotsky's Zone of Proximal Development in relation to human learning implies that AL is collective and interactive which is important for intellectual growth (Bartley & Milner, 2011; Mathias, 2014). How this constructivist view is integrated into Tolman's Purposive Behaviourism is shown in Figure 3.4. The theoretical constructs of active learning identified in this study are participation, engagement, and meaningful learning. The theoretical constructs of constructivism are assimilation, accommodation, learning in the Zone of Proximal Distance, the social environment.

Like in CHC, AL is also a continuum. The range of different quality of AL activities executed by teachers and hence different experiences experienced by Chinese students can be illustrated in a continuum as below (Figure 3.5), ranging from the narrow and limited (bad experience), to broad and extensive scope (good experience). Example of AL that is narrow and limited (bad experience) such as the

AL activities that are poorly executed or poorly delivered by teachers and giving rise to bad experience experienced by Chinese students, and vice versa.

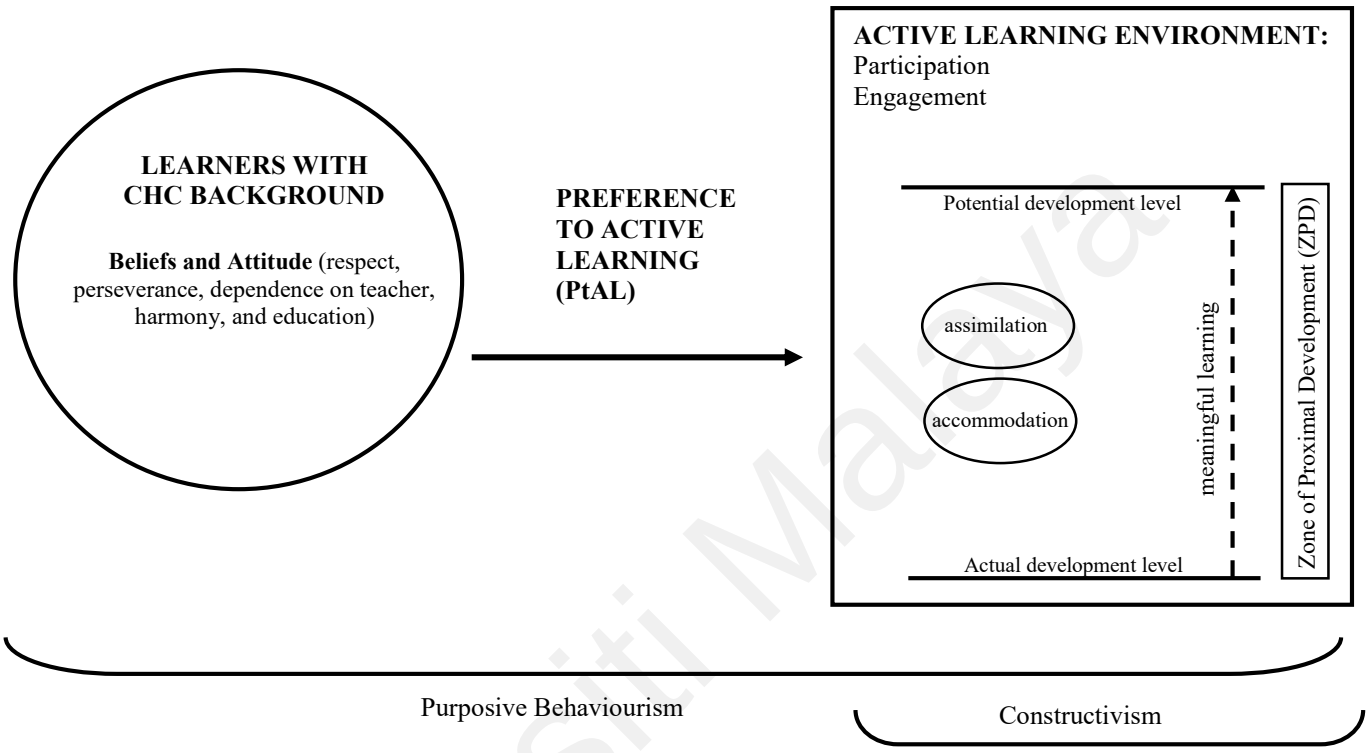
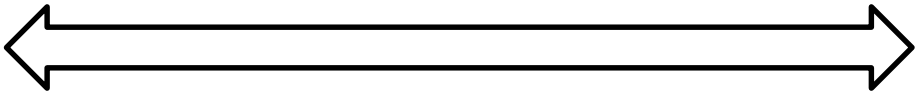


Figure 3.4 Interpretation of Tolman's purposive behaviourism and constructivism



narrow and limited — broad and extensive

(bad experience) — (good experience)

Figure 3.5 Continuum of preference to active learning

Cognitive Dissonance Theory. Dissonance refers to the unpleasant emotional state that follows from holding contradictory beliefs (Festinger, 1957). This state is especially apparent when a person may hold an internal view which is in conflict with an external view. When individuals experience this type of conflict in relation to a belief, opinion, attitude, idea or perception it may have an aversive motivational effect (Littlejohn & Foss, 2010). In this present study, attitude is important in relation to resistance to AL as attitude is the most distinctive and indispensable concept of social psychology (Allport, 1935). Attitude is considered to be good predictor of behaviours, however it may also depend on the contextual situation (Campbell, Converse, Miller, & Stokes, 1960; Cooper, 2010; Schwarz, 2007). Besides attitude, participation is also investigated in relation to resistance to AL, as this is closely related to the individualistic-collective continuum in the CHC background which can give rise to dissonance. Finally, the perception and understanding about meaningful learning can also lead to dissonance. This is shown in Figure 3.6. The theoretical constructs of the cognitive dissonance theory are unpleasant emotional state, contradictory belief, conflict, and dissonance.

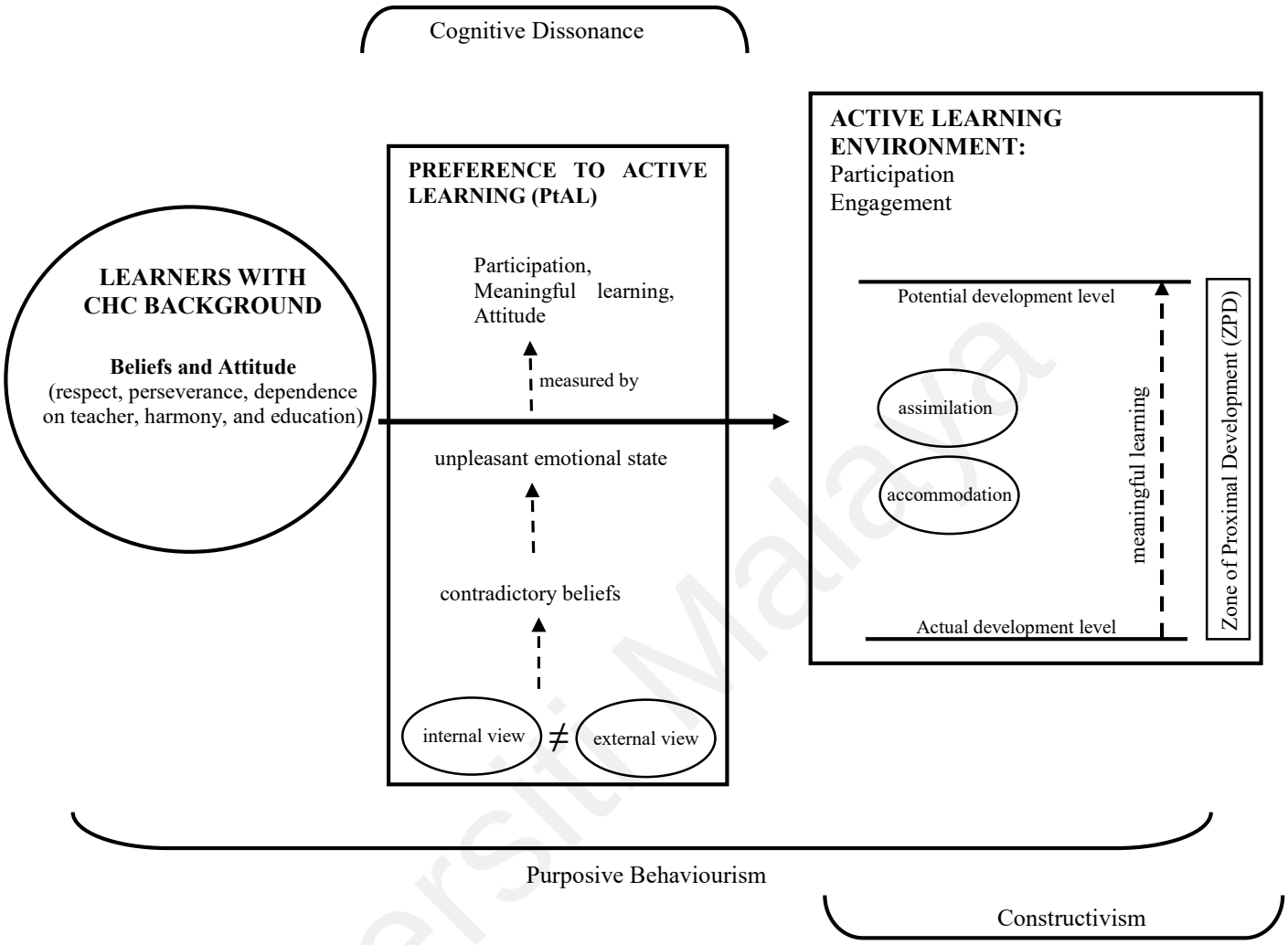


Figure 3.6 Interpretation of Tolman's purposive behaviourism, constructivism and cognitive dissonance theories

Integrating the interpreted Confucian heritage culture, purposive behaviorism, constructivism, and cognitive dissonance theory for the present study. The actions of responding to the AL environment by the students, either participatory action or resistance to AL, giving rise to their preference to AL as they strive toward their chemistry learning is based on beliefs and attitude. The actions of participating or resisting AL which are the internal representations acquired from the experiences, including values and beliefs in the CHC environment, can affect students' attitude and participation. In addition, meaningful learning can be measured in the PtAL construct as Chinese students participate and engage in AL instructional approaches which promotes students' meaningful learning.

Chinese students in an AL environment will be stimulated (termed as external stimuli in purposive behaviorism theory (Tolman, 1932)) and guided from more capable peers or teachers (termed as scaffolding in Vygotsky's constructivism (Vygotsky, 1978)) through social interaction from students' actual development level and students' potential development level (termed as Zone of Proximal Development in Vygotsky's constructivism (Vygotsky, 1978)), to relate incoming new information with old information which has been stored in their existing cognitive structures. If the new information can be linked and assimilated to the old information, a cognitive equilibration is said to be achieved (termed as assimilation and equilibration in Piaget's constructivism (Piaget, 2013)). However, if the new information cannot be linked to the old information, and the old information needs to be changed to deal with the new information, accommodation and cognitive disequilibration are said to have happened (Piaget, 2013).

However, the conflicts of a Chinese students experienced in an AL environment is not restricted to cognitive conflicts (Piaget, 2013); contradictory beliefs, opinions, attitudes received from AL environment (which is a form of experience in the external environment experienced from external stimuli in purposive behaviorism theory (Tolman, 1932)) can arouse an unpleasant emotional state (Festinger, 1957) which is measured in the PtAL Scale in this study, and eventually students' will demonstrate resistance to AL as a form of actions towards dissonance (Festinger, 1957; Tolman, 1932).

Apart from the above discussion, CHC and AL continuum are related to the above theories. A Chinese student who has narrow and limited scope of CHC, perhaps would have pleasant experience from previous AL activities and thus do not arouse contradictory beliefs and dissonance, therefore the student would perhaps love to do group discussion in chemistry learning and prefer AL, and vice versa.

Chapter Summary

In this chapter, several research gaps have been identified and discussed in the section of Conceptual Framework. In view of that, the present study was designed in such a way so that the contribution could be made to fill those missing links.

Besides, various educational theories that underpinned this study are discussed from the perspectives of psychology and science education. It is in hope that the findings of this present study could explore and then develop a theory to understand the relationship of CHC and PtAL in the Chinese students within the chemistry learning environment.

In the following chapter (Chapter 4 Methodology), the methodological consideration, sampling, research procedures and measures, development of both of the CHC Scale and PtAL Scale will be discussed.

Chapter 4 Methodology

Introduction

In accordance with the research problem and objectives, quantitative research design is used to investigate the research questions of this study. The present study aimed to develop two scales (CHC Scale and PtAL Scale), and to explore the relationship between CHC and PtAL.

The present study was conducted in two phases. In Phase 1, the scales were developed and validated, and these instruments were pre-tested. Then in Phase 2, the model was validated and relationship was explored and theory was developed.

Methodological Consideration

Factor Analysis. There are two methods for factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Although both techniques can be used to examine the underlying factor structure of the data, however their roles are different and are serving different purpose (Hair, Black, Babin, & Anderson, 2014). EFA is used for theory-building, whereas CFA is used for theory-testing (Matsunaga, 2010). EFA permits the following objective when developing particular scale: 1) identifying of the number of constructs, 2) identifying the items that load onto particular factor, and 3) reducing items that do not load clearly and strongly onto particular factor. EFA is often applied prior to CFA. In this study, EFA was deemed to be more suitable in fulfilling the research objectives, and hence it was performed.

Structural Equation Modeling. With the advancement of second generation multivariate data analysis, Partial Least Square Structural Equation Modeling (PLS-SEM) has permitted the development of theories in exploratory research and predicting purpose in a research model (Becker, Klein, & Wetzels, 2012; Hair, Ringle, & Sarstedt, 2011; Hair, Hult, Ringle, & Sarstedt, 2016). In this study, due to the *a priori* theories or concepts are not fully established, the use of PLS-SEM is deemed to be more suitable. Besides, the PLS-SEM is used to validate the model because the model has formative constructs (as well as reflective constructs) (Barroso, Cepeda, & Roldan, 2010; Jarvis, MacKenzie, & Podsakoff, 2003).

Compared to covariance-based SEM (CB-SEM) which focuses on minimising the difference between the theoretical matrix (model) and empirical covariance matrix (data), PLS-SEM aims to maximise the explained variance of the endogenous latent constructs (dependent variables). Although PLS-SEM and CB-SEM complements each other in several other ways while serving different purposes, but PLS-SEM holds an advantage over CB-SEM in assessing the higher order constructs (HOCs) as it allows combination of reflective and formative measurement in the same model (Becker et al., 2012).

In addition to attest the validity of CHC in PtAL model, the purpose of the present study was also to test the proposed model with HOCs. Using the iterative review of literature as the basis, it was posited that Respect, Perseverance, Dependence on Teacher, Harmony, and Education form CHC construct, as well as Participation, Meaningful Learning, and Attitudes form PtAL construct, thus portraying a reflective-formative second order constructs.

Sample Size

At the initial stage, there were a total of 85 items (or indicators) for both of the scales. Therefore, following the general rule suggested by Hair et al. (2014), the minimum sample size must be at least 85x5=425 observations to perform EFA.

After the data was analysed with EFA, a second version of questionnaire was obtained and the second sample of data was collected. The total number of items for both scales in the second version of questionnaire was 61. Therefore, following the minimum sample size rule of thumb for PLS-SEM is 10 times of the largest number of paths appointed to a particular construct (Chin & Dibbern, 2010; Hair, Ringle, & Sarstedt, 2011; Rasoolimanesh, Dahalan, & Jaafar, 2016). Therefore, the minimum sample size must be at least 35x10=350 observations to perform PLS-SEM.

Sample

The present study was conducted mainly in two phases and data were collected from two independent samples (first sample and second sample) from several institutions and schools in Malaysia. (Chan & Bauer, 2015; Miller, 2015; Veloo, Rani, & Hashim, 2015). The selected sample represents the range of the population of Malaysian Chinese students (who possess Confucian heritage culture). However, since the population of the Chinese students in Malaysia is not available, the non-probability sampling method was used to ensure that Malaysian Chinese pre-university chemistry students were sampled purposefully. Non-probability sampling method has been widely used in the research (Chuah & Ting, 2015; Himschoot, 2012; Tatnall, Osorio, & Visscher, 2004; Teoh, 2016; Ting, Chuah, Cheah, Memon,

& Yacob, 2015). The researcher used the criteria decided upon to select the sample in order to intentionally choose institutions and schools in Malaysia whose availability and reasonable number of Chinese students in the institutions and schools to survey. Only pre-university Chinese students were selected as the target population. These pre-university students who have just enrolled into tertiary higher education from the secondary school are growing into early adulthood, and therefore they are expected to be independent in their learning, take charge of their own learning, and participate actively in AL. Moreover, past literature has cited that more samples from pre-university students should be studied. It must be noted here that, some institutions approached by the researcher were not forthcoming to participate in the research. Hence, the researcher could only collect data from the institutions were agreed to participate.

While the data collected from the first sample was used to develop the initial scale and examine its underlying dimensionality in the first phase, data collected from the second sample was used to attest the model and to explore the relationship of the study in the second phase. The data for both samples were collected via paper-based survey method.

The students studying in the pre-university science programmes at these selected institutions and schools have a choice to not undertake chemistry. Therefore, the participants for this study must have taken chemistry in the pre-university science programmes. Besides, other inclusion criteria such as participants must be Chinese, and parents must be able to speak and/or read Chinese, were adopted in this study. As described in the previous chapters and sections, parental and family influence have greatly impacted on CHC's ways of respecting elderly, commitment in education,

and needs to persevere, therefore the criteria of including parental ability to speak and/or read Chinese so that their level of CHC can be reflected.

Despite distributing 623 copies of questionnaire to collect the first sample, 448 copies were collected, accounting for 72% of response rate. Nevertheless, as 18 copies were found to be unusable, 430 copies were computed into SPSS for data analysis (EFA). While for the collection of the second set of sample, 613 copies of questionnaire were distributed, 453 were collected, accounting for 74% of response rate. Of these, 12 copies were found to be unusable, 441 copies were computed into SPSS for further data analysis (PLS-SEM).

The first sample consisted of 430 and second sample consisted of 441 Chinese pre-university chemistry students from different programmes (Form 6, A-Level, Diploma, and Foundation programmes) from 6 higher educational institutions and schools in Kuala Lumpur, Selangor, and Melaka. The participants were coming from different states of Malaysia, but studying in the selected institutions situated in the above-mentioned sites. These 871 numbers of Chinese pre-university chemistry students in these institutions and schools in Kuala Lumpur, Selangor, and Melaka are taught by 18 lecturers.

In the first sample, there were 241 males and 189 females (56% and 44%, respectively) between the ages of 18 to 20 (248 aged 18 (57.7%), 141 aged 19 (32.8%), 41 aged 20 (9.5%)). Of these 430 Chinese students, 18% are from Selangor, 13% are from Kuala Lumpur, 12% are from Penang, 10% are from Sabah, 10% from Johor, 8% from Sarawak, 7% from Perak, 5% are from Melaka, 17% from other states (see section Findings for the Descriptive Analysis in the Chapter 5

Development of the Confucian Heritage Culture Scale and Chapter 6 Development of the Preference to Active Learning, for further details).

In the second sample, there are 283 males and 158 females (64.2% and 35.8% respectively) between the ages of 18 to 20 (378 aged 18 (85.7%), 48 aged 19 (10.9%), 15 aged 20 (3.4%)). Of these 441 Chinese students, 19% are from Selangor, 12% are from Kuala Lumpur, 11% are from Penang, 10% from Johor, 9% are from Sabah, 8% from Sarawak, 7% from Perak, 5% are from Melaka, 19% from other states (see section Findings for the Descriptive Analysis in the Chapter 7 Model Validation and Relationship between Confucian Heritage Culture and Preference to Active Learning, for further details).

Procedures and Measures

Phase 1(a): Development of Confucian Heritage Culture (CHC) Scale. In this study, the CHC Scale was developed as a data collection tool to assess the extent of CHC characteristics experienced by Chinese pre-university chemistry students. In general, the scale development process took place in five steps, 1) identifying constructs, 2) generating item pool, 3) inclusion of items, 4) pretest, and 5) first version of scale.

In the first step, decisions were made to identify underlying constructs of CHC. In regard of this, a comprehensive iterative review was conducted to specify and describe the different constructs of CHC (see Table 4.1 and Chapter 2 Review of Literature). Based on reviewing other relevant scales as well as drawing on research related to CHC and common agreements among studies related to CHC (see Table 4.2), five constructs are proposed (1) Respect, (2) Perseverance, (3) Dependence on Teacher, (4) Harmony, and (5) Education.

Although The Chinese Culture Connection (1987) has developed Chinese Values Survey (CVS) to measure 40 Chinese values (for example, filial piety, being hardworking, perseverance, humility), and contributed to the development of Values Survey Module (VSM), the researcher had found that these 40 Chinese values were not all applicable to the context of learning in the classroom; this was done through repeated discussion with experts. The researcher compared the items and constructs from CVS and VSM and found that these 40 Chinese values from CVS and constructs from VSM mainly were parallel with the five themes (i.e Respect, Perseverance, Dependence on Teacher, Harmony, and Education).

Table 4.1

Selected past studies relevant to the sub-constructs of CHC Scale

Constructs	**Past studies**
Respect	Foong & Daniel, 2013; Hofstede et al., 2010; Hofstede, 2001; Knapp, 2005; Liu & Feng, 2015; Nguyen et al., 2006; Stork & Hartley, 2011; Tran, 2013
Education	Clark & Gieve, 2006; Kember, 2000; Liu & Feng, 2015; Marginson, 2011; O'Dwyer, 2016; Wang, 2013; Wong, 2008; Yuen et al., 2017
Perseverance	Helmke & Tuyet, 1999; Hess & Azuma, 1991; Hofstede et al., 2010; Hofstede, 2001; Nguyen, 2008; Rainey, 2010; Saravanamuthu, 2008; Watkins & Biggs, 1996; Yuen et al., 2017
Dependence on teacher	Hofstede et al., 1997; Hofstede, 2011; Liu & Feng, 2015; Maley, 1983; Nguyen et al., 2005; Tan et al., 2007; Tran, 2013; Wang, 2013
Harmony	Baker & Clark, 2010; Chiu, 2009; Cocroft & Ting-Toomey, 1994; Dennehy, 2014; Helmke & Tuyet, 1999; Hofstede et al., 2010; Hofstede, 2001; Li & Campbell, 2008; Lin et al., 2013; Liu & Feng, 2015; Matthews, 2000; Merriam & Mohamad, 2000; Nguyen et al., 2006; Nguyen, 2008; Oetzel & Ting-Toomey, 2003; Pearson & Entrekin, 2001; Saravanamuthu, 2008; Tan et al., 2007; Tehseen et al., 2017; Thanh et al., 2008; Tjong & Yong, 2004; Tran, 2013; Zheng, 2010

Table 4.2

Selected past studies relevant to Chinese values scale

Author(s)	Year	Scale	Target group (sample)	Constructs	Total of items
Siah et al.	2015	Adopted Chinese Value Survey, CVS	Malaysian Chinese secondary students	Integrity and tolerance Confucian ethos Loyalty to ideals and humanity Moderation and moral discipline	40
Wu, Taylor, & Chen	2001	Developed new scale and adapted Values Survey Module, VSM	Taiwanese public relations practitioners	Press agentry Public information Two-way asymmetrical Two way symmetrical Personal influence Cultural interpreter Power distance Uncertainty avoidance Femininity Masculinity Individualism Collectivism	48
Matthews	2000	Adopted Chinese Value Survey, CVS	Sojourners to Australia	Integrity and tolerance Confucian ethos Loyalty to ideals and humanity Moderation and moral discipline	40
The Chinese Culture Connection	1987	Developed Chinese Value Survey, CVS	Chinese university students	Integration Confucian work dynamism Human-heartedness Moral discipline	40
Hofstede	1984	Developed Values Survey Module, VSM	Chinese	Power distance Uncertainty avoidance Femininity-masculinity Individualism-collectivism	

In the second step, an item pool was generated based on the five proposed constructs identified in the first step, guided by the findings from the simulation study done by other scholars, they had found that more items were not necessarily better but using single-item was not a good alternative, the general advice given was to employ minimum 3 items per construct, hence 30 items were composed with each

construct represented by 6 items (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012; Hayduk & Littvay, 2012).

In the third step, a panel of four experts from the fields of Confucianism and Chinese studies, active learning, and chemistry education examined the item pool for content and face validity. Lecturers, and/or teachers of these fields who have at least 3 years of experience were contacted to form the panel upon their consent and willingness to participate in this research. The consultation with the expert panel was done by interview and questionnaire. After the experts' in-depth examination of each item and when feedback was received from them, some items were revised in terms of their grammar and structure. For instance, "Being lack of confidence, one might choose not to be actively involved." was changed to "In a conflict, I would choose to remain silent as I lack confidence in myself." Consequently, the first version of the scale was developed with 30 items, but was not finalised till later.

In the fourth step, for the purpose of pretesting, two cognitive interviews using a debriefing method were conducted with two Chinese pre-university chemistry students to ensure targeted respondents were able to comprehend and understand the instructions and statements (Hunt, Sparkman, & Wilcox, 1982). Findings from the cognitive interviews suggested that there was no need to revise any part of the items.

In the final step of Phase 1(a), the first version of the scale was finalised based upon the panel's comments. The scale measured 5-point in a Likert scale with 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The constructs of CHC and number of items in relation to each subscale are shown in

Table 4.3. The CHC Scale is shown in Appendix A. The first version of the scale was then analysed with EFA.

Table 4.3

Confucian Heritage Culture Scale Specifications (see Appendix II CHC Inventory)

Constructs and subscales	Items comprising the scale in the CHC Scale	Number of items in the CHC Scale
Respect	1, 2, 3, 4, 5, 6	6
Perseverance	7, 8, 9, 10, 11, 12	6
Dependence on Teacher	13, 14, 15, 16, 17, 18	6
Harmony	19, 20, 21 22, 23, 24	6
Education	25, 26, 27, 28, 29, 30	6
Total number of items		30

Phase 1(b): Development of Preference to Active Learning (PtAL) Scale.

In this study, the PtAL Scale was developed as a data collection tool to assess the extent of preference to AL perceived by Chinese pre-university chemistry students. Same as the development of CHC scale, the scale development of PtAL also took place in five steps, 1) identifying constructs, 2) generating item pool, 3) inclusion of items, 4) pretest, and 5) first version of scale, and these were done concurrently with the development of CHC Scale.

In the first step, decisions were made to identify underlying constructs of PtAL. In regard of this, a comprehensive iterative review was conducted to specify and describe the different constructs of PtAL (see Table 4.4 and Chapter 2 Review of Literature). Based on reviewing other relevant scales as well as drawing on research related to PtAL and common agreements among studies related to PtAL (see Table 4.5 and Table 4.6), three constructs were proposed (1) Participation, (2) Meaningful Learning, and (3) Attitudes.

Table 4.4

Selected past studies relevant to the sub-constructs of PtAL Scale

Constructs	Past studies
Participation	Aguinis, Gottfredson, & Joo, 2013; Appleton et al., 2006; Fredricks et al., 2004; Fredricks & McColskey, 2012; Mustapha et al., 2010; Skinner et al., 2009; Wigfield et al., 2008
Meaningful learning	Aguinis et al., 2013; Bretz, 2001; Bross, 2008; Trowler, 2010
Attitude	Jalil et al., 2009; Littlejohn & Foss, 2010; Lovelace & Brickman, 2013; Martinie et al., 2013; Parisi, 2009; Piburn & Baker, 1993; Pundak et al., 2009; Shibley & Zimmaro, 2002; Yudko et al., 2008

Table 4.5

Selected past studies relevant to PtAL Scale

Author(s)	Year	Scale	Target group (sample)	Constructs	Total of items
DeMonbrun et al.	2017	Student responses to instruction	University students	Value Positivity Participation Evaluation	17
Gilbert	2012	Transtheoretical model of change learning survey	University students	Precontemplation (denial) Precontemplation (believers) Contemplation Preparation Action Maintenance	12
Covill	2011	Students' perception to lecture method	University students	Course evaluation	11
Struyven et al.	2008	Perceptions of the learning environment (Course experience questionnaire)	University students	Course experience Learning environment (good teaching, clear goals and standards, appropriate assessment, appropriate workload) General Generic skills Independence	36

Table 4.6

PtAL Inventory specifications (see Appendix B Preference to Active Learning, PtAL)

Constructs and subscales	Items comprising the scale in the adapted Preference to Active Learning Inventory	Number of items kept in the Preference to Active Learning Inventory
Participation	31–55	25
Meaningful Learning	56–62	7
Attitude		
Mental Discomfort: Uncomfortable/Uneasy/Unbothered	63–70	8
Negative Self: Angry at myself/Annoyed at myself/Disappointed with myself/Disgusted with myself	71–76	6
Embarrassment: Shame	77–80	4
Positive Self: Optimistic/Happy/ Energetic/ Good	81–87	7
Total number of items		57

In this study, the Participation and Meaningful Learning sub-scales were adapted from Student Responses to Instruction developed by DeMonbrun et al. (2017), while the Attitude sub-scale was adapted from Dissonance Thermometer developed by Elliot and Devine (1994). Hence, the researcher adapted DeMonbrun et al.'s work by only using selected items from it and also developed new items for the scale. Besides, DeMonbrun et al. used only 3 items to measure emotional engagement (which is comparable with Attitude in this study). For the Participation sub-scale, the reliability had been reported as 0.70 for Participation, 0.74 for Value of Investment by DeMonbrun et al. (2017) (note: the Value construct had been renamed to Meaningful Learning in this study based on two justification (a) active learning is about meaningful learning, (b) the construct of Meaningful Learning had been

expanded to valuing knowledge and skills rather than only valuing time, effort used in the study of DeMonbrun (2017)).

Grounded on the cognitive dissonance theory and comparing the constructs with the inventory developed by DeMonbrun et al., more items had been developed and added into the Attitude subscale (see Table 4.5 and Table 4.6). The affect associated with the state of dissonance was measured. In this study, the researcher modified and adopted the original Dissonance Thermometer. The researcher believed that the psychological discomfort associated with dissonance was indeed related to negative emotion. The Attitude subscale in this study consisting of a 25-item questionnaire covering four constructs; mental discomfort (i.e. uncomfortable, uneasy, bothered), negative self (i.e. angry at myself, annoyed at myself, disappointed with myself, disgusted with myself), positive self (i.e. optimistic, happy, energetic, good), and embarrassment (i.e. shame) (Elliot & Devine, 1994).

In this study for the Attitude subscale, the researcher also adopted the original Dissonance Thermometer which had 7-point Likert scale to a 5-point Likert scale, so that all the sections throughout the questionnaire is standardised. On a scale of 1 (strongly disagree) to 5 (strongly agree) respondents were able to indicate how each feeling describes their present mood (see Appendix B).

In the second step, an item pool was generated based on the three proposed constructs, guided by the findings from other simulation study done by other scholars, they found that more items were not necessarily better but using single-item was not a good alternative, hence 55 items were composed with each construct represented by minimum 5 items (Diamantopoulos et al., 2012; Hayduk & Littvay, 2012). For the purpose of tailoring the questionnaire to suit the current research

context, some items were adapted where some wordings in the questionnaires were refined or added to make the items specific and easy to understand. For example, a phrase "when I do assignment/groupwork/presentation/ extra reading in chemistry class" was added to most of the items to facilitate students' understanding of the items. Table 4.6 presents the constructs of PtAL and the number of items in the PtAL Inventory in relation to each subscale. Appendix C presents the list of items being adapted and/or new item. The instrument was renamed as PtAL Inventory. The PtAL Inventory is shown in Appendix B.

In the third step, a panel of four experts from the fields of Confucianism and Chinese studies, active learning, and chemistry education examined the item pool for content and face validity. Lecturers, and/or teachers of these fields who have at least 3 years of experience were contacted to form the panel upon their consent and willingness to participate in this research. The consultation with the expert panel was done by interview and questionnaire. After the experts' in-depth examination of each item and feedback was received from them, the items with similar or narrow meanings were either merged or deleted to make sure each item was clear and comprehensive. For instance, three items "I solve problems in a group during chemistry groupwork." and "I solve problems individually during chemistry groupwork." and "I solve chemistry problems that have more than one correct answer." were merged into one "During chemistry group work, I would rather solve problems individually rather in a group." Furthermore, some items were revised in terms of their grammar and structure. For instance, "I am disappointed at myself because I am not able to fit into the group." was changed to "I am disappointed at myself when I am not able to fit into the group." Consequently, the first version of the scale was formed with 55 items, but was not finalised till later.

In the fourth step, for the purpose of pretesting, two cognitive interviews using a debriefing method were conducted with two Chinese pre-university chemistry students to ensure targeted respondents were able to comprehend and understand the instructions and statements (Hunt et al., 1982). Findings from the cognitive interviews suggested that there was no need to revise any part of the items.

In the final step of Phase 1(b), the first version of the scale was finalised based upon the panel's comments. The scale measured 5-point in a Likert scale with 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The constructs of PtAL and number of items in relation to each subscale are shown in Table 4.6. The PtAL Scale is shown in Appendix B. The first version of the scale was then analysed with EFA.

Phase 2(a): Model Validation of Confucian Heritage Culture Scale. Based on the result and findings of EFA (which will be further discussed in Chapter 5 and Chapter 6), a second version of CHC Scale was obtained and new sample was collected. The sampling method used was non-probability sampling to ensure that Chinese pre-university students were sampled purposefully to accomplish the objectives of the study (Onwuegbuzie & Leech, 2007). First the measurement model of CHC Scale was tested, and then the structural model.

Phase 2(b): Model Validation of Preference to Active Learning Scale. Based on the result and findings of EFA (which will be further discussed in Chapter 5 and Chapter 6), a second version of PtAL Scale was obtained and new sample was collected. The sampling method used was non-probability sampling to ensure that Chinese pre-university students were sampled purposefully to accomplish the objectives of the study (Onwuegbuzie & Leech, 2007). First the measurement model of CHC Scale was tested, and then the structural model.

Data Analysis

Data analysis was performed in the two techniques. Firstly, Exploratory Factor Analysis (EFA) was conducted to determine the dimensionality (or factor structure) of the scale. Secondly, Partial Least Square Structural Equation Modeling (PLS-SEM) was used to assess the measurement and structural model as well as to explore the relationship of CHC towards PtAL.

During EFA, the IBM SPSS 20 software was used. During PLS-SEM analysis, the Smart-PLS (version 3.2.4) software was used (Ringle, Wende, & Becker, 2015). A two-stage approach technique was used to analyse the HOCs in the model (Anderson & Gerbing, 1988; Becker et al., 2012). Both of the scales in this study were reflective-formative HOCs model; while Respect, Perseverance, Dependence on Teacher, Harmony, and Education as well as Participation, Meaningful Learning, and Attitudes were reflective in the lower order of the model, they also formed CHC construct and PtAL construct, respectively. The measurement model was first evaluated by performing the reliability and validity analyses, then the structural model was analysed.

Chapter Summary

In this chapter, the researcher first gave a brief explanation on the choice of factor analysis and structural equation modeling, followed by a justification on the sample size and sample. The present study was conducted in two phases, each with 2 parts happened concurrently.

In the first phase which aimed to determine the factor structure of the scales, the CHC Scale and the PtAL Scale were developed. During the process, the underlying dimensions of the scales were first identified, then an item pool was examined for content and face validity. In the fourth step of Phase 1, a pretesting was conducted, and then the first version of the scales was finalised. The research was then continued with Phase 2, which aimed to validate the models and find relationship between the CHC Scale and PtAL Scale. A new set of sample was collected for Phase 2.

With these research procedures, the researcher carried out the research and data were collected for analysis. Findings and discussion of the research is presented in Chapter 5, 6, and 7.

Chapter 5 Development of the Confucian Heritage Culture Scale

Introduction

After a thorough literature review, as stated earlier, the review showed that there is no such instrument at the present time that conceptually defines and measures the characteristics of Chinese students who come from a CHC background, attested quantitatively in a single model, using the sub-constructs put forward in the present study which are applicable to the context of learning in the classroom, and carry out the research from interdisciplinary perspectives.

Literature shows that CHC as a field of research is a grey area where there is no deep conceptualisation of it. What most of the past literature shows is either the revelation of the characteristics of Chinese students in their qualitative research as an individual emergent theme, or no clear differentiation between Confucianism values and CHC values. This is the challenge faced by researchers, and finally the researcher of the present study has gone deeper by attempting to conceptually define CHC and to come up with this instrument.

Thus, one of the objectives of the present study is to conceptually define CHC construct to measure the characteristics of CHC Chinese students. The development of the CHC Scale in the present study was derived totally from the Confucian heritage perspective literature. This chapter aims to answer the first research question which has been put forward. This chapter will also outline the detailed steps on performing the statistical analysis onto CHC Scale together with its findings and discussion.

In the first phase, data are collected from 430 pre-university students using a self-developed questionnaire comprising of 5 factors in the Confucian heritage culture (CHC) Scale and 10 factors in the Preference to Active Learning Scale. IBM SPSS 20 statistical software is employed for the EFA and internal consistency analysis. Before performing EFA, data screening and data cleaning is performed. Cases that have missing data are discarded.

Besides, the following assumptions of EFA are checked:

(1) Sample size. Ideally, the sample size should be more than 100 and there should be a ratio of at least five cases for each of the variables (Hair et al., 2014).

(2) Ideally, the factorability of the correlation matrix showing at least r = 0.3 or greater. Bartlett's test of sphericity should be statistically significant at $p<0.05$ (Hair et al., 2014) and the Kaiser-Meyer-Olkin value should be 0.6 or above (Tabachnick & Fidell, 2007; Pallant, 2011).

(3) Linearity. Ideally, the relationship between the factors is linear (Tabachnick & Fidell, 2007; Pallant, 2011).

(4) Outliers among case. Ideally, there should have no extreme outliers (Pallant, 2011).

Rotation. In this study, oblique rotation is used, because the CHC factors are correlated to each other, as discussed in the previous chapters. In social sciences, behavior is rarely isolated into neatly independent unit (Costello & Osborne, 2005); the constructs in CHC Scale is a measurable form of behavior. And thus, the Pattern

Matrix is examined for factor loadings and the Correlation Matrix reveals the correlation between the factors.

Factor/Item loading. Minimum threshold of factor/item loading is important to determine practical significance and statistical significance. Hair et al. (2014) and Tabachnick and Fidell (2007) mentioned that the factor loading of an item of ±0.30 to 0.40 are considered to meet the minimum level of interpretation of structure, and achieved practical significance. Moreover, as stated by Hair et al. (2014), in a sample of 350, a factor loading of 0.30 is required for statistical significance. And thus, in this study which has a sample of 430, a factor loading of 0.30 has achieved practical significance and statistical significance. In other words, the factor loading has to be >0.30, in this study.

Cross-loading. In this study, an item that loads at >0.30 on two or more factors with very similar loadings (cross-loadings differ by <0.1), is considered as cross-loading, thus the particular item should be dropped from the analysis (Chin, 1998; Matsunaga, 2010; Osborne, 2009; Snell & Dean, 1992).

Item communalities. If the item communalities are all 0.8 or greater, they are considered as "high", but this situation is unlikely to occur in real data (Velicer, Fava, Prevention, Ryde, & Wales, 1998). Nonetheless, low to moderate communalities of 0.40 to 0.70 is a more common magnitudes in the social sciences (Costello & Osborne, 2005). In this study, communalities of >0.30 is followed.

Cronbach's alpha. Although Cronbach's alpha is the most widely used measure for reliability coefficient, and the generally agreed upon minimum value is 0.70, however, it may decrease to 0.60 in an exploratory research (Hair et al., 2014).

Moreover, it is also to be noted that Cronbach's alpha has positive relationship to the number of items in the scale. This means, increasing the number of items, will increase the reliability values, even with the same degree of intercorrelation; and vice versa (Hair et al., 2014).

Results and relevant discussion are reported as below.

Findings for the EFA on CHC Scale

Outliers. The histogram is slightly skewed to the left with the scores dropped away in a reasonable even slope, suggesting potential outliers. Moreover, from the Box Plot, outliers are observed. The outliers are then handled by Winsorisation method (Aguinis et al., 2013), giving Figure 5.1 and 5.2 as the final outcome. Normality test is then assessed.

Normality. Since the sample size is 430, Kolmogorov-Smirnov test is used. The p-value (sig.) of the test is 0.002, less than 0.05, suggesting violation of the assumption of normality. This is quite common in larger samples. However, from the Normal Q-Q Plot (Figure 5.3), the observed values are being very close to the linear line, indicating of data normality. Upon checking with skewness and kurtosis, the data is a little skewed and kurtotic (Table 5.2), but it does not differ significantly from normality. In general, the distribution of scores can be assumed is approximately normally distributed.

Normally distributed, interval-level data are assumed on modern parametric statistical methods like factor analysis and structural equation model. The claim of

inappropriateness in using parametric test like factor analysis, structural equation model because the data are ordinal and should not be assumed as normal (Jamieson, 2004), has been expounded by Carifio and Perla (2008) on the issue of robustness which has been ignored by many who defended the logical position that parametric methods cannot be used on ordinal data. One of the strongest arguments is that while Likert items may well be ordinal, however, Likert scales which are consisting of sums across many items, will be interval (Gaito, 1980; Norman, 2010). All in all, parametric statistics can be used with Likert data, with unequal variances, and with non-normal distributions (note: since the data in this study is found reasonably normal as described in above, it does not cause any issue to the parametric statistics), with no fear of making the wrong conclusion (Norman, 2010).

After assessing the assumption of EFA as described in above, the following sections detailed the process of getting the corresponding factor structure of model and its number of items for CHC Scale.

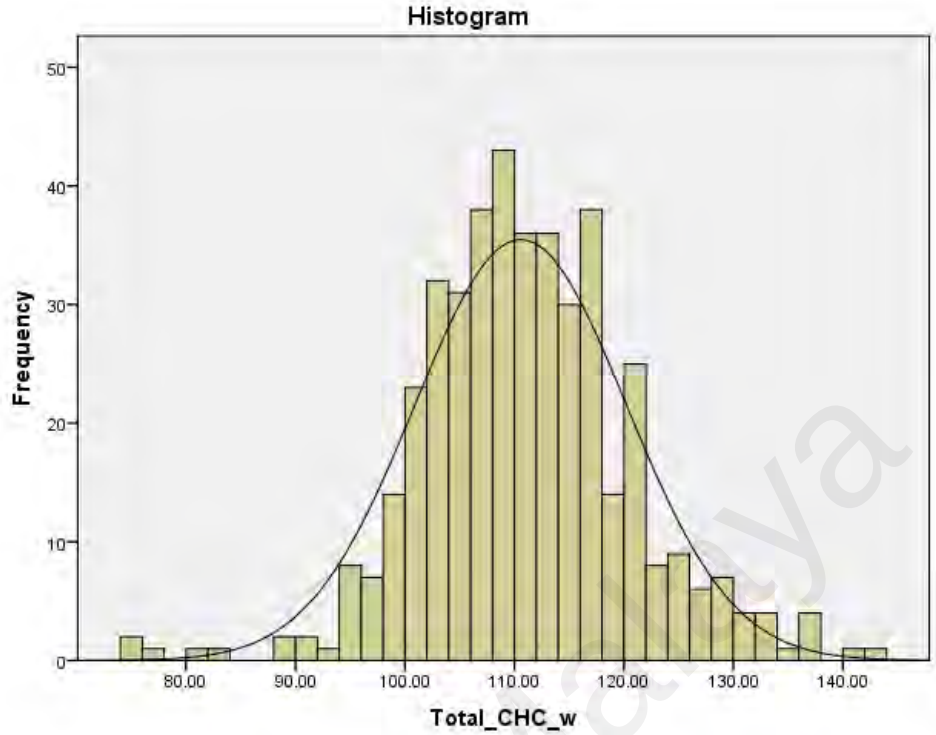


Figure 5.1 Histogram

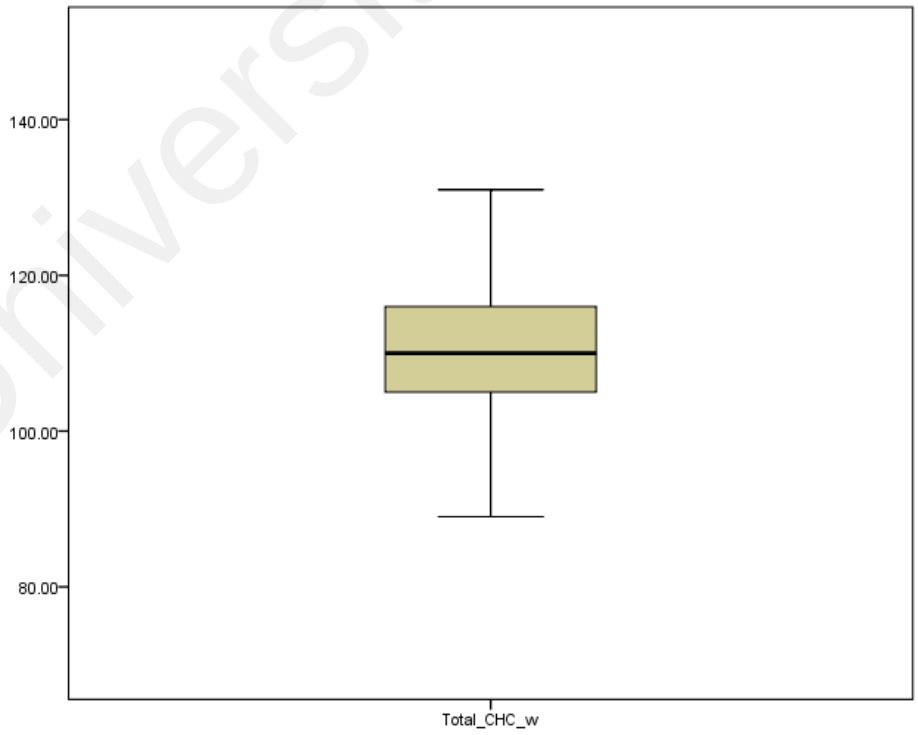


Figure 5.2 Boxplot

Table 5.1

Tests of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total_CHC_w	.058	430	.002	.981	430	.000

a. Lilliefors Significance Correction

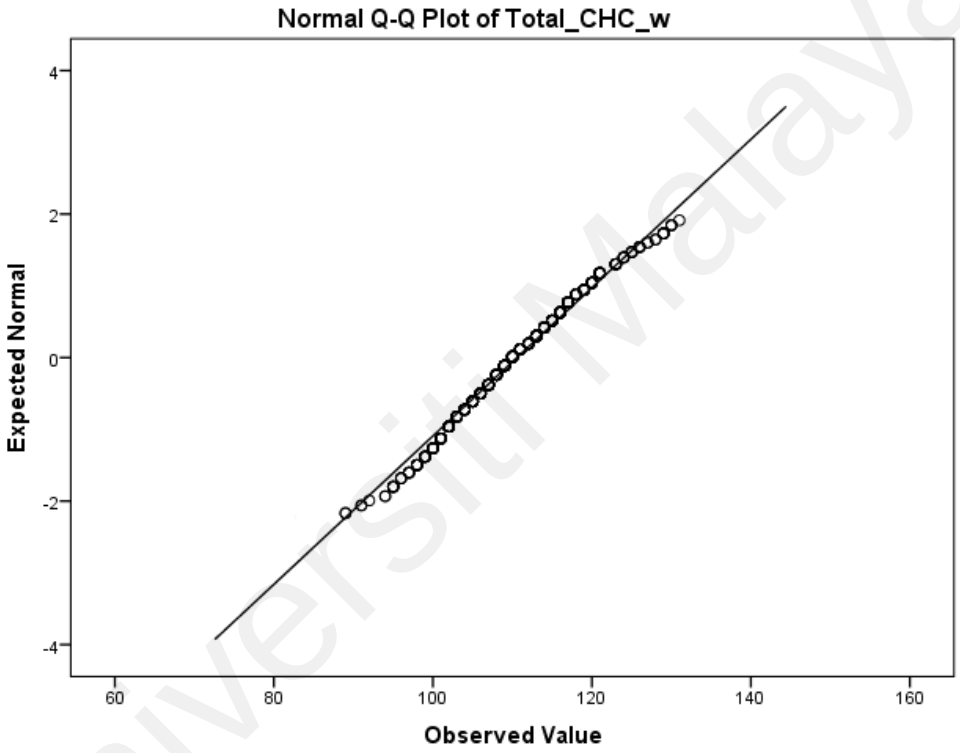


Figure 5.3 Normal Q-Q plot

Table 5.2

Test of normality (skewness and kurtosis)

	Skewness		Kurtosis		z-value (should be in the span of -1.96 to +1.96	
	Statistic	Std. Error	Statistic	Std. Error	Skewness	Kurtosis
Total_CHC_w	0.031	0.118	0.309	0.235	0.262	1.314

7-factors model (30 items). The 30 items of the CHC Scale are subjected to Principal Components Analysis (PCA) since the items are reflective indicators and is aimed to determine the number of factors, this is done by using principal axis factoring extraction method with SPSS version 20. Prior to performing PCA, the suitability of data for factor analysis is assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. Hence the items correlated adequately in the construct. From the Table 5.3, the Kaiser-Meyer-Olkin (KMO) value is 0.84, exceeding the recommended value of 0.6 and Bartlett's Test of Sphericity is 0.00, which has reached statistical significance (Hair, Black, Babin, & Anderson, 2014), indicating that the correlation matrix is not an identity matrix, and therefore appropriate for factor analysis.

Table 5.3

KMO and Bartlett's Test onto 30 items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.844**
Bartlett's Test of Sphericity	Approx. Chi-Square	3972.415
	df	435
	Sig.	**.000**

Principal components analysis revealed the presence of 7 factors that explained 56% of the variation (slightly above 50%) in the 30 items of CHC Scale, with eigenvalues exceeding 1, explained 20.4%, 11.4%, 6.3%, 5.6%, 4.6%, 4.0%, and 3.6% of the variance respectively (Figure 5.4 Eigenvalue Plot for Scree Test Criterion (7-factors model and Table 5.4 Total variance explained). To aid in the interpretation of number of factors, as well as to simplify and clarify the data

structure, Promax rotation (oblique rotation) is performed because these factors are correlated to each other. In social sciences, behavior is rarely isolated into neatly independent unit (Costello & Osborne, 2005); the constructs in CHC Scale is a measurable form of behaviour. After rotation, the poor factors that did not have minimum 4 items are dropped (Table 5.5 Pattern Matrix, Table 5.6 Communalities and Table 5.7 Correlation matrix) to give a 4-factors model. A factor with fewer than 3 items is generally considered as weak and unstable (Costello & Osborne, 2005; Matsunaga, 2010).

4-factors model (26 items). Re-running the analysis gave the statistical result as shown in Table 5.8. However, after assessing on the Correlation Matrix and Communalities, 4 items (Per5, Per6, Dep1, and Dep4) are dropped because their correlation is < 0.3 (Costello & Osborne, 2005; Matsunaga, 2010), and also because the objective is to trim down number of items.

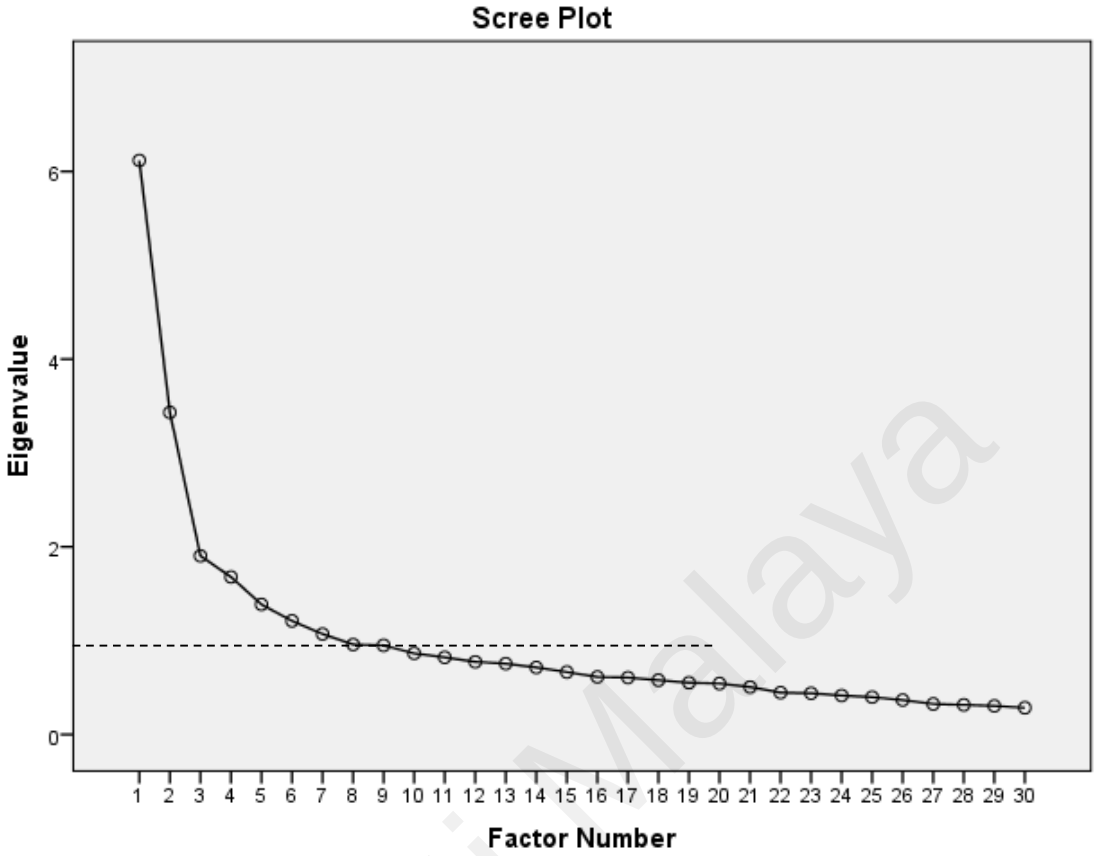


Figure 5.4 Eigenvalue Plot for Scree Test Criterion (7-factors model)

Table 5.4

Total variance explained of 30 items

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.118	20.393	20.393	5.619	18.729	18.729	3.661
2	3.432	11.441	31.834	2.850	9.502	28.231	4.159
3	1.904	6.347	38.181	1.359	4.530	32.761	2.520
4	1.679	5.596	43.777	1.087	3.622	36.383	4.073
5	1.386	4.619	48.397	.772	2.573	38.956	2.054
6	1.210	4.035	52.431	.689	2.298	41.254	3.426
7	1.071	3.569	**56.000**	.518	1.726	42.980	1.289
8	.959	3.197	59.197				
9	.950	3.165	62.362				
10	.864	2.881	65.243				
11	.822	2.741	67.984				
12	.774	2.581	70.565				
13	.755	2.518	73.084				
14	.715	2.382	75.466				
15	.665	2.217	77.683				
16	.613	2.043	79.726				
17	.607	2.022	81.748				
18	.579	1.930	83.678				
19	.552	1.840	85.518				
20	.543	1.810	87.328				
21	.507	1.688	89.017				
22	.446	1.487	90.504				
23	.439	1.464	91.967				
24	.415	1.385	93.352				
25	.398	1.326	94.678				
26	.367	1.222	95.900				
27	.325	1.085	96.985				
28	.315	1.051	98.036				
29	.305	1.016	99.052				
30	.284	.948	100.000				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 5.5

Pattern matrix of 7-factors model

	Factor						
	1	2	3	4	5	6	7
Edu5	.714						
Edu6	.689						
Edu4	.677						
Edu3	.627						
Edu2	.406						
Res3		.871					
Res1		.722					
Res2		.557					
Dep3			.759				
Dep2			.744				
Dep5			.634				
Dep6			.472				
Per2				.774			
Per1				.736			
Per4				.482			
Per3							
Har3					.668		
Har5					.619		
Har2					.529		
Har4					.509		
Har1					.378		
Har6						.615	
Edu1						.522	
Res6						.460	
Res5						.374	
Dep4						**-.359**	
Dep1			**.309**			**.316**	
Per5							**-.503**
Res4							**.316**
Per6							

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Table 5.6

Communalities of 30 items. Items with poor communality value (<0.3) are highlighted

	Initial	Extraction
Res1	.484	.379
Res2	.401	.341
Res3	.561	.478
Res4	.348	.318
Res5	.508	.512
Res6	.463	.456
Per1	.583	.545
Per2	.503	.392
Per3	.404	.361
Per4	.236	**.131**
Per5	.223	**.181**
Per6	.268	**.210**
Dep1	.230	**.149**
Dep2	.457	.539
Dep3	.449	.497
Dep4	.280	**.161**
Dep5	.401	.444
Dep6	.296	**.298**
Har1	.291	**.259**
Har2	.328	.330
Har3	.344	.425
Har4	.283	**.286**
Har5	.257	**.268**
Har6	.401	**.293**
Edu1	.373	.298
Edu2	.306	**.262**
Edu3	.420	**.415**
Edu4	.500	.484
Edu5	.449	.520
Edu6	.405	.444

Extraction Method: Principal Axis Factoring.

Table 5.7

Correlation matrix table

Correlation Matrix

		Res1	Res2	Res3	Res4	Res5	Res6	Per1	Per2	Per3	Per4	Per5	Per6	Dep1	Dep2	Dep3	Dep4	Dep5	Dep6	Har1	Har2	Har3	Har4	Har5	Har6	Edu1	Edu2	Edu3	Edu4	Edu5	Edu6
Correlation	Res1	1.000	.432	.643	.292	.414	.419	.392	.336	.315	.165	.019	.057	.067	-.126	.038	.025	-.131	.126	-.040	.038	.019	-.019	-.002	.265	.311	.188	.205	.262	.222	.217
	Res2	.432	1.000	.523	.362	.359	.351	.357	.325	.384	.190	-.078	.111	.105	-.092	.008	.092	-.009	.157	-.041	.092	.059	-.029	-.050	.302	.232	.182	.235	.302	.176	.163
	Res3	.643	.523	1.000	.340	.451	.446	.463	.425	.393	.176	.000	.047	.110	-.051	.093	.098	-.036	.235	-.069	.081	.068	-.003	.033	.308	.301	.234	.249	.297	.244	.210
	Res4	.292	.362	.340	1.000	.465	.392	.397	.329	.357	.215	-.111	.017	.114	-.075	-.048	.011	-.007	.025	-.022	.000	-.007	.029	-.046	.247	.225	.163	.255	.140	.111	.125
	Res5	.414	.359	.451	.465	1.000	.578	.485	.412	.324	.289	-.106	.063	.183	-.031	.056	.032	.017	.142	.001	.011	.053	-.025	.032	.434	.312	.228	.275	.266	.189	.138
	Res6	.419	.351	.446	.392	.578	1.000	.463	.351	.320	.183	-.059	.052	.148	-.079	.044	-.012	.026	.124	.034	-.005	.069	.024	.036	.414	.373	.264	.242	.294	.140	.092
	Per1	.392	.357	.463	.397	.485	.463	1.000	.658	.463	.334	-.012	.060	.170	-.009	.048	.046	-.003	.146	-.026	-.017	.063	.045	.091	.365	.395	.295	.329	.303	.219	.149
	Per2	.336	.325	.425	.329	.412	.351	.658	1.000	.423	.288	.002	.095	.101	.002	.023	.076	-.033	.099	-.080	-.019	.046	.090	.046	.312	.280	.161	.254	.216	.217	.203
	Per3	.315	.384	.393	.357	.324	.320	.463	.423	1.000	.308	-.017	.031	.149	.037	.074	.225	.015	.170	-.016	.024	.029	-.028	.024	.270	.269	.264	.342	.288	.235	.248
	Per4	.165	.190	.176	.215	.289	.183	.334	.288	.308	1.000	-.130	-.095	.049	-.030	.002	.049	-.059	.020	-.043	-.035	.069	.083	.020	.082	.169	.090	.117	.102	.133	.113
	Per5	.019	-.078	.000	-.111	-.106	-.059	-.012	.002	-.017	-.130	1.000	.260	-.199	-.185	-.205	-.046	-.209	-.109	-.188	-.191	-.115	-.198	-.057	.053	.032	.039	.027	-.006	.025	.053
	Per6	.057	.111	.047	.017	.063	.052	.060	.095	.031	-.095	.260	1.000	-.146	-.274	-.203	-.215	-.251	-.113	-.180	-.241	-.104	-.206	-.149	.109	.060	-.091	.074	.101	-.007	-.037
	Dep1	.067	.105	.110	.114	.183	.148	.170	.101	.149	.049	-.199	-.146	1.000	.200	.277	-.070	.149	.162	.028	.028	.049	.002	.091	.170	.152	.101	.166	.038	.011	-.003
	Dep2	-.126	-.092	-.051	-.075	-.031	-.079	-.009	.002	.037	-.030	-.185	-.274	.200	1.000	.579	.227	.463	.301	.260	.202	.130	.110	.120	-.065	-.009	.069	-.007	.022	.076	.064
	Dep3	.038	.008	.093	-.048	.056	.044	.048	.023	.074	.002	-.205	-.203	.277	.579	1.000	.194	.440	.336	.238	.210	.166	.054	.130	.039	.051	.035	.046	.081	.130	.038
	Dep4	.025	.092	.098	.011	.032	-.012	.046	.076	.225	.049	-.046	-.215	-.070	.227	.194	1.000	.280	.283	.105	.162	.048	.204	.037	.000	.007	.102	.167	.092	.219	.136
	Dep5	-.131	-.009	-.036	-.007	.017	.026	-.003	-.033	.015	-.059	-.209	-.251	.149	.463	.440	.280	1.000	.377	.172	.153	.164	.082	.052	.025	.014	.160	.088	.013	.133	.016
	Dep6	.126	.157	.235	.025	.142	.124	.146	.099	.170	.020	-.109	-.113	.162	.301	.336	.283	.377	1.000	.161	.181	.164	.091	.094	.081	.156	.195	.187	.146	.219	.170
	Har1	-.040	-.041	-.069	-.022	.001	.034	-.026	-.080	-.016	-.043	-.188	-.180	.028	.260	.238	.105	.172	.161	1.000	.273	.288	.302	.222	.037	.031	.036	.045	.211	.098	.073
	Har2	.038	.092	.081	.000	.011	-.005	-.017	-.019	.024	-.035	-.191	-.241	.028	.202	.210	.162	.153	.181	.273	1.000	.439	.240	.255	.016	-.027	.116	.030	-.026	.135	.097
	Har3	.019	.059	.068	-.007	.053	.069	.063	.046	.029	.069	-.115	-.104	.049	.130	.166	.048	.164	.164	.288	.439	1.000	.302	.387	.070	.077	.118	.072	.093	.191	.133
	Har4	-.019	-.029	-.003	.029	-.025	.024	.045	.090	-.028	.083	-.198	-.206	.002	.110	.054	.204	.082	.091	.302	.240	.302	1.000	.292	-.056	-.014	.106	.086	.040	.084	.098
	Har5	-.002	-.050	.033	-.046	.032	.036	.091	.046	.024	.020	-.057	-.149	.091	.120	.130	.037	.052	.094	.222	.255	.387	.292	1.000	.146	.146	.091	.059	.062	.045	.078
	Har6	.265	.302	.308	.247	.434	.414	.365	.312	.270	.082	.053	.109	.170	-.065	.039	.000	.025	.081	.037	.016	.070	-.056	.146	1.000	.484	.233	.230	.335	.203	.187
	Edu1	.311	.232	.301	.225	.312	.373	.395	.280	.269	.169	.032	.060	.152	-.009	.051	.007	.014	.156	.031	-.027	.077	-.014	.146	.484	1.000	.318	.288	.374	.255	.217
	Edu2	.188	.182	.234	.163	.228	.264	.295	.161	.264	.090	.039	-.091	.101	.069	.035	.102	.160	.195	.036	.116	.118	.106	.091	.233	.318	1.000	.351	.355	.298	.321
	Edu3	.205	.235	.249	.255	.275	.242	.329	.254	.342	.117	.027	.074	.166	-.007	.046	.167	.088	.187	.045	.030	.072	.086	.059	.230	.288	.351	1.000	.505	.420	.407
	Edu4	.262	.302	.297	.140	.266	.294	.303	.216	.288	.102	-.006	.101	.038	.022	.081	.092	.013	.146	.211	-.026	.093	.040	.062	.335	.374	.355	.505	1.000	.485	.404
	Edu5	.222	.176	.244	.111	.189	.140	.219	.217	.235	.133	.025	-.007	.011	.076	.130	.219	.133	.219	.098	.135	.191	.084	.045	.203	.255	.298	.420	.485	1.000	.550
	Edu6	.217	.163	.210	.125	.138	.092	.149	.203	.248	.113	.053	-.037	-.003	.064	.038	.136	.016	.170	.073	.097	.133	.098	.078	.187	.217	.321	.407	.404	.550	1.000

Table 5.8

KMO and Bartlett's Test on 24 items (Per5, Per6, Dep1 and Dep4 are dropped)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.853**
Bartlett's Test of Sphericity	Approx. Chi-Square	3554.097
	df	325
	Sig.	**.000**

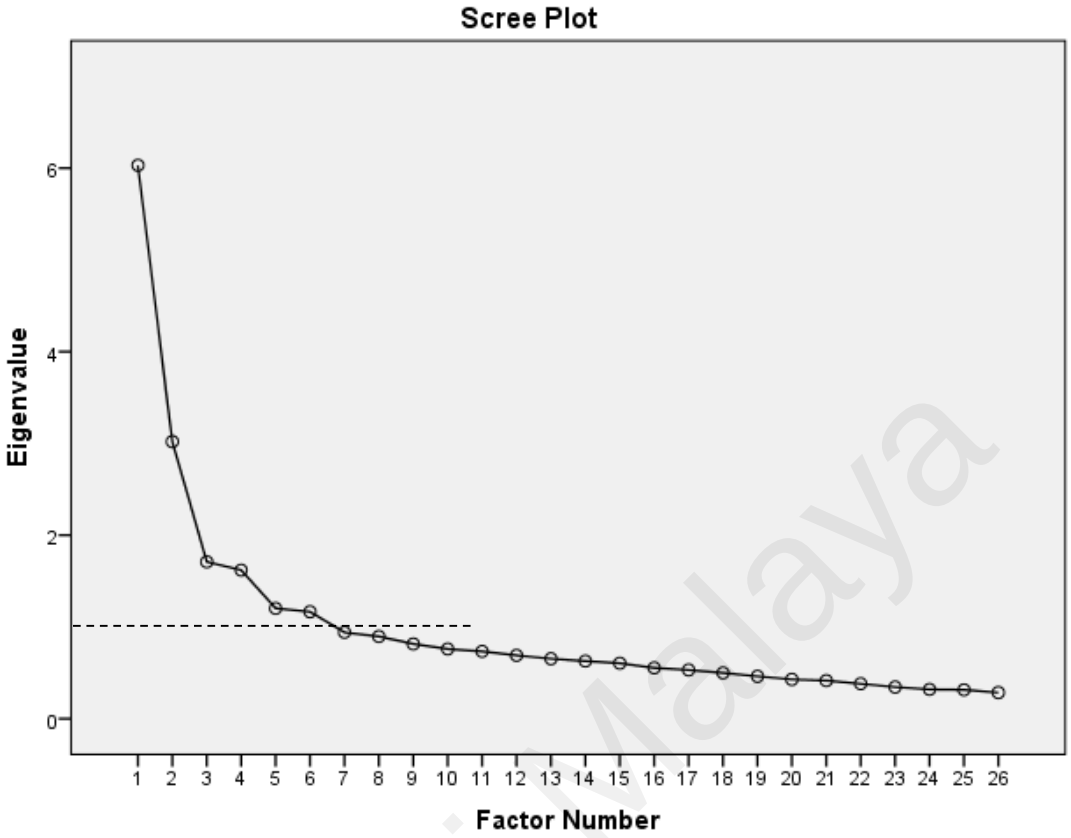


Figure 5.5 Eigenvalue Plot for Scree Test Criterion (4-factors model)

Table 5.9

Total variance explained of 4-factors model, 26 items (after Per5, Per6, Dep1 and Dep4 are dropped)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.032	23.198	23.198	5.442	20.930	20.930	5.090
2	3.019	11.613	34.811	2.431	9.351	30.281	3.638
3	1.709	6.574	41.385	1.172	4.509	34.790	2.144
4	1.619	6.228	**47.613**	1.005	3.866	38.656	1.939
5	1.202	4.622	52.235				
6	1.166	4.483	56.718				
7	.941	3.618	60.336				
8	.896	3.446	63.782				
9	.814	3.133	66.915				
10	.760	2.922	69.837				
11	.733	2.821	72.658				
12	.690	2.652	75.310				
13	.653	2.512	77.823				
14	.628	2.415	80.238				
15	.604	2.324	82.562				
16	.554	2.129	84.691				
17	.532	2.044	86.736				
18	.499	1.920	88.655				
19	.462	1.776	90.432				
20	.429	1.649	92.080				
21	.414	1.594	93.674				
22	.381	1.465	95.139				
23	.345	1.327	96.466				
24	.319	1.228	97.694				
25	.315	1.210	98.904				
26	.285	1.096	100.000				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

4-factors model (24 items). Utilising conceptual foundation (a priori criterion), empirical evidence (statistical result) together with practical relevance (required 50% of variance explained), upon re-running the analysis, the 4-factors model is obtained that explained 47.6% of the variation in the items: The four-factors explained 23.2%, 11.6%, 6.6%, and 6.2% of the variance respectively (Figure 5.5 Eigenvalue Plot for Scree Test Criterion (4-factors model) and Table 5.9). From Table 5.10 (Pattern Matrix), it is evident that 10 items (Per1, Res5, Res6, Res3, Per2, Res1, Res4, Res2, Per3, Per4) as highlighted under Factor 1 are retained in the study. The two items, Har6 and Edu1, are excluded from Factor 1 as they are related to Harmony and Education, which do not belong to the rest of the items in Factor 1. After some delicate consideration by the researcher, the Factor 1 is renamed to Principled. The 5 items that loaded significantly in Factor 2 (Edu5, Edu6, Edu4, Edu3, Edu2) related to education, 4 items loaded significantly in Factor 3 (Dep2, Dep3, Dep5, Dep6) related to Dependence on Teacher, lastly the 5 items loaded significantly in Factor 4 (Har3, Har5, Har2, Har4, Har1) related to Harmony. The aforementioned factors have eigenvalues >1 and accounted for 49.2% of the variance (Table 5.11).

At this point, the initial pool of items has been reduced in size, from 30 items to 24 items. The remaining items are reviewed and examined to ensure the theoretical basis to retain each item.

Table 5.10

Pattern matrix of the 4-factors model (after Per5, Per6, Dep1 and Dep4 are dropped)

	Factor			
	1	2	3	4
Per1	.749			
Res5	.746			
Res6	.707			
Res3	.700			
Per2	.642			
Res1	.605			
Res4	.590			
Res2	.569			
Per3	.502			
Har6	.455			
Edu1	.377			
Per4	.366			
Edu5		.732		
Edu6		.724		
Edu4		.680		
Edu3		.604		
Edu2		.401		
Dep2			.752	
Dep3			.740	
Dep5			.653	
Dep6			.456	
Har3				.705
Har5				.563
Har2				.526
Har4				.517
Har1				.400

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Table 5.11

Total variance explained of 4-factors model, 24 items (after Per5, Per6, Dep1, Dep4, Har6, Edu1 are dropped)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.469	22.788	22.788	5.469	22.788	22.788	5.039
2	3.015	12.561	35.349	3.015	12.561	35.349	3.704
3	1.703	7.095	42.443	1.703	7.095	42.443	2.617
4	1.618	6.740	**49.184**	1.618	6.740	49.184	2.457
5	1.166	4.857	54.041				
6	.997	4.154	58.195				
7	.896	3.734	61.929				
8	.857	3.573	65.501				
9	.772	3.215	68.716				
10	.748	3.115	71.832				
11	.725	3.019	74.851				
12	.684	2.850	77.701				
13	.649	2.705	80.406				
14	.605	2.520	82.926				
15	.548	2.283	85.209				
16	.507	2.113	87.323				
17	.477	1.986	89.308				
18	.455	1.897	91.205				
19	.427	1.781	92.986				
20	.386	1.610	94.596				
21	.363	1.512	96.108				
22	.332	1.381	97.489				
23	.318	1.323	98.812				
24	.285	1.188	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Summary. A 4-factors model with 24 items is obtained from performing EFA on CHC Scale. The items and their item loadings are presented in Table 5.12 below.

Table 5.12

Factors, items, item loadings, communalities for the 4-factor model (24 items)

Item code	Factor	Item loading (threshold >0.3)	Communalities (threshold >0.3)
Res1	1	.605	.454
Res2		.569	.413
Res3		.700	.559
Res4		.590	.395
Res5		.746	.545
Res6		.707	.490
Per1		.749	.588
Per2		.642	.470
Per3		.502	.424
Per4		.366	.198
Dep2	3	.752	.644
Dep3		.740	.643
Dep5		.653	.586
Dep6		.456	.433
Har1	4	.400	.371
Har2		.526	.439
Har3		.705	.570
Har4		.517	.442
Har5		.563	.459
Edu2	2	.401	.347
Edu3		.604	.542
Edu4		.680	.582
Edu5		.732	.613
Edu6		.724	.597

Findings for the Reliability Analysis on CHC Scale

Factor 1. The reliability of the Factor 1 is then statistically assessed (Table 5.13, Table 5.14, and Table 5.15). The Cronbach's alpha value is 0.848, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.349, which is greater than 0.3.

Table 5.13

Reliability statistics (Factor 1)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.848	.858	10

Table 5.14

Inter-item correlation matrix (Factor 1)

	Res1	Res2	Res3	Res4	Res5	Res6	Per1	Per2	Per3	Per4
Res1	1.000	.432	**.643**	.292	.414	.419	.392	.336	.315	.165
Res2	.432	1.000	.523	.362	.359	.351	.357	.325	.384	.190
Res3	**.643**	**.523**	1.000	.340	.451	.446	.463	.425	.393	.176
Res4	.292	.362	.340	1.000	.465	.392	.397	.329	.357	.215
Res5	.414	.359	.451	**.465**	1.000	**.578**	.485	.412	.324	.289
Res6	.419	.351	.446	.392	.578	1.000	.463	.351	.320	.183
Per1	.392	.357	.463	.397	**.485**	.463	1.000	**.658**	**.463**	**.334**
Per2	.336	.325	.425	.329	.412	.351	**.658**	1.000	.423	.288
Per3	.315	.384	.393	.357	.324	.320	.463	.423	1.000	.308
Per4	.165	.190	.176	.215	.289	.183	.334	.288	.308	1.000

Table 5.15

Item-total statistics (Factor 1)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Res1	36.9000	21.419	.554	.450	.834
Res2	37.1256	21.056	.539	.347	.835
Res3	36.9302	20.937	.638	.539	.827
Res4	37.1442	21.317	.516	.304	.837
Res5	36.8977	21.314	.628	.467	.829
Res6	36.8070	21.345	.570	.417	.833
Per1	37.0326	20.493	.680	.548	.823
Per2	37.0860	20.745	.593	.470	.830
Per3	37.3000	20.257	.550	.326	.835
Per4	37.6395	21.243	**.349**	.165	.860

Factor 2. The reliability of the Factor 2 sub-scale is then statistically assessed (Table 5.16, Table 5.17, and Table 5.18). The Cronbach's alpha value is 0.777, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.427, which is greater than 0.3.

Table 5.16

Reliability statistics (Factor 2)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.777	.776	5

Table 5.17

Inter-item correlation matric (Factor 2)

	Edu2	Edu3	Edu4	Edu5	Edu6
Edu2	1.000	.351	.355	.298	.321
Edu3	.351	1.000	**.505**	.420	.407
Edu4	**.355**	**.505**	1.000	.485	.404
Edu5	.298	.420	.485	1.000	**.550**
Edu6	.321	.407	.404	**.550**	1.000

Table 5.18

Item-total statistics (Factor 2)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Edu2	15.7140	9.030	**.427**	.189	.774
Edu3	15.7047	8.120	.565	.335	.731
Edu4	15.5349	8.123	.594	.370	.722
Edu5	15.8279	7.537	.600	.398	.719
Edu6	15.7302	7.811	.572	.359	.729

Factor 3. The reliability of the Factor 3 sub-scale is then statistically assessed (Table 5.19, Table 5.20, and Table 5.21). The Cronbach's alpha value is 0.743, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.415, which is greater than 0.3.

Table 5.19

Reliability statistics (Factor 3)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.743	.740	4

Table 5.20

Inter-item correlation matrix (Factor 3)

	Dep2	Dep3	Dep5	Dep6
Dep2	1.000	**.579**	**.463**	.301
Dep3	**.579**	1.000	.440	.336
Dep5	.463	.440	1.000	**.377**
Dep6	.301	.336	.377	1.000

Table 5.21

Item-total statistics (Factor 3)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Dep2	9.8093	5.502	.588	.392	.652
Dep3	9.3116	5.534	.594	.387	.649
Dep5	9.5395	5.755	.549	.303	.676
Dep6	9.3209	6.629	**.415**	.182	.746

Factor 4. The reliability of the Factor 4 is then statistically assessed (Table 5.22, Table 5.23, and Table 5.24). The Cronbach's alpha value is 0.682, which is slightly lower than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.388, which is greater than 0.3. Furthermore, in the column headed Cronbach Alpha if Item Deleted, the impact of removing any item from the sub-scale did not increase the final alpha value. Hence, no item is deleted from the sub-scale.

Table 5.22

Reliability statistics (Factor 4)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.682	.682	5

Table 5.23

Inter-item correlation matrix (Factor 4)

	Har1	Har2	Har3	Har4	Har5
Har1	1.000	.273	.288	**.302**	.222
Har2	.273	1.000	**.439**	.240	.255
Har3	.288	**.439**	1.000	**.302**	**.387**
Har4	**.302**	.240	.302	1.000	.292
Har5	.222	.255	.387	.292	1.000

Table 5.*24*

Item-total statistics (Factor 4)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Har1	12.1186	8.510	**.388**	.157	.654
Har2	12.1047	8.164	.441	.226	.630
Har3	11.8233	7.745	.530	.303	.589
Har4	12.5977	8.642	.408	.173	.644
Har5	11.7651	8.576	.417	.193	.640

Total CHC Scale. The reliability on total CHC Scale is then statistically assessed (Table 5.25). The Cronbach's alpha value is 0.811, which is more than 0.7.

Table 5.25

Reliability statistics (Total CHC Scale)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.811	.827	24

Summary. The summary from reliability analysis of CHC Scale are reported as below (Table 5.26).

Table 5.26

Summary from reliability analysis of CHC Scale

Construct	Number of items		Cronbach's alpha	Minimum CITC
	Initial	Final		
Factor 1	12	10	0.848	0.349
Factor 2	6	5	0.777	0.427
Factor 3	6	4	0.743	0.415
Factor 4	6	5	0.682	0.388

Findings for the Descriptive Analysis

To understand the nature and characteristics of the collected data, the present study performed descriptive statistics by using IBM SPSS 20 statistical software. Firstly, the frequency testing is performed. The number of valid responses and respondents' profile is explored. Secondly, the descriptive statistics of the constructs in this study are studied.

The first sample consisted of 430 Chinese pre-university students from different programmes. Of these, 241 males and 189 females (56% and 44%, respectively) between the ages of 18 to 20 (248 aged 18 (57.7%), 141 aged 19 (32.8%), 41 aged 20 (9.5%)). Of these 430 Chinese students, 18% are from Selangor, 13% are from Kuala Lumpur, 12% are from Penang, 10% are from Sabah, 10% are from Johor, 8% are from Sarawak, 7% are from Perak, 5% are from Melaka, 17% are from other states. More details about the type of primary school, type of secondary school, parents' ability to speak Chinese, and parents' ability to read Chinese of these 430 Chinese students, are projected as below in Table 5.27, as well as the mean and standard deviation scores of each items and constructs in Table 5.28.

Table 5.27

Respondents' profile

		n	%
Gender	Male	241	56
	Female	189	44
Age	18	248	57.7
	19	141	32.8
	20	41	9.5
States	Selangor	77	18
	Kuala Lumpur	56	13
	Penang	52	12
	Sabah	43	10
	Johor	43	10
	Sarawak	34	8
	Perak	30	7
	Melaka	22	5
	Others	73	17
Type of primary school	SK	0	0
	SJK (Cina)	430	100
	SJK (Tamil)	0	0
	International school	0	0
	Homeschooling	0	0
Type of secondary school	SMK	297	69.1
	Chinese Independent School	23	5.3
	SMJK	97	22.6
	International school	10	2.3
	Homeschooling	3	0.7
Parents' ability to speak Chinese	Yes, can	430	100
	No, cannot	0	0
Parents' ability to read Chinese	Yes, can	415	96.5
	No, cannot	15	3.5

Table 5.28

Descriptive analysis of CHC Scale

Construct	Item	N	Mean	Mean (sub-construct)	Std. Deviation
Principled	Res1	430	4.31	4.12	0.70
	Res2	430	4.08		0.78
(Factor 1)	Res3	430	4.28		0.70
	Res4	430	4.06		0.76
	Res5	430	4.31		0.65
	Res6	430	4.40		0.70
	Per1	430	4.17		0.73
	Per2	430	4.12		0.77
	Per3	430	3.91		0.90
	Per4	430	3.57		1.01
Dependence on	Dep2	430	2.85	3.17	1.07
Teacher	Dep3	430	3.35		1.05
	Dep5	430	3.12		1.04
(Factor 3)	Dep6	430	3.34		0.96
Harmony	Har1	430	2.98	3.02	1.07
	Har2	430	3.00		1.08
(Factor 4)	Har3	430	3.27		1.07
	Har4	430	2.50		1.00
	Har5	430	3.34		1.01
Education	Edu2	430	3.91	3.92	0.87
	Edu3	430	3.92		0.94
(Factor 2)	Edu4	430	4.09		0.91
	Edu5	430	3.80		1.04
	Edu6	430	3.90		1.00

Discussion

One of the objectives of the current study is to develop a CHC Scale to measure the characteristics of CHC Chinese students. The current study is one of the first attempts to empirically explore these constructs in Chinese chemistry students. In doing so, a firm process is followed to explore the underlying constructs (or latent factors) of CHC and provide a reliable and valid scale. Results from EFA suggested a 4-factor model for CHC with a sample of 430 Chinese pre-university chemistry students. The reliability analysis demonstrated that the current CHC Scale has a good level of internal consistency. Hence, the H_1 alternative hypothesis is rejected. That is, the Respect, Perseverance, Dependence on Teacher, Harmony, and Education did not emerge as the constructs of the CHC Scale for the selected Chinese pre-university chemistry students; Principled, Dependence on Teacher, Harmony, and Education emerged as constructs of the CHC Scale for the selected Chinese pre-university chemistry students.

What is different in this study compared to other studies is that, in the literature, 5 constructs of CHC are initially identified and hypothesised: 1) Respect, 2) Perseverance, 3) Dependence on teacher, 4) Harmony, and 5) Education. However, unlike the literature (Matthews, 2000; Siah, Ong, Tan, & Sim, 2015), the Respect and Perseverance constructs are combined into a single construct corresponding to Principled. It is the statistical result showing clearly that what is initially thought to be two different constructs (Respect and Perseverance) is in fact considered as one construct (Principled); this has challenged the hypothesis that was initially put forward. The current study's findings also clearly indicate that everyone has a different perspective regarding perseverance. So, this shows that individual

perseverance relies heavily upon a person's commitment, principle and self-discipline, which is governed by one's integrity (Cranor, 1975; Schlenker, 2008). A principled person takes responsibility for their own actions and its accompanied consequences, with persistent commitments. Therefore, it was decided that the term Principled was appropriate to be used to encompass both Respect and Perseverance in the present study.

The descriptive analyses portrayed a very high mean score for the sub-construct of Principled. Undoubtedly, Principled can be used to measure CHC. Following Tan (2013) and Lin et al. (2013), they have also mentioned that Chinese students and parents highly regard respect. This is also consistent with findings of past studies by Huang and Gove (2012), which believed that being filial piety is a form of respect that is regarded highly in CHC. In addition, Ip (2009) mentioned that the virtue of being principled and consistent stressed in the *Analects* by Confucius are upheld by many Confucian firms, which is a type of virtue-based corporation as informed and constituted by Confucianism. Besides, in a report released by the U.S. Department of Education's Office of Technology, which addresses ways for educators to integrate grit, tenacity, and perseverance into their teaching practices, it has ported that students persist more when they perceive that they are respected and treated fairly, and also when adults show caring about them (Barseghian, 2018).

Nonetheless, the findings, at a minimum, appear to support the Dependence on Teacher sub-construct can be used to measure CHC. Following Pemberton, Li, Or, and Pierson (1996) language students were trained to be less teacher dependence so that their language skills can be improved, and to become more autonomous

learners. Therefore, the researcher anticipated that Dependence on Teacher sub-construct can be used to measure CHC.

In addition, the findings appear to support that Harmony can be used to measure CHC. The finding which was consistent with the finding of Chen and Chung (1994) that the influence of Confucian at organisation level such as non-confrontational communication and conflict avoidance were seen important. However, what is different in this study compared to other studies is that the mean score of this Harmony sub-construct appears to be at the midpoint. From the Confucianism philosophical perspective, this has challenged the conception of *He* (harmony) in Confucianism teaching. However, the researcher believed that the finding does not mean that the respondents hold no opinion with regard to the item. This is because the items in the particular sub-construct are summed and averaged giving a mean score that lies in the midpoint of "neutral". Moreover, the standard deviation score showed a relatively disperse of scoring (>1), indicating that the respondents' opinion varied vastly. However, the researcher also opinionated that there could be two more reasons to explain why respondents gave a midpoint score. Firstly, from the psychological mechanism point of view, some respondents could have also selected "neutral" that refers to "I don't know", contributing to the scoring of midpoint. This is to say that the respondents may be selecting "neutral" in order to avoid social embarrassment among respondents, who felt they should have an opinion on that particular matter, and this claim is consistent with Sturgis, Roberts and Smith's (2014)'s claim that those who selected "face-saving don't know" are whom express greatest interest in the topic of harmony, but avoiding social embarrassment. Nevertheless, the reasoning of "face-saving don't know" is in line with the findings found in the Harmony. In other words, the respondents would like

to maintain harmony and save face when answering the questionnaire, leading them to choose the midpoint of "neutral". Secondly, the respondents could hold an opinion but select the midpoint to avoid cognitive costs of selecting the most appropriate scale. Therefore, the findings of the current study suggest an additional cost of follow-up probes to be conducted to find a valid reason to understand why chemistry students are "neutral" on the issue of harmony. Nonetheless, the researcher anticipated that Harmony sub-construct can be used to measure CHC.

The findings observed in the present study mirror those of the previous studies that have examined the importance of education and self-cultivation in the context of CHC (Kim & Park, 2006; Lam, Sui, Ho, & Wong, 2002; Tan, 2013). It is encouraging to compare the high mean score of education showing the characteristics of CHC with that assertions claimed by Kim and Park (2006) that Koreans highly regard education and view it as a part of self-education to pursue for one's own sake and to achieve personal, social and occupational success. This also accords with the other previous study described by Siah et al. (2015) that educational success leads to a better life, and having educated is essential in CHC. Undoubtedly, Education sub-construct can be used to measure CHC.

Up to this point, the CHC can be initially defined and measured by Principled, Dependence on Teacher, Harmony, and Education; a 4-factor model which needs further analysis to validate the model and give the conceptual definition of CHC. The confirmation of the 4-factor model with measurement model analysis corroborates the association of 4 constructs with the theoretical construct of CHC and construct validity of the CHC is assured (more will be discussed in Chapter 7). Further analysis corroborated the validity of the scale.

Chapter Summary

This chapter presents the EFA's findings and its discussion in the process of developing CHC Scale. Before performing EFA, the assumptions of EFA are checked. The number of factors is trimmed down from 7 to 4 factors. Poor factors are dropped when the factor did not have minimum 4 items. The number of items of CHC Scale is trimmed from 30 to 24 items, which composed of 4 factors. Poor items that do not load clearly and strongly onto one factor and/or cross-load with very similar loadings (loading <0.1) onto other components are considered as poor item; however, theoretical basis is checked too before dropping the item. 6 items are dropped due to having correlation <0.3 as well to meet the objective of conducting EFA that is to trim down the number of items, or by reviewing and examining from the theoretical basis. Hence, the H_1 alternative hypothesis is rejected.

The reliability analysis on CHC Scale shows that it has good reliability, all factors have Cronbach's alpha value above 0.7 (except for Factor 4 which has Cronbach's alpha value of 0.682) and minimum CITC greater than 0.3. Also, the descriptive analysis showed 241 males and 189 females, age between 18 to 20.

In the section of Discussion, the researcher supported the underlying factors emerged from the findings using past literature. These underlying factors that are discovered from EFA are supported by the concept of Confucianism in CHC as well as past studies. Interestingly, the researcher revealed that Respect and Perseverance (two separate constructs) are needed to combine into a single construct in forming the Principled construct. The second interesting finding is that the Harmony appeared at "neutral" midpoint, perceived by the respondents. This challenge the conception of *He* (harmony) in Confucianism teaching. However, the researcher opined that the

respondents do not mean to hold no opinion with regard to the items measuring Harmony. The researcher has given three reasons corresponding to the discussion of the interesting findings: 1) summation and average of scores gave the mean score to appear at midpoint of "neutral", 2) due to "face-saving don't know", and 3) the respondents could have an opinion but select the midpoint to avoid cognitive costs of selecting the most appropriate scale. In view of this, the researcher also has suggested to conduct a further study to understand why chemistry students are "neutral" on the issue of harmony.

Overall, the final model is a 4-factors model comprising of 24 items, and showed good reliability. Hence, the H_1 alternative hypothesis is rejected, that is Respect, Perseverance, Dependence on Teacher, Harmony, and Education did not emerge as the constructs of the CHC Scale for the selected Chinese pre-university chemistry students, but Principled, Dependence on Teacher, Harmony, and Education emerged.

Following this, the 4-factor model of CHC will be validated using PLS-SEM. It's findings and discussion will be presented in Chapter 7. In the next Chapter 6, the scale development of PtAL Scale will be reported.

Chapter 6 Development of the Preference to Active Learning Scale

Introduction

The development of CHC Scale as illustrated and discussed in Chapter 5 was driven by the research gaps that the availability of a suitable instrument to measure what CHC is, is missing. Nevertheless, a 4-factor model CHC Scale was developed, and showed good reliability.

For the PtAL Scale, after a thorough literature review, as stated earlier, literature showed that there is no such instrument at the present time that conceptually defines and measures students' preference to AL, attested quantitatively in a single model, using the sub-constructs put forward in the present study, and carry out the research from interdisciplinary perspectives.

Literature shows that PtAL as a field of research is a grey area where there is no deep conceptualisation of it. What most of the past literature shows is either fail to produce reliable instrument, or have been including other constructs which are not relevant to measure PtAL. This is the challenge faced by researchers, and finally the researcher of the present study has gone deeper by attempting to conceptually define PtAL and to come up with this instrument.

Thus, the other of the objectives of the present study is to conceptually define PtAL construct to measure the preference of Chinese students toward AL. This chapter aims to answer the second research question which has been put forward. This chapter will also outline the detailed steps on performing the statistical analysis onto PtAL Scale together with its findings and discussion.

A similar steps and statistical analysis with the CHC Scale discussed in the previous chapter are performed onto PtAL Scale, including screening and cleaning data, handling missing data, checking assumptions prior to EFA, and threshold for factor loading and communalities. Results and relevant discussion are reported as below.

Findings for the EFA on PtAL Scale

Outliers. The histogram looks quite symmetrical and, visibly, there are no outliers (Figure 6.1). From the Box Plot shown in Figure 6.2, there are no extreme outliers. Normality test is then assessed.

Normality. Since the sample size is 430, Kolmogorov-Smirnov test is used. From the Table 6.1, the p-value (Sig.) of the test is .007, The p-value (sig.) of the test is 0.002, less than 0.05, suggesting violation of the assumption of normality. This is quite common in larger samples. However, from the Normal Q-Q Plot (Figure 6.3), the observed values are being very close to the linear line, indicating of data normality. Upon checking with skewness and kurtosis, the data is a little skewed and kurtotic (Table 6.2), but it does not differ significantly from normality. In general, the distribution of scores can be assumed is approximately normally distributed.

After assessing the assumption of EFA as described in above, the following sections detailed the process of getting the corresponding factor structure of model and its number of items for PtAL Scale.

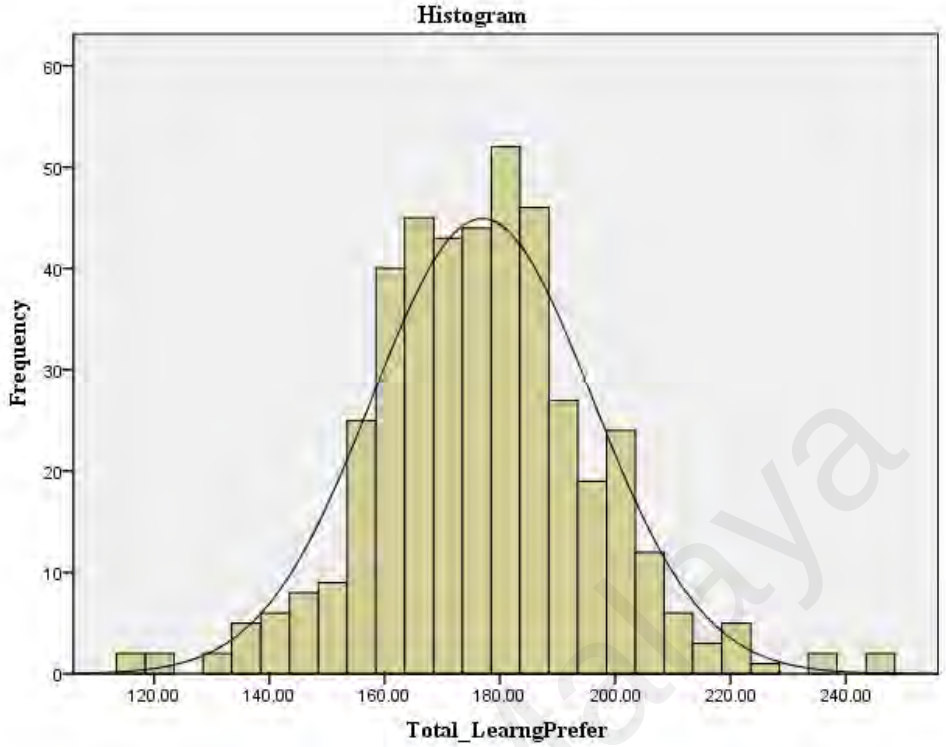


Figure 6.1 Histogram

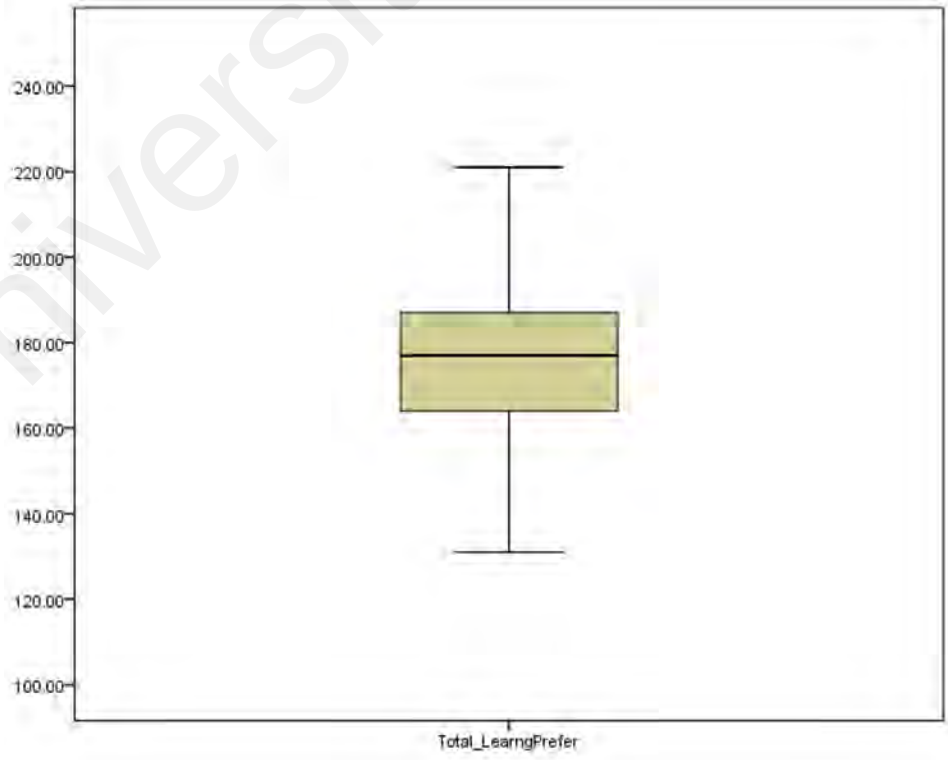


Figure 6.2 Boxplot

Table 6.1

Tests of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total_LearngPrefer	.052	430	.007	.988	430	.001

a. Lilliefors Significance Correction

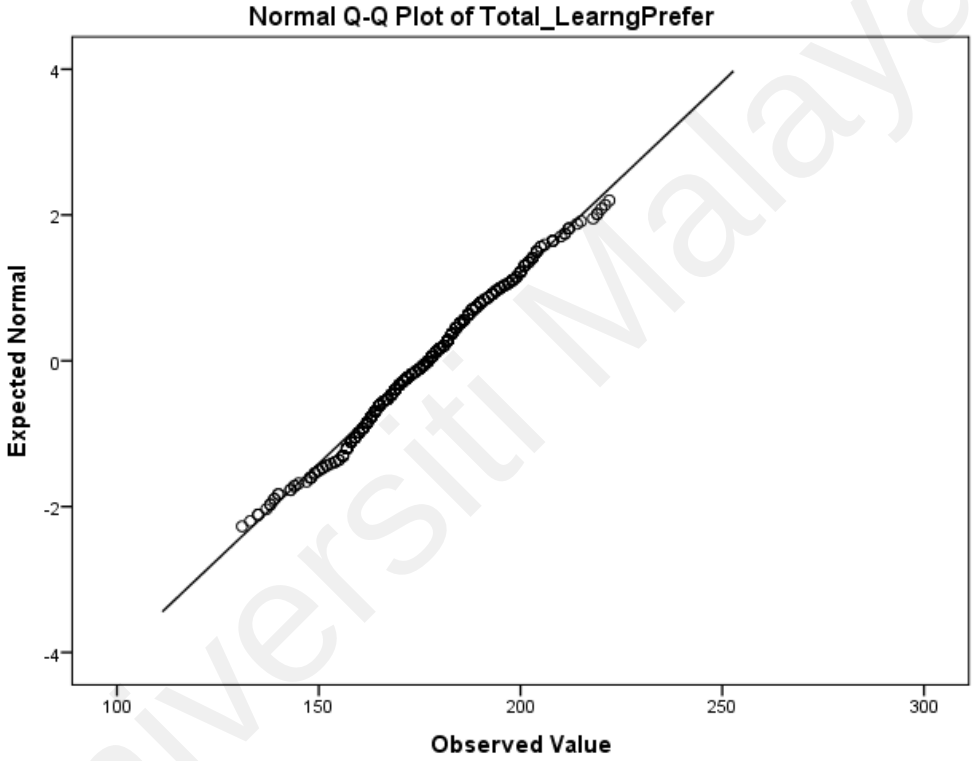


Figure 6.3 Normal Q-Q plot

Table 6.2

Test of normality (skewness and kurtosis)

	Skewness		Kurtosis		z-value (should be in the span of -1.96 to +1.96	
	Statistic	Std. Error	Statistic	Std. Error	Skewness	Kurtosis
Total_LearngPrefer	0.153	0.118	0.083	0.235	1.297	0.353

13-factors model (55 items). The 55 items of the LP Scale are subjected to Principal Components Analysis (PCA) since the items are reflective indicators and is aimed to determine the number of factors, this is done by using principal axis factoring extraction method with SPSS version 20. Prior to performing PCA, the suitability of data for factor analysis is assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. Hence the items correlated adequately in the construct. From the Table 6.3, the Kaiser-Meyer-Olkin (KMO) value is 0.83, exceeding the recommended value of 0.6 and Bartlett's Test of Sphericity is 0.00, which has reached statistical significance (Hair et al., 2014), indicating that the correlation matrix is not an identity matrix, and therefore appropriate for factor analysis.

Table 6.3

KMO and Bartlett's Test (13 factors)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.833**
Bartlett's Test of Sphericity	Approx. Chi-Square	9717.103
	df	1485
	Sig.	**.000**

Principal components analysis revealed the presence of 13 factors that explained 60.7% of the variation (above 50%) in the 55 items of PtAL scale, with eigenvalues exceeding 1, explained 14.7%, 11.7%, 7.2%, 3.8%, 3.4%, 3.2%, 3.0%, 2.6%, 2.4%, 2.3%, 2.2%, 2.2%, and 1.9% of the variance respectively (Figure 6.4 Eigenvalue Plot for Scree Test Criterion (13-factors model) and Table 6.4 Total variance explained). To aid in the interpretation of number of factors, Promax

rotation (oblique rotation) is performed because these factors are correlated to each other. In social sciences, behavior is rarely isolated into neatly independent unit (Costello & Osborne, 2005); the constructs in PtAL Scale is a measurable form of behavior. After rotation, the poor factors that do not have minimum 3 items are dropped (Table 6.5 Pattern Matrix, Table 6.6 Communalities) to give a 11-factors model.

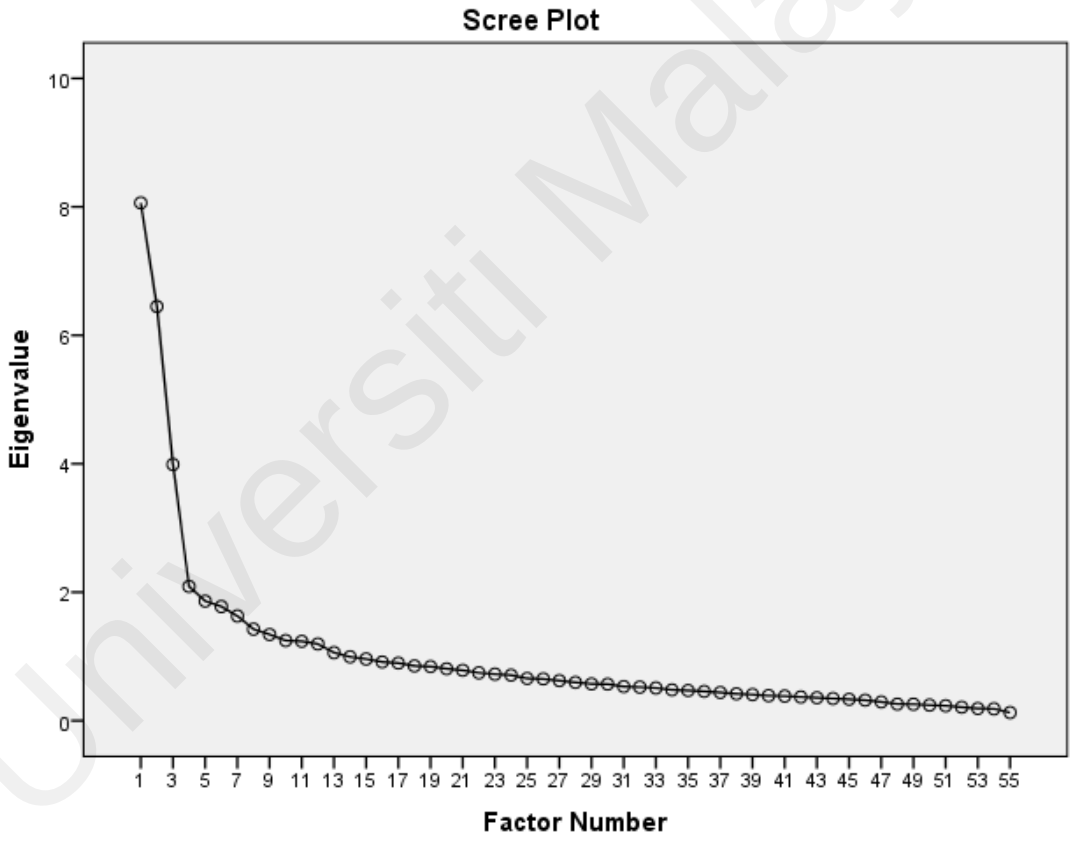


Figure 6.4 Eigenvalue Plot for Scree Test Criterion (13-factors model)

Table 6.4

Total variance explained (13 factors)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.062	14.658	14.658	7.563	13.751	13.751	5.349
2	6.449	11.726	26.384	6.027	10.958	24.709	4.979
3	3.989	7.253	33.637	3.484	6.334	31.044	4.674
4	2.090	3.800	37.437	1.656	3.011	34.055	4.596
5	1.862	3.386	40.823	1.362	2.477	36.531	3.975
6	1.778	3.232	44.055	1.240	2.255	38.786	4.396
7	1.630	2.964	47.019	1.081	1.965	40.751	3.512
8	1.425	2.591	49.610	.907	1.649	42.401	3.083
9	1.342	2.441	52.050	.832	1.514	43.914	2.268
10	1.247	2.268	54.318	.797	1.449	45.363	1.773
11	1.236	2.248	56.566	.725	1.318	46.681	2.122
12	1.195	2.174	58.740	.611	1.110	47.791	1.666
13	1.060	1.927	**60.667**	.538	.979	48.770	1.831
14	.995	1.809	62.476				
15	.961	1.747	64.222				
16	.914	1.662	65.884				
17	.897	1.631	67.516				
18	.853	1.550	69.066				
19	.842	1.531	70.596				
20	.809	1.470	72.066				
21	.784	1.426	73.493				
22	.745	1.355	74.848				
23	.725	1.319	76.166				
24	.709	1.288	77.454				
25	.657	1.195	78.649				
26	.650	1.182	79.832				
27	.624	1.135	80.966				
28	.597	1.086	82.052				
29	.573	1.042	83.095				
30	.569	1.035	84.130				
31	.532	.967	85.096				
32	.523	.951	86.047				
33	.510	.927	86.974				

34	.480	.873	87.847
35	.470	.854	88.701
36	.456	.829	89.531
37	.440	.800	90.330
38	.419	.762	91.092
39	.406	.739	91.831
40	.389	.708	92.539
41	.383	.696	93.236
42	.370	.672	93.908
43	.358	.650	94.558
44	.345	.627	95.184
45	.334	.607	95.792
46	.320	.582	96.374
47	.292	.531	96.905
48	.259	.471	97.376
49	.256	.466	97.842
50	.243	.442	98.284
51	.233	.423	98.707
52	.210	.381	99.088
53	.190	.345	99.433
54	.185	.336	99.769
55	.127	.231	100.000

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 6.5

Pattern matrix (13 factors)

	Factor												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Att10	.894												
Att12	.821												
Att11	.788												
Att9	.748												
Att13	.696												
Att14	.674												
Att15	.669												
Att8	.528												
Att16	.492												
Par13		.715											
Par10		.648											
Par12		.608											
Par9		.557											
Par21		.479											
Par14		.473											
Par15		.437											
Par17		.393											
Par11		.314											
Par3													
Par6													
Att2			.891										
Att4			.778										
Att1			.595										
Att5			.569										
Att3			.434										
Par18			-.417										
Par25				.771									
Mea1				.732									
Par24				.659									
Par23				.495									
Att25					.861								
Att23					.789								
Att22					.614								
Mea3						.774							
Mea2						.634							
Att21						.460							.425
Att24					.381	.452							
Par4							.726						

Par2					.641					.456		
Par5					.639							
Par8					.495							
Att18						.788						
Att17						.741						
Mea4							.639					
Mea5							.553					
Par22			.378				-.388					
Att7								.707				
Att6		.341						.560				
Par19									.537		.308	
Par16									-.495			
Par1						.426			-.452			
Par20	.339			-.316					.352			
Par7										.504		
Att20				.377							.622	
Att19				.440							.547	

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 25 iterations.

Table 6.6

Communalities (13 factors)

	Initial	Extraction
Par1	.312	**.292**
Par2	.302	.337
Par3	.414	.368
Par4	.397	.433
Par5	.402	.435
Par6	.434	.389
Par7	.275	**.239**
Par8	.354	.402
Par9	.403	.341
Par10	.468	.467
Par11	.447	.493
Par12	.395	.386
Par13	.513	.566
Par14	.340	.330

Par15	.290	**.243**
Par16	.258	**.250**
Par17	.384	.400
Par18	.354	.304
Par19	.393	.429
Par20	.451	.463
Par21	.477	.498
Par22	.411	.402
Par23	.442	.383
Par24	.500	.522
Par25	.531	.562
Mea1	.562	.608
Mea2	.453	.449
Mea3	.443	.456
Mea4	.339	.358
Mea5	.415	.456
Att1	.624	.657
Att2	.630	.612
Att3	.435	.348
Att4	.511	.505
Att5	.506	.477
Att6	.484	.522
Att7	.481	.562
Att8	.406	.364
Att9	.699	.629
Att10	.787	.824
Att11	.626	.628
Att12	.666	.658
Att13	.665	.670
Att14	.614	.561
Att15	.616	.634
Att16	.535	.490
Att17	.593	.658
Att18	.599	.688
Att19	.490	.583
Att20	.492	.508
Att21	.489	.506
Att22	.539	.513
Att23	.540	.602
Att24	.616	.606
Att25	.636	.759

Extraction Method: Principal Axis Factoring.

11-factors model (41 items). Re-running the analysis gives another set of statistical result. Loadings in Pattern Matrix, communality values in Communalities, correlation values in Correlation Matrix are checked after, to select good item for the scale. Poor factors and poor items (items that do not load clearly and strongly onto one factor and/or cross-load with very similar loadings (cross-loadings differ by <0.1) onto other components are considered as poor items (Chin, 1998; Snell & Dean, 1992)) that do not meet the threshold values are dropped further in the subsequent analysis which are not shown here to simplify the reporting (Par1, Par7, Par8, Par15, Par16, Par3, Par4, Par18, Par2, Par14, Par20, Par19, and Par6 are dropped in the subsequent analysis). Then, a 11-factors model is obtained that explained 63.9% of the variation in the 41 items; the 11-factors explained 17.6%, 29.9%, 36.9%, 41.8%, 45.9%, 49.5%, 52.8%, 56.0%, 58.9%, 61.5%, and 63.9% of the variance respectively. The statistical result is shown in Table 6.7.

Table 6.7

Total variance explained (11 factors, 41 items)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.195	17.549	17.549	6.720	16.391	16.391	4.112
2	5.056	12.331	29.880	4.627	11.285	27.675	4.169
3	2.878	7.019	36.898	2.382	5.810	33.486	4.653
4	2.019	4.925	41.823	1.597	3.895	37.381	4.462
5	1.669	4.070	45.893	1.167	2.846	40.227	3.929
6	1.470	3.586	49.480	.973	2.372	42.599	1.923
7	1.360	3.317	52.797	.857	2.091	44.691	3.856
8	1.322	3.225	56.022	.790	1.927	46.617	2.826
9	1.165	2.841	58.863	.780	1.902	48.519	4.148
10	1.101	2.686	61.549	.583	1.423	49.942	1.686
11	.946	2.306	**63.855**	.491	1.197	51.139	1.637

12	.911	2.222	66.077
13	.846	2.062	68.140
14	.796	1.941	70.080
15	.784	1.913	71.994
16	.751	1.831	73.824
17	.685	1.670	75.495
18	.653	1.592	77.086
19	.633	1.544	78.631
20	.599	1.461	80.091
21	.590	1.440	81.531
22	.584	1.424	82.955
23	.569	1.388	84.343
24	.523	1.274	85.618
25	.506	1.233	86.851
26	.493	1.202	88.053
27	.471	1.148	89.201
28	.446	1.088	90.288
29	.427	1.042	91.331
30	.385	.938	92.269
31	.375	.916	93.185
32	.365	.891	94.076
33	.347	.846	94.922
34	.334	.815	95.737
35	.321	.783	96.520
36	.272	.664	97.184
37	.262	.639	97.823
38	.258	.629	98.451
39	.225	.550	99.001
40	.223	.544	99.545
41	.186	.455	100.000

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

10-factors model (35 items). However, after assessing on the Table 6.8 Pattern Matrix, 5 items (Par13, Par22, Par5, Par17, and Att24) are dropped further. Items Par13 is dropped even though the items cross-loaded on other factors with cross-loading scores differ by >0.1, so that a more "cleaner" and comprehensive construct is obtained (Chin, 1998; Snell & Dean, 1992). Item Att24 is excluded from Factor 7 because (1) it cross-loaded, (2) does not fit along with the other items in the same factors. Item Par22 is dropped because it cross-loaded with loadings differ by <0.1 on other components. Besides, items Par5 and Par17 are dropped because both of the items do not fit along in the factor after reviewing the statement of items; Lastly, item Par6 is dropped because it has no loadings. Utilising conceptual foundation (a priori criterion), empirical evidence (statistical result) together with practical relevance (required 50% of variance explained), deleting these items resulted in 10 factors with 35 items remained (Figure 6.5 Eigenvalue Plot for Scree Test Criterion (10-factors model) and Table 6.9 Pattern matrix).

Table 6.8

Pattern matrix (11 factors, 41 items)

	Factor										
	1	2	3	4	5	6	7	8	9	10	11
Att12	.879										
Att13	.781										
Att15	.741										
Att14	.736										
Att11	.621										
Att16	.543										
Att8	.450										
Att2		.836									
Att4		.730									
Att1		.636									

Att5	.527									
Att3	.412									
Par10		.836								
Par9		.701								
Par12		.593								
Par13		.578								.452
Par21		.492								
Par11		.466								
Par6		.302								
Par25			.770							
Mea1			.724							
Par24			.701							
Par23			.564							
Par22			.422						-.356	
Att25				.897						
Att23				.779						
Att22				.620						
Att6					.709					
Att7					.655					
Mea3						.830				
Mea2						.492				
Att24				.421		.426				
Att18							.868			
Att17							.730			
Att20								.791		
Att19								.650		
Att21								.499		
Mea4									.640	
Mea5	.363								.564	
Par5										-.471
Par17										.455

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 9 iterations.

Table 6.9

Pattern matrix (10 factors, 36 items)

	Component									
	1	2	3	4	5	6	7	8	9	10
Att12	.851									
Att14	.804									
Att15	.773									
Att13	.761									
Att11	.708									
Att16	.640									
Att8	.551									
Att2		.806								
Att4		.791								
Att1		.648								
Att5		.588								
Att3		.411					.257			
Par25			.857							
Par24			.795							
Mea1			.751							
Par23			.646							
Par9				.868						
Par10				.855						
Par12				.574						
Par21			.317	.498						
Par11		.329		.466						
Par6										
Att23					.848					
Att25					.832					
Att22					.748					
Att20						.877				
Att21						.633				
Att19						.630	.330			
Att18							.864			
Att17							.804			
Att7								.846		
Att6								.806		
Mea3									.846	
Mea2									.650	
Mea4										.879
Mea5		.411								.682

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

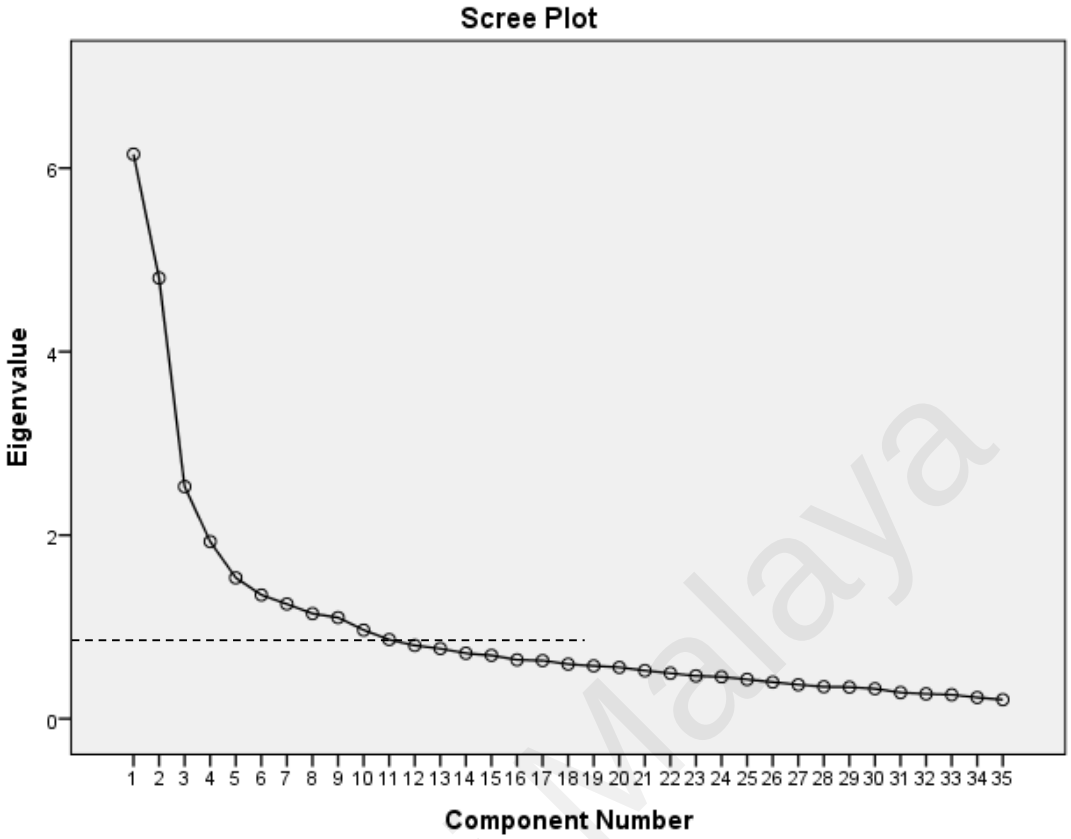


Figure 6.5 Eigenvalue Plot for Scree Test Criterion (10-factors model)

From Table 6.9 (Pattern Matrix), it is evident that 7 items (Att8, Att11, Att12, Att13, Att14, Att15, and Att16) as highlighted under Factor 1 are included in the study. The 5 items (Att1, Att2, Att3, Att4, and Att5) as highlighted under Factor 2 are included in the study. The item Att3 cross-loaded with Factor 2 and Factor 7, however, after careful consideration, the item is decided to be grouped under Factor 2 as (1) it has a higher loading on Factor 2 (cross-loadings differ by >0.1), (2) it is an emotional state resulted from mental discomfort of feeling uncomfortable, and not an emotional state resulted from being embarrassed (based on theoretical basis), and (3) to provide a more "cleaner" and comprehensive construct. The 4 items that loaded significantly (Par23, Par24, Par25 and Mea1) as highlighted under Factor 3 are included in the study. The 5 items (Par9, Par10, Par11, Par12, and Par21) as highlighted under Factor 4 are included in the study. The item Par11 and Par21 cross-loaded with Factor 3 and Factor 5, however, after careful consideration, the item is decided to be grouped under Factor 5 as (1) it has a higher loading on Factor 5 (cross-loadings differ by >0.1), (2) it is theoretically loaded on Factor 5 since it is a form of participation behaviour or action, rather than a perceived value (based on theoretical basis), and (3) to provide a more "cleaner" and comprehensive construct. In addition, the item Par6 is dropped because it has no loadings. The 3 items that loaded significantly (Att22, Att23, and Att25) as highlighted under Factor 5 are included in the study. The 3 items (Att19, Att20, and Att21) as highlighted under Factor 6 are included in the study. The item Att19 cross-loaded with Factor 6 and Factor 7, however, after careful consideration, the item is decided to be grouped under Factor 6 because (1) it has a higher loading on Factor 6 (cross-loadings differ by >0.1), (2) it is theoretically loaded on Factor 6 since it is an emotional state resulted from positive-self rather than a negative emotional state, and (3) to provide a

more “cleaner” and comprehensive construct. The 2 items that loaded significantly (Att17 and Att18) as highlighted under Factor 7, 2 items that loaded significantly (Att6 and Att7) as highlighted under Factor 8, 2 items that loaded significantly (Mea2, Mea3) as highlighted under Factor 9, are all included in the study. Lastly, the 2 items (Mea4 and Mea5) as highlighted under Factor 10 are included in the study. The item Mea5 cross-loaded with Factor 2 and Factor 10, however, after careful consideration, the item is decided to be grouped under Factor 10 because (1) it has a higher loading on Factor 10 (cross-loadings differ by >0.1), (2) it is a perception on how students perceived the meaningful learning of active learning how the AL affected their examination preparation and grades, and (3) to provide a more “cleaner” and comprehensive construct.

The aforementioned factors has eigenvalues >1 and accounted for 65.0% of the variance (Table 6.10).

Table 6.10

Total variance explained (10 factors, 35 items)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.152	17.578	17.578	6.152	17.578	17.578	4.346
2	4.802	13.720	31.298	4.802	13.720	31.298	3.902
3	2.529	7.227	38.525	2.529	7.227	38.525	3.799
4	1.930	5.515	44.040	1.930	5.515	44.040	3.208
5	1.535	4.387	48.427	1.535	4.387	48.427	3.187
6	1.349	3.854	52.281	1.349	3.854	52.281	3.016

7	1.250	3.570	55.851	1.250	3.570	55.851	2.722
8	1.145	3.272	59.123	1.145	3.272	59.123	2.561
9	1.102	3.150	62.273	1.102	3.150	62.273	2.760
10	.966	2.759	**65.032**	.966	2.759	65.032	2.073
11	.862	2.463	67.494				
12	.798	2.279	69.773				
13	.764	2.182	71.956				
14	.713	2.036	73.992				
15	.691	1.973	75.965				
16	.641	1.831	77.796				
17	.634	1.810	79.606				
18	.594	1.697	81.304				
19	.575	1.642	82.946				
20	.559	1.598	84.544				
21	.524	1.496	86.040				
22	.495	1.415	87.455				
23	.467	1.333	88.788				
24	.455	1.301	90.090				
25	.428	1.224	91.314				
26	.399	1.139	92.453				
27	.370	1.058	93.511				
28	.348	.995	94.506				
29	.343	.980	95.486				
30	.326	.932	96.418				
31	.284	.812	97.231				
32	.271	.773	98.003				
33	.261	.745	98.749				
34	.231	.660	99.408				
35	.207	.592	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Summary. A 10-factors model with 35 items is obtained from performing EFA on PtAL Scale. The items and their item loadings are presented in Table 6.11 below.

Table 6.11

Factors, items, item loadings, communalities for the 10-factors model (35 items)

Item code	Factor	Item loading (threshold >0.3)	Communalities (threshold >0.3)
Par9	5	.831	.636
Par10		.824	.663
Par11		.480	.577
Par12		.565	.518
Par21		.481	.535
Par23	3	.647	.518
Par24		.792	.667
Par25		.849	.715
Mea1		.746	.683
Mea2	9	.657	.627
Mea3		.844	.703
Mea4	10	.897	.764
Mea5		.669	.704
Att1	2	.622	.678
Att2		.806	.690
Att3		.404	.493
Att4		.801	.632
Att5		.574	.576
Att6	8	.803	.716
Att7		.871	.735
Att8	1	.555	.511
Att11		.709	.510
Att12		.853	.709
Att13		.759	.705
Att14		.804	.657
Att15		.774	.668
Att16		.644	.561
Att17	7	.799	.718
Att18		.857	.768
Att19	6	.628	.646
Att20		.859	.721
Att21		607	.630
Att22	4	.757	.669
Att23		.843	.706
Att25		.854	.751

Findings for the Reliability Analysis on PtAL Scale

Factor 1. The reliability of the Factor 1 sub-scale is then statistically assessed (Table 6.12, Table 6.13, and Table 6.14). The Cronbach's alpha value is 0.868, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. In overall, all the items in Factor 1 correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.432, which is greater than 0.3.

Table 6.12

Reliability statistics (Factor 1)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.868	.866	7

Table 6.13

Inter-item correlation matrix (Factor 1)

	Att8	Att11	Att12	Att13	Att14	Att15	Att16
Att8	1.000	.362	.374	.299	.321	.335	.347
Att11	.362	1.000	.553	.426	.406	.425	.385
Att12	**.374**	**.553**	1.000	**.680**	.635	.608	.468
Att13	.299	.426	**.680**	1.000	**.661**	**.626**	.484
Att14	.321	.406	.635	.661	1.000	.561	.523
Att15	.335	.425	.608	.626	.561	1.000	**.606**
Att16	.347	.385	.468	.484	.523	.606	1.000

Table 6.14

Item-total statistics (Factor 1)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att8	15.6698	24.198	**.432**	.205	.875
Att11	15.5977	22.768	.556	.348	.860
Att12	15.7465	21.047	.754	.608	.833
Att13	15.5953	20.908	.717	.588	.838
Att14	15.7326	20.942	.698	.536	.841
Att15	15.5326	21.457	.711	.548	.839
Att16	15.6465	22.369	.621	.435	.851

Factor 2. The reliability of the Factor 2 sub-scale is then statistically assessed (Table 6.15, Table 6.16, and Table 6.17). The Cronbach's alpha value is 0.794, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. In overall, all the items in Factor 2 correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.349, which is greater than 0.3.

Table 6.15

Reliability statistics (Factor 2)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.794	.795	5

Table 6.16

Inter-item correlation matrix (Factor 2)

	Att1	Att2	Att3	Att4	Att5
Att1	1.000	**.590**	**.472**	.383	**.470**
Att2	**.590**	1.000	.434	**.577**	.383
Att3	.472	.434	1.000	.217	.409
Att4	.383	.577	.217	1.000	.428
Att5	.470	.383	.409	.428	1.000

Table 6.17

Item-total statistics (Factor 2)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att1	13.7256	10.004	.640	.447	.733
Att2	14.0884	9.088	.680	.519	.717
Att3	13.4791	10.996	**.485**	.306	**.781**
Att4	14.3256	9.996	.527	.395	.772
Att5	13.6093	10.994	.550	.335	.763

Factor 3. The reliability of the Factor 3 sub-scale is then statistically assessed (Table 6.18, Table 6.19, and Table 6.20). The Cronbach's alpha value is 0.771, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.433, which is greater than 0.3.

Table 6.18

Reliability statistics (Factor 3)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.771	.774	4

Table 6.19

Inter-item correlation matrix (Factor 3)

	Par23	Par24	Par25	Mea1
Par23	1.000	.402	.322	.363
Par24	**.402**	1.000	.548	.522
Par25	.322	**.548**	1.000	**.607**
Mea1	.363	.522	**.607**	1.000

Table 6.20

Item-total statistics (Factor 3)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Par23	10.6674	5.505	**.433**	.196	.790
Par24	10.6093	4.924	.621	.393	.689
Par25	10.4907	5.206	.623	.443	.692
Mea1	10.5535	4.933	.628	.433	.686

Factor 4. The reliability of the Factor 4 sub-scale is then statistically assessed (Table 6.21, Table 6.22, and Table 6.23). The Cronbach's alpha value is 0.790, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.619, which is greater than 0.3.

Table 6.21

Reliability statistics (Factor 4)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.790	.791	3

Table 6.22

Inter-item correlation matrix (Factor 4)

	Att22	Att23	Att25
Att22	1.000	.529	.570
Att23	.529	1.000	**.574**
Att25	**.570**	**.574**	1.000

Table 6.23

Item-total statistics (Factor 4)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att22	6.8186	2.624	**.619**	.386	.729
Att23	7.0488	2.597	.622	.390	.726
Att25	6.6163	2.638	.654	.428	.692

Factor 5. The reliability of the Factor 5 sub-scale is then statistically assessed (Table 6.24, Table 6.25, and Table 6.26). The Cronbach's alpha value is 0.698, which is slightly lower than 0.7, and is considered acceptable. Moreover, a closer look at the "Cronbach's Alpha If Item Deleted" revealed that even if the item is deleted, the Cronbach's alpha will decrease, and not increase. Thus, all the items are retained. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is not between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.414, which is greater than 0.3.

Table 6.24

Reliability statistics (Factor 5)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.698	.700	5

Table 6.25

Inter-item correlation matrix (Factor 5)

	Par9	Par10	Par11	Par12	Par21
Par9	1.000	**.463**	.273	.253	.306
Par10	**.463**	1.000	**.379**	.304	**.360**
Par11	.273	.379	1.000	.302	.213
Par12	.253	.304	.302	1.000	.330
Par21	.306	.360	.213	**.330**	1.000

Table 6.26

Item-total statistics (Factor 5)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Par9	13.1651	7.719	.462	.250	.645
Par10	12.9767	7.235	.549	.329	.607
Par11	12.8419	8.157	**.414**	.190	.664
Par12	13.6302	7.264	.420	.186	.668
Par21	13.1163	7.893	.433	.200	.656

Factor 6. The reliability of the Factor 6 sub-scale is then statistically assessed (Table 6.27, Table 6.28, and Table 6.29). The Cronbach's alpha value is 0.715, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlated adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.516, which is greater than 0.3.

Table 6.27

Reliability statistics (Factor 6)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.715	.716	3

Table 6.28

Inter-item correlation matrix (Factor 6)

	Att19	Att20	Att21
Att19	1.000	.475	.412
Att20	**.475**	1.000	**.482**
Att21	.412	**.482**	1.000

Table 6.29

Item-total statistics (Factor 6)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att19	6.9233	2.374	**.516**	.269	.650
Att20	7.2372	1.986	.570	.324	.582
Att21	7.1884	2.167	.523	.276	.640

Factor 7. The reliability of the Factor 7 sub-scale is then statistically assessed (Table 6.30, Table 6.31, and Table 6.32). The Cronbach's alpha value is 0.817, which is more than 0.7. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlate adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.691, which is greater than 0.3.

Table 6.30

Reliability statistics (Factor 7)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.817	.817	2

Table 6.31

Inter-item correlation matrix (Factor 7)

	Att17	Att18
Att17	1.000	**.691**
Att18	**.691**	1.000

Table 6.32

Item-total statistics (Factor 7)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att17	3.2419	1.191	**.691**	.478	.
Att18	3.1233	1.330	.691	.478	.

Factor 8. The reliability of the Factor 8 sub-scale is then statistically assessed (Table 6.33, Table 6.34, and Table 6.35). The Cronbach's alpha value is 0.691, which is slightly lower than 0.7. As mentioned earlier in Chapter 5 Introduction, the Cronbach's alpha is sensitive to the number of items in the scale. Due to having only two items in this Factor 8, the Cronbach's alpha is expected to be slightly lower. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlate adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.529, which is greater than 0.3.

Table 6.33

Reliability statistics (Factor 8)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.691	.692	2

Table 6.34

Inter-item correlation matrix (Factor 8)

	Att6	Att7
Att6	1.000	**.529**
Att7	**.529**	1.000

Table 6.35

Item-total statistics (Factor 8)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att6	3.4860	.945	**.529**	.280	.
Att7	3.4814	1.080	.529	.280	.

Factor 9. The reliability of the Factor 9 sub-scale is then statistically assessed (Table 6.36, Table 6.37, and Table 6.38). The Cronbach's alpha value is 0.651, which is slightly lower than 0.7. As mentioned earlier in Chapter 5 Introduction, the Cronbach's alpha is sensitive to the number of items in the scale. Due to having only two items in this Factor 8, the Cronbach's alpha is expected to be slightly lower. The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlate adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.483, which is greater than 0.3.

Table 6.36

Reliability statistics (Factor 9)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.651	.651	2

Table 6.37

Inter-item correlation matrix (Factor 9)

	Mea2	Mea3
Mea2	1.000	**.483**
Mea3	**.483**	1.000

Table 6.38

Item-total statistics (Factor 9)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Mea2	3.6791	.680	**.483**	.233	.
Mea3	3.8186	.652	.483	.233	.

Factor 10. The reliability of the Factor 10 sub-scale is then statistically assessed (Table 6.39, Table 6.40, and Table 6.41). The Cronbach's alpha value is 0.551, which is lower than 0.7. The Factor 10 has a low value because the construct having only 2 items. This is because Cronbach's alpha is sensitive to number of items in the scale (Cortina, 1993). The standard deviation values are not 0. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, the items correlate adequately in the construct. The lowest Corrected Item-Total Correlation (CITC) value is 0.382, which is greater than 0.3.

Table 6.39

Reliability statistics (Factor 10)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.551	.553	2

Table 6.40

Inter-item correlation matrix (Factor 10)

	Mea4	Mea5
Mea4	1.000	**.382**
Mea5	**.382**	1.000

Table 6.41

Item-total statistics (Factor 10)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Mea4	3.1953	1.290	**.382**	.146	.
Mea5	2.7907	1.094	.382	.146	.

Total PtAL Scale. The reliability on total PtAL Scale is then statistically assessed (Table 6.42). The Cronbach's alpha value is 0.853, which is more than 0.7.

Table 6.42

Reliability statistics (Total PtAL Score)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.853	.854	35

Summary. The summary from reliability analysis of PtAL Scale are reported as below (Table 6.43).

Table 6.43

Summary from reliability analysis of PtAL Scale

Construct	Number of items		Cronbach's alpha	Minimum CITC
	Initial	Final		
Factor 5	25	5	0.698	0.414
Factor 3		4	0.771	0.433
Factor 9	7	2	0.651	0.483
Factor 10		2	0.551	0.382
Factor 2	8	5	0.794	0.349
Factor 8		2	0.691	0.529
Factor 1	6	7	0.868	0.432
Factor 7	4	2	0.817	0.691
Factor 6	7	3	0.715	0.516
Factor 4		3	0.790	0.619

Findings for the Descriptive Analysis

To understand the nature and characteristics of the collected data, the present study performed descriptive statistics by using IBM SPSS 20 statistical software. Firstly, the frequency testing is performed. The number of valid responses and respondents' profile is explored. Secondly, the descriptive statistics of the constructs in this study are studied.

The first sample consisted of 430 Chinese pre-university students from different programmes. Of these, 241 males and 189 females (56% and 44%, respectively) between the ages of 18 to 20 (248 aged 18 (57.7%), 141 aged 19 (32.8%), 41 aged 20 (9.5%)). Of these 430 Chinese students, 18% are from Selangor, 13% are from Kuala Lumpur, 12% are from Penang, 10% are from Sabah, 10% are from Johor, 8% are from Sarawak, 7% are from Perak, 5% are from Melaka, 17% are from other states. More details about the type of primary school, type of secondary school, parents' ability to speak Chinese, and parents' ability to read Chinese of these 430 Chinese students, are projected as below in Table 6.44, as well as the mean and standard deviation scores of each items and constructs in Table 6.45.

Table 6.44

Respondents' profile

		n	%
Gender	Male	241	56
	Female	189	44
Age	18	248	57.7
	19	141	32.8
	20	41	9.5
States	Selangor	77	18
	Kuala Lumpur	56	13
	Penang	52	12
	Sabah	43	10
	Johor	43	10
	Sarawak	34	8
	Perak	30	7
	Melaka	22	5
	Others	73	17
Type of primary school	SK	0	0
	SJK (Cina)	430	100
	SJK (Tamil)	0	0
	International school	0	0
	Homeschooling	0	0
Type of secondary school	SMK	297	69.1
	Chinese Independent School	23	5.3
	SMJK	97	22.6
	International school	10	2.3
	Homeschooling	3	0.7
Parents ability to speak Chinese	Yes, can	430	100
	No, cannot	0	0
Parents ability to read Chinese	Yes, can	415	96.5
	No, cannot	15	3.5

Table 6.45

Descriptive analysis of PtAL Scale

	Item	N	Mean	Mean (sub-construct)	Std. Deviation
Action	Par9	430	3.27	3.29	0.96
(Factor 5)	Par10	430	3.46		0.99
	Par11	430	3.59		0.91
	Par12	430	2.80		1.13
	Par21	430	3.32		0.95
Perceived value	Par23	430	3.44	3.53	0.99
(Factor 3)	Par24	430	3.50		0.96
	Par25	430	3.62		0.88
	Mea1	430	3.55		0.95
Application into Life	Mea2	430	3.82	3.75	0.81
(Factor 9)	Mea3	430	3.68		0.82
Examination	Mea4	430	2.79	3.00	1.05
(Factor 10)	Mea5	430	3.20		1.14
Uncomfortable	Att1	430	3.58	3.46	1.02
(Factor 2)	Att2	430	3.22		1.16
	Att3	430	3.83		0.99
	Att4	430	2.98		1.15
	Att5	430	3.70		0.92
Unbothered	Att6	430	3.48	3.49	1.04
(Factor 8)	Att7	430	3.49		0.97
Disappointed with self	Att8	430	2.58	2.61	0.97
(Factor 1)	Att11	430	2.66		1.025
	Att12	430	2.51		1.03
	Att13	430	2.66		1.09
	Att14	430	2.52		1.11
	Att15	430	2.72		1.02
	Att16	430	2.61		1.00
Embarrassment	Att17	430	3.12	3.18	1.15
(Factor 7)	Att18	430	3.24		1.09
Optimistic	Att19	430	3.75	3.56	0.80
(Factor 6)	Att20	430	3.44		0.91
	Att21	430	3.49		0.88
Confidence	Att22	430	3.42	3.41	0.92
(Factor 4)	Att23	430	3.19		0.93
	Att25	430	3.63		0.89

Discussion

The second objective of the current study is to develop a PtAL Scale to measure the preference of CHC Chinese student toward AL. The current study is one of the first attempts to empirically explore these constructs in chemistry learning. In doing so, a firm process is followed to explore the underlying constructs (or latent factors) of PtAL and provide a reliable and valid scale. Results from EFA suggested a 10-factor model for PtAL with a sample of 430 Chinese pre-university chemistry students. The reliability analysis demonstrated that the current PtAL Scale has a good level of internal consistency. Hence, the H_2 alternative hypothesis is rejected. That is, the Participation, Meaningful Learning, and Attitude did not emerge as the constructs of the PtAL for the selected Chinese pre-university chemistry students; Action, Percevied values, Application into Life, Examination, Uncomfortable, Unbothered, Dissappointed with Self, Embarassment, Optimistic, and Confidence emerged as constructs of the PtAL for the selected Chinese pre-university chemistry students.

In this study, students' perceptions of the AL varied widely and both extremely positive and negative opinions were present. These results tend to comply with the findings of former studies (Struyven et al., 2008) where students' opinion on AL environment was ambiguous and widespread. Although the finding that some students preferred AL and some did not, it did not surprise the researcher, however, the added value of the present study is that the extent of students prefers AL is measured. The finding shows the respondents somewhat moderately prefer AL. It differs from Shekhar et al. (2015) that students were not engaged in AL activities. Although Shekhar et al.'s work was a qualitative observation research which the data was collected via researcher's observation rather than students' perception, the

findings of the current research tend to triangulate and support the past literature empirically.

On the other hand, the findings of the current study supported the past literature that the Asian students could respond positively to AL methods (Hallinger & Lu, 2013; Kember, 2000; Watkins & Biggs, 1996). The findings from this present study was not, however, altogether surprising given the findings in Hallinger and Lu' (2013) that learner-centred education can be implemented in East Asian high education institution. Based on the findings from this present study, the researcher has showed that AL can be implemented in Southeast Asian education institution.

The findings in current study also support the assertions that AL can positively impact students' participation in chemistry learning. More specifically, data drawn from the sample suggested that as AL activities are implemented, respondents perceived themselves as taking part and valued the AL activities. This imply that students seek to make learning meaningful by connecting the tasks that students have learnt with professional careers that they will encounter in the future.

In terms of how respondents perceived the value of AL activities, the data showed that students valued the activities designed by teachers and thus understand the purpose of participating in the AL activities, hence students perceived they prefer AL. This result is consistent with a recent report by DeMonbrun et al. (2017) who concluded that the respondents in their study also valued the students-centred learning activities implemented on engineering students. However, DeMonbrun's sample was not drawn from CHC countries. Nonetheless, the researcher anticipated that perceived value can be used to measure PtAL.

In this study, the students proved that they have taken proactive action and participated in AL. They brainstormed ideas, take initiative to find additional information, worked in group, and studied in group outside of class. The respondents were showing preference to AL. The findings of the current study again supports DeMonbrun et al's (2017) work that participation can be used to measure students' preference to teaching instruction. Besides, building on the theoretical perspective of engagement, the action measured in the present study was built upon behavior engagement. The findings of the current study is parallel with Herreid and Schiller (2012) that students' engagement is vital in case study and flipped classroom (which are forms of AL activities). Hence, the researcher anticipated that action can be used to measure PtAL.

Respondents in the current study preferred AL that could allow them to learn skills that can be applied into life. Considering that the objective of AL is to allow students to explore their abilities, problem solving skills, thinking skills etc., the respondents perceived that they preferred AL since they can apply what they have learnt. It is somewhat not surprising to see that students wanting a meaningful learning. Hence, the researcher anticipated that application into life can be used to measure PtAL.

Contrary with the past literature that Chinese students highly regard examination and grades, the findings of the current study found somewhat surprising findings (Morrison, 2006; Tan & Yates, 2011; Tsai, Jessie Ho, Liang, & Lin, 2011). The findings from the current study revealed that students perceived "neutral" (selecting the midpoint) with regard to the matter of examination. This challenged the common perception of CHC learners that are regarded as high achievers and

extrinsically motivated. Despite the arguments on the issue of extrinsically or intrinsically motivated, however, the researcher opined that the finding does not mean that they hold no opinion with regard to the item. This is because the items in the particular sub-construct are summed and averaged giving a mean score that lies in the midpoint of "neutral". Moreover, the standard deviation score showed a relatively disperse of scoring (>1), indicating that the respondents' opinion varied vastly. However, the researcher also opinionated that there could be two more reasons to explain why respondents gave a midpoint score. Firstly, from the psychological mechanism point of view, some respondents could have also selected "neutral" that refers to "I don't know", contributing to the scoring of midpoint. This is to say that the respondents may be selecting "neutral" in order to avoid social embarrassment among respondents, who felt they should have an opinion on that particular matter, and this claim is consistent with Sturgis, Roberts and Smith's (2014)'s claim that those who selected "face-saving don't know" are whom express greatest interest in the topic of examination importance. This explanation would also fit plausibly with the analysis on Harmony (see Discussion section of Chapter 5) where respondents also recorded a score of midpoint, potentially avoiding social embarrassment. Secondly, the respondents could hold an opinion but select the midpoint to avoid cognitive costs of selecting the most appropriate scale. Therefore, the findings of the current study suggest an additional cost of follow-up probes to be conducted to find a valid reason to understand why chemistry students are "neutral" on the issue of examination. Nonetheless, the researcher anticipated that examination can be used to measure PtAL.

In addition, the findings of the present study supported the past literature that the respondents have had negative experiences that make them disappointed with self

(Heath, 2011; Smith, 2014). This negative experience of disappointed with self is resulted from participating in AL activities and thus negative experience could cause dissonance to the individual and impede the preference to AL. In line with Smith's (2014) findings that students have had negative experiences in AL that make them to have unpleasant state to group learning in the future and thus experiencing psychological grief. Hence, the researcher anticipated that disappointed with self can be used to measure PtAL.

Lastly, other attitudinal state such as uncomfortable, unbothered, embarrassment, optimistic and confidence scored relatively higher in mean score. This suggesting that the respondents are preferring AL. The findings are in line with past literature that one's emotional state could influence one's behavior. The findings in the current study supported Mathias's (2014) that AL is affected by biology students' attitude in college level, as well as Hong's (2010) that measuring students' attitude toward collaborative learning (which is a form of AL) is important. Hence, the researcher anticipated that these constructs can be used to measure PtAL.

Up to this point, the PtAL can be initially defined and measured by Action, Perceived Values, Application into Life, Examination, Uncomfortable, Unbothered, Disappointed with Self, Embarrassment, Optimistic, and Confidence; a 10-factor model which needs further analysis to validate the model and give the conceptual definition of PtAL. The confirmation of the 10-factor model with measurement model analysis corroborates the association of 10 constructs with the theoretical construct of PtAL and construct validity of the PtAL is assured (more will be discussed in Chapter 7). Further analysis corroborated the validity of the scale.

Chapter Summary

This chapter presents the EFA's findings and its discussion in the process of developing PtAL Scale. Before performing EFA, the assumptions of EFA are checked. The number of factors is trimmed down from 13 to 10 factors. Poor factors are dropped when the factor did not have minimum 3 items. Hence, the H_2 alternative hypothesis is rejected.

The number of items of PtAL Scale are trimmed from 55 to 35 items, which composed of 10 factors. Poor items that do not load clearly and strongly onto one factor and/or cross-load with very similar loadings (cross-loadings differ by <0.1) onto other components are considered as poor item; however, theoretical basis are checked too before dropping the item. 20 items are dropped due to either (1) having correlation <0.3, (2) cross-loaded with other components with loadings <0.1, and (3) does not fit along with the other items in the same factors, based on theoretical basis.

The reliability analysis on PtAL Scale shows that it has good reliability. Almost all factors have Cronbach's alpha value above 0.7 and minimum CITC greater than 0.3.

The descriptive analysis showed 241 males and 189 females, age between 18 to 20. In the section of Discussion, the researcher supported the underlying factors emerged from the findings using past literature.

The finding shows that the respondents are somewhat moderately prefer AL. Also, the findings revealed that AL can be implemented in Southeast Asian education institution. Interestingly, the findings revealed that students perceived "neutral" regarding examination and grades matter. This challenged the common perception of

CHC learners that are regarded as high achievers and extrinsically motivated. Despite the arguments on the issue of extrinsically or intrinsically motivated, however, the researcher opined that the respondents do not mean to hold no opinion with regard to the items measuring examination matters. The researcher gave three reasons corresponding to the discussion of the interesting findings: 1) summation and average of scores gave the mean score to appear at midpoint of "neutral", 2) due to "face-saving don't know", and 3) the respondents could have an opinion but select the midpoint to avoid cognitive costs of selecting the most appropriate scale. In view of this, the researcher also suggested to conduct a further study to understand why chemistry students are "neutral" on the issue of examination.

Overall, the final model is a 10-factors model comprising of 35 items, and showed good reliability. Hence, the H_2 alternative hypothesis is rejected, that is Participation, Meaningful Learning, and Attitude did not emerge as the constructs of the PtAL Scale for the selected Chinese pre-university chemistry students, but Action, Percevied values, Application into Life, Examination, Uncomfortable, Unbothered, Dissappointed with Self, Embarassment, Optimistic, and Confidence emerged.

The 10-factor model of PtAL will be validated using PLS-SEM. It's findings and discussion will be presented in the next Chapter 7.

Chapter 7 Model Validation and Relationship between Confucian Heritage Culture and Preference to Active Learning

Introduction

In the earlier chapters, two scales were developed through a deeper conceptualisation on the definition of CHC and PtAL. Their findings were interpreted and discussed from various disciplinary perspectives. Each CHC and PtAL constructs have revealed an initial definition and model, which needs further analysis and validation in this chapter.

For the CHC construct, four underlying factors emerged from the findings and form the initial definition of CHC. It is worthwhile to highlight here on the more interesting findings revealed in the previous chapters. Firstly, the present study found the two-separate construct of Respect and Perseverance that were put forward initially in the hypothesis are needed to combine into a single construct. Hence, the Perseverance is not a suitable word to describe the phenomena. Instead, Principled is deemed to be more suitable. Secondly, the Chinese pre-university chemistry students as the respondents perceived the Harmony as "neutral"—the mean score of this Harmony sub-construct appeared to be at the midpoint "neutral". Several reasons were given by the researcher to support researcher's opinions that the result did not mean the respondents does not hold opinion with regard to the items. In fact, the action of selecting midpoint of "neutral" by the respondents supported their behavior that they are trying to save-face or maintaining harmony.

Whereas for the PtAL construct, ten underlying factors emerged from the findings and form the initial definition of PtAL. What is different in this study

compared to other study is that the findings revealed the Chinese pre-university chemistry students perceived "neutral" regarding examination and grade matters. Although this has challenged the common conception of Chinese learners, several reasons were given by the researcher to support researcher's opinions that the result did not mean the respondents does not hold opinion with regard to the items.

In this chapter, the objective is to explore the possible relationship between CHC and PtAL, in which to answer the third research question. Therefore, the question of "Would the values, beliefs, and attitudes embedded in CHC students affect their preference to active learning?" will be answered. At the same time, this chapter will be revealing more findings that challenge our conceptions of CHC students.

In order to explore the relationship between the CHC and PtAL and to give conceptual definitions on CHC and PtAL, in the Phase 2 of procedure, a new set of data are collected from 441 pre-university students using a self-developed questionnaire obtained from first phase comprising of 4 factors in the CHC Scale and 10 factors in the PtAL Scale. Smart-PLS (version 3.2.4) software is employed for the exploratory research. Results are reported as below.

Findings for the Analysis of Confucian Heritage Culture as a Reflective-Formative Second Order Construct

The Confucian Heritage Culture (CHC) construct is taken as reflective-formative type II second-order construct because the first-order constructs (i.e. RDI, DEP, HAR, and EDU constructs) are reflectively measured using reflective indicators and form a general concept that mediate the impact on CHC endogenous variable but these first-order constructs do not share a common cause among themselves (Becker, Klein, & Wetzels, 2012; Chin, 1998). Since each of the CHC constructs represents a separate concept (see Chapter 5), thus these constructs are not conceptually united and do not share a common cause among themselves, therefore, CHC has been taken as reflective-formative type II second order construct.

The Confucian Heritage Culture (CHC) construct is a second-order construct (or called as higher-order construct), which constitutes four constructs including (1) Principled, (2) Dependence on Teacher, (3) Harmony, and (4) Education as underlying first-order constructs, each with their specific indicators (Table 7.1). The second-order construct is modeled by using repeated indicator approach, where the CHC construct is indicated by all (24) the indicators taken from the first-order constructs. Consequently, the indicators have been used twice. The repeated indicator approach is used because the approach enables to estimate all the constructs simultaneously instead of estimating the second-order and first-order constructs separately, and therefore it avoids the interpretational confounding by taking consideration of the whole nomological network (Becker et al., 2012). Besides, Mode A is used for the second-order repeated indicators. Missing data is handled with imputation method.

Table 7.1

Indicators of CHC Construct

Construct (First-order construct)	Indicators of first-order construct	Number of indicator
Principled (RDI)	Res1, Res2, Res3, Res4, Res5, Res6, Per1 Per2, Per3, Per4	10
Dependence of Teacher (DEP)	Dep2, Dep3, Dep5, Dep6	4
Harmony (HAR)	Har1, Har2, Har3, Har4, Har5	5
Education (EDU)	Edu2, Edu3, Edu4, Edu5, Edu6	5
	Total	**24**

Measurement model analysis. First of all, the measurement model is evaluated for internal consistency, indicator reliability, and convergent validity. These are examined through the composite reliability (CR), factor loadings, and average variance extracted (AVE). For CR, 0.60 is the threshold criterion for exploratory study, values between 0.70–0.90 can be regarded as satisfactory, values >0.90 suggest undesirable internal consistency reliability (Hair, Hult, Ringle, & Sarstedt, 2014). Since this study aims to explore the key target constructs of CHC and develop theories in students' preference to active learning (an exploratory research), the threshold criterion for CR at 0.60 is used. The factor loadings with values >0.708 is recommended but loadings <0.7, 0.6, 0.5 or 0.4 is adequate if other loadings have high score of loadings to complement AVE and CR (Hair et al., 2014). Likewise, the AVE value >0.5 suggests an adequate convergent validity (Hair et al., 2014).

The initial model of reflective measurement model for CHC is shown in Appendix G. Table 7.2 depicts the assessment of internal consistency, indicator reliability, and convergent validity before the final measurement model is obtained in this study. As illustrated, the AVE for RDI and HAR are <0.50, therefore, low

loading indicators Per4 and Har4 are deleted to give the data shown on the right hand side of the Table 7.2. AVE of the constructs is then checked again, and noticed that Res4 and Har1 needed to be further deleted in order to yield a better value of AVE.

Table 7.2

Assessment of internal consistency, indicator reliability, and convergent validity before final measurement model

Construct		Initial				Per4 and Har4 are deleted			
	Indicator	Loading	CR	AVE	Remarks	Loading	CR	AVE	Remarks
Principled (RDI)	Res1	0.671	0.890	**0.453**	AVE<0.5	0.677	0.895	**0.488**	AVE<0.5
	Res2	0.703				0.702			
	Res3	0.771			Delete:	0.781			Delete:
	Res4	**0.555**			Per4 then	**0.555**			Res4
	Res5	0.719			Res4	0.724			
	Res6	0.650				0.653			
	Per1	0.793				0.795			
	Per2	0.741				0.741			
	Per3	0.627				0.621			
	Per4	**0.412**				---			
Dependence on Teacher (DEP)	Dep2	0.667	0.811	0.518		0.671	0.812	0.520	
	Dep3	0.755				0.760			
	Dep5	0.711				0.716			
	Dep6	0.742				0.734			
Harmony (HAR)	Har1	**0.558**	0.796	**0.446**	AVE<0.5	**0.569**	0.792	**0.495**	AVE
	Har2	0.580				0.588			beyond
	Har3	0.806			Delete:	0.818			0.5
	Har4	**0.553**			Har4 then	---			
	Har5	0.790			Har1	0.800			Delete:
									Har1
Education (EDU)	Edu2	0.624	0.857	0.547		0.625	0.857	0.547	
	Edu3	0.750				0.750			
	Edu4	0.805				0.806			
	Edu5	0.777				0.777			
	Edu6	0.729				0.728			

Table 7.3 depicts the final assessment of the internal consistency, indicator reliability and convergent validity of the 20 indicators (after further deletion of Res4 and Har1). As illustrated, the CR values of 0.895 (RDI), 0.810 (DEP), 0.800 (HAR), and 0.857 (EDU) indicated that these constructs possess internal consistency. Similarly, these constructs also demonstrated adequate convergent validity after removing indicators with low loadings. Hence, they achieved the minimum threshold value of 0.5 for AVE, which indicated that the indicators loaded to the respective constructs explained more than 50% of the constructs' variances (Hair et al., 2014).

Table 7.3

Assessment of internal consistency, indicator reliability, and convergent validity of the final measurement model

Construct	Indicator	Loading	Cronbach's alpha	rho A	CR	AVE	Convergent validity
Principled (RDI)	Res1	0.683	0.865	0.868	0.895	0.516	Yes
	Res2	0.700					
	Res3	0.784					
	Res5	0.714					
	Res6	0.653					
	Per1	0.809					
	Per2	0.755					
	Per3	0.633					
Dependence on Teacher (DEP)	Dep2	0.658	0.714	0.729	0.810	0.517	Yes
	Dep3	0.755					
	Dep5	0.716					
	Dep6	0.744					
Harmony (HAR)	Har2	0.584	0.648	0.709	0.800	0.577	Yes
	Har3	0.833					
	Har5	0.835					
Education (EDU)	Edu2	0.622	0.791	0.800	0.857	0.547	Yes
	Edu3	0.750					
	Edu4	0.805					
	Edu5	0.779					
	Edu6	0.729					

Discriminant validity is assessed using cross-loadings, Fornell-Larcker criterion, and Henseler's heterotrait-monotrait (HTMT) criterion. In assessing the cross-loadings, the outer loading of each indicator should be the highest on its respective constructs and the difference between loadings across other construct most not be ≤0.1(Chin, 1998; Snell & Dean, 1992). Whereas for the Fornell-Larcker criterion, the square root of AVE of a construct should be larger than the correlations with other constructs in the model, denoting that the constructs are distinctively different from one another (Hair et al., 2014). A more stringent assessment than the earlier criterion has been imposed by the HTMT criterion; HTMT criterion suggests that all constructs are distinctively different at $HTMT_{0.85}$ (Kline, 2011) and $HTMT_{0.90}$ threshold (Gold, Malhotra, & Segars, 2001; Henseler, Ringle, & Sarstedt, 2015).

Table 7.4 reveals that the outer-loading of each indicator is greater on its respective construct than its cross-loadings on other constructs, and no cross-loadings scores differ by ≤0.1. This denotes that each item clearly defines one construct.

Table 7.4

Cross-loadings

	DEP	EDU	HAR	RDI
Dep2	**0.658**	0.113	0.173	-0.020
Dep3	**0.755**	0.206	0.157	0.113
Dep5	**0.716**	0.146	0.226	-0.010
Dep6	**0.744**	0.260	0.180	0.145
Edu2	0.219	**0.622**	0.087	0.332
Edu3	0.216	**0.750**	0.057	0.348
Edu4	0.197	**0.805**	-0.012	0.448
Edu5	0.203	**0.779**	0.013	0.300
Edu6	0.196	**0.729**	-0.053	0.260
Har2	0.249	0.034	**0.584**	-0.025
Har3	0.199	0.022	**0.833**	0.042
Har5	0.165	0.010	**0.835**	0.067
Per1	0.062	0.341	0.001	**0.809**
Per2	0.062	0.311	0.016	**0.755**
Per3	0.138	0.421	-0.040	**0.633**
Res1	0.111	0.314	0.116	**0.683**
Res2	0.134	0.336	0.096	**0.700**
Res3	0.054	0.337	0.054	**0.784**
Res5	0.085	0.304	0.067	**0.714**
Res6	0.029	0.304	-0.013	**0.653**

In the second approach to examine the discriminant validity using the Fornell-Larcker criterion, the Table 7.5 reveals that the square root of AVE of each construct is greater than the correlations with other constructs in the model.

Table 7.5

Fornell-Larcker criterion

	DEP	EDU	HAR	RDI
DEP	**0.719**			
EDU	0.278	**0.740**		
HAR	0.246	0.024	**0.760**	
RDI	0.117	0.464	0.051	**0.719**

The third approach to examine the discriminant validity is by conducting HTMT criterion. Table 7.6 depicts that the HTMT value for all the constructs are below 0.85 and 0.90, indicates that the discriminant validity is achieved.

Table 7.6

HTMT criterion

	DEP	EDU	HAR	RDI
DEP				
EDU	0.332			
HAR	0.398	0.102		
RDI	0.155	0.555	0.144	

Formative second-order construct analysis. To examine the convergent validity of the reflective-formative second-order construct, a global indicator is used to summarise the essence of CHC construct by conducting redundancy analysis as suggested by Chin (1998). Following Hair et al. (2016) guidelines, the redundancy analysis for an exploratory study needs to be 0.6 and above. The model for the assessment of formative second-order construct of CHC is shown in Appendix I. As seen in Table 7.7, the formative constructs of CHC formative measures yield path coefficients of 0.720, more than 0.60, thus, the formatively measured constructs have sufficient degrees of convergent validity.

Besides, the multi-collinearity between indicators is assessed. Following Hair, Ringle and Sarstedt's (2011) guidelines, if VIF is 5 or higher, it indicates a potential collinearity problem. Besides, Diamantopoulos and Siguaw's (2006) guidelines suggested a more stringent criteria; If VIF 3.3 or higher, it indicates a potential collinearity problem. Based on the results shown in the Table 7.7, the predictors of CHC construct (RDI, DEP, HAR, and EDU) satisfy the inner VIF values and they are consistently below the threshold value of 0.5 and also 3.3. Therefore, it can be concluded that collinearity does not reach critical levels in the formative construct.

Table 7.7

Convergent validity and collinearity assessment

Construct	Convergent validity	Inner VIF
DEP	0.720	1.160
EDU		1.363
HAR		1.079
RDI		1.277

Lastly, the significance and relevance of the outer weights of the formative constructs are examined. The bootstrapping procedure using 1000 resamples is used to assess the significance of weight of the formative indicators. The result in Table 7.8 show that all formative indicators' weight are above the recommended value of 0.1 (Lohmöller, 1989). Besides, the Table 7.8 also reveals that all formative indicators are having significant t-values and therefore provided an empirical support to retain all the indicators (Hair et al., 2016).

Table 7.8

Testing of significance of weights

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	**P Values**
Dep → CHC	0.199	0.200	0.029	6.804	**0.00**
Edu → CHC	0.421	0.423	0.033	12.658	**0.00**
Har → CHC	0.101	0.100	0.027	3.749	**0.00**
Res → CHC	0.654	0.646	0.027	24.093	**0.00**

Findings for the Analysis of Preference to Active Learning as a Reflective-Formative Second-Order Construct

The assessment of Preference to Active Learning (PtAL) as a reflective-formative second-order construct is the same with CHC reflective-formative second-order construct, which has been reported and interpreted in the previous section. The same threshold value and criteria for each assessment are applied into this section.

Measurement model analysis. The initial model of reflective measurement model for PtAL is shown in Appendix J. Table 7.9 depicts the assessment of internal consistency, indicator reliability, and convergent validity before the final measurement model is obtained in this study. As illustrated, the AVE for ACT and DIS are <0.50, therefore, low loading indicators Par21 and Att8 are deleted, giving the final measurement model.

Table 7.9

Assessment of internal consistency, indicator reliability, and convergent validity before final measurement model

Construct	Indicator	Initial			
		Loading	CR	AVE	Remarks
Action (ACT)	Par9	0.704	0.802	**0.450**	AVE<0.5
	Par10	0.732			
	Par11	0.677			Delete: Par21
	Par12	0.639			
	Par21	**0.592**			
Perceived value (PER)	Par23	0.626	0.861	0.611	
	Par24	0.819			
	Par25	0.832			
	Mea1	0.830			
Application into life (APP)	Mea2	0.855	0.857	0.749	
	Mea3	0.876			
Examination (EXM)	Mea4	0.521	0.743	0.612	
	Mea5	0.976			
Disappointed with self (DIS)	Att8	**0.139**	0.831	**0.452**	AVE<0.5
	Att11	0.685			
	Att12	0.790			Delete: Att8
	Att13	0.910			
	Att14	0.781			
	Att15	0.715			
	Att16	0.319			
Uncomfortable (UNC)	Att1	0.811	0.856	0.544	
	Att2	0.713			
	Att3	0.769			
	Att4	0.641			
	Att5	0.744			
Confidence (CON)	Att22	0.857	0.866	0.682	
	Att23	0.800			
	Att25	0.820			
Optimistic (OPT)	Att19	0.786	0.866	0.683	
	Att20	0.855			
	Att21	0.836			
Embarrassment (EMB)	Att17	0.905	0.905	0.827	
	Att18	0.914			
Unbothered (UNB)	Att6	0.867	0.885	0.794	
	Att7	0.914			

The final model of reflective measurement model for PtAL is shown in Appendix K. Table 7.10 depicts the final assessment of the internal consistency, indicator reliability and convergent validity of the 33 indicators (after deletion of Par21 and Att8). As illustrated, the CR values of 0.813 (ACT), 0.861 (PER), 0.857 (APP), 0.751 (EXM), 0.908 (DIS), 0.856 (UNC), 0.865 (CON), 0.905 (EMB), and 0.885 (UNB) indicated that these constructs possess internal consistency. Similarly, these constructs also demonstrated adequate convergent validity after removing indicators with low loadings. Hence, they achieved the minimum threshold value of 0.5 for AVE, which indicated that the indicators loaded to the respective constructs explained more than 50% of the constructs' variances (Hair et al., 2014).

Although, the Cronbach's alpha for EXM is <0.6 (threshold value for an exploratory research), but this is acceptable because there are only two indicators in the construct which yielded a low Cronbach's alpha value. This is because Cronbach's alpha is sensitive to number of items in the scale (Cortina, 1993). It is also to be noted that although Cronbach's alpha is a traditional method to measure the reliability, however most researchers have highlighted the number of limitations of Cronbach's alphas even though it is the most common measure of reliability (Shook, Ketchen, Hult, & Kacmar, 2004). Therefore, composite reliability (CR) is a more superior choice. In the context of this study, since EXM has CR values of 0.751 (>0.60) but Cronbach's alpha is 0.487 (<0.60), the internal consistency of EXM is not an issue.

Table 7.10

Assessment of internal consistency, indicator reliability, and convergent validity of the final measurement model

Construct	Indicator	Loading	Cronbach's alpha	rho A	CR	AVE	Convergent validity
Action (ACT)	Par9	0.721	0.694	0.695	0.813	0.521	Yes
	Par10	0.760					
	Par11	0.716					
	Par12	0.689					
Perceived value (PER)	Par23	0.626	0.783	0.798	0.861	0.611	Yes
	Par24	0.818					
	Par25	0.831					
Application into life (APP)	Mea1	0.832	0.666	0.668	0.857	0.749	Yes
	Mea2	0.855					
	Mea3	0.876					
Examination (EXM)	Mea4	0.549	**0.487**	0.993	0.751	0.619	Yes
	Mea5	0.968					
Disappointed with self (DIS)	Att11	0.733	0.892	0.949	0.908	0.627	Yes
	Att12	0.872					
	Att13	0.912					
	Att14	0.841					
	Att15	0.809					
	Att16	0.520					
Uncomfortable (UNC)	Att1	0.808	0.793	0.811	0.856	0.545	Yes
	Att2	0.719					
	Att3	0.768					
	Att4	0.647					
	Att5	0.739					
Confidence (CON)	Att22	0.858	0.769	0.786	0.865	0.682	Yes
	Att23	0.798					
	Att25	0.821					
Optimistic (OPT)	Att19	0.784	0.768	0.773	0.866	0.682	Yes
	Att20	0.854					
	Att21	0.838					
Embarrassment (EMB)	Att17	0.906	0.791	0.792	0.905	0.827	Yes
	Att18	0.913					
Unbothered (UNB)	Att6	0.866	0.742	0.765	0.885	0.793	Yes
	Att7	0.915					

Discriminant validity is assessed using three approaches namely cross-loadings, Fornell-Larcker criterion, and Henseler's heterotrait-monotrait (HTMT) criterion. Table 7.11 reveals that the outer-loading of each indicator is greater on its respective construct than its cross-loadings on other constructs, and no cross-loadings scores differ by ≤0.1. This denotes that each item clearly defines one construct.

Table 7.11

Cross-loadings

	ACT	PER	APP	EXM	DIS	UNC	CON	OPT	EMB	UNB
Par9	**0.721**	0.216	0.233	0.019	0.057	-0.0200	0.246	0.198	0.081	0.072
Par10	**0.760**	0.280	0.154	0.125	0.053	0.070	0.236	0.229	0.072	0.069
Par11	**0.716**	0.287	0.207	0.015	0.041	0.128	0.213	0.248	0.055	0.110
Par12	**0.689**	0.256	0.212	0.092	0.098	0.042	0.244	0.254	-0.038	0.018
Par23	0.324	**0.626**	0.235	0.056	0.031	0.149	0.244	0.277	0.063	0.007
Par24	0.254	**0.818**	0.328	0.172	-0.050	0.129	0.192	0.383	0.046	0.022
Par25	0.289	**0.831**	0.375	0.142	-0.070	0.176	0.211	0.470	0.013	0.036
Mea1	0.277	**0.832**	0.440	0.234	-0.100	0.223	0.253	0.443	0.005	0.072
Mea2	0.244	0.369	**0.855**	0.089	0.029	0.187	0.226	0.377	0.075	0.115
Mea3	0.237	0.408	**0.876**	0.165	-0.078	0.180	0.322	0.429	-0.005	0.142
Mea4	-0.077	-0.008	-0.055	**0.549**	0.101	0.230	0.015	0.056	0.098	0.113
Mea5	0.123	0.229	0.185	**0.968**	0.097	0.379	0.072	0.185	0.134	0.213
Att11	0.032	-0.065	0.031	0.145	**0.733**	0.127	-0.038	-0.089	0.233	0.093
Att12	0.045	-0.098	-0.093	0.117	**0.872**	0.152	-0.044	-0.143	0.261	0.136
Att13	0.076	-0.048	-0.029	0.092	**0.912**	0.174	0.010	-0.025	0.297	0.137
Att14	0.089	-0.034	-0.011	0.066	**0.841**	0.137	0.004	-0.084	0.256	0.033
Att15	0.072	-0.086	-0.085	0.069	**0.809**	0.111	-0.040	-0.115	0.264	0.076
Att16	-0.106	-0.097	-0.083	0.085	**0.520**	0.152	-0.150	-0.102	0.309	0.007
Att1	0.080	0.239	0.205	0.370	0.125	**0.808**	0.131	0.254	0.262	0.364
Att2	0.075	0.072	0.034	0.230	0.205	**0.719**	0.083	0.012	0.296	0.287
Att3	0.020	0.165	0.132	0.220	0.122	**0.768**	0.110	0.086	0.366	0.367
Att4	0.099	0.073	0.092	0.241	0.168	**0.647**	0.028	0.045	0.278	0.219
Att5	0.035	0.206	0.264	0.362	0.047	**0.739**	0.030	0.174	0.249	0.463
Att22	0.279	0.297	0.288	0.068	-0.033	0.127	**0.858**	0.470	-0.019	0.086
Att23	0.271	0.215	0.229	0.034	-0.002	0.002	**0.798**	0.319	-0.107	-0.039
Att25	0.256	0.186	0.266	0.063	0.018	0.121	**0.821**	0.328	0.033	0.030
Att19	0.267	0.371	0.339	0.071	-0.129	0.174	0.370	**0.784**	0.026	0.070
Att20	0.279	0.378	0.373	0.080	-0.048	0.050	0.370	**0.854**	-0.062	0.079
Att21	0.256	0.502	0.435	0.270	-0.047	0.197	0.396	**0.838**	-0.029	0.079
Att17	0.066	0.023	0.051	0.114	0.292	0.342	-0.019	-0.034	**0.906**	0.248
Att18	0.041	0.044	0.021	0.148	0.271	0.362	-0.040	-0.015	**0.913**	0.284
Att6	0.023	0.035	0.089	0.171	0.005	0.447	0.014	0.067	0.205	**0.866**
Att7	0.133	0.047	0.169	0.213	0.185	0.400	0.051	0.095	0.308	**0.915**

In the second approach to examine the discriminant validity using the Fornell-Larcker criterion, the Table 7.12 reveals that the square root of AVE of each construct is greater than the correlations with other constructs in the model.

Table 7.12

Fornell-Larcker criterion

	ACT	APP	CON	DIS	EMB	EXM	OPT	PER	UNB	UNC
ACT	**0.722**									
APP	0.278	**0.866**								
CON	0.324	0.318	**0.826**							
DIS	0.086	-0.031	-0.009	**0.792**						
EMB	0.059	0.039	-0.033	0.309	**0.909**					
EXM	0.088	0.148	0.068	0.113	0.144	**0.787**				
OPT	0.323	0.466	0.459	-0.089	-0.027	0.179	**0.826**			
PER	0.362	0.449	0.287	-0.067	0.037	0.200	0.511	**0.781**		
UNB	0.094	0.149	0.039	0.117	0.293	0.218	0.092	0.047	**0.891**	
UNC	0.081	0.212	0.108	0.170	0.387	0.396	0.174	0.219	0.472	**0.738**

The third approach to examine the discriminant validity is by conducting HTMT criterion. Table 7.13 depicts that the HTMT value for all the constructs are below 0.85 and 0.90, indicates that the discriminant validity has achieved.

Table 7.13

HTMT criterion

	ACT	APP	CON	DIS	EMB	EXM	OPT	PER	UNB	UNC
ACT										
APP	0.412									
CON	0.446	0.438								
DIS	0.119	0.109	0.077							
EMB	0.115	0.064	0.082	0.400						
EXM	0.210	0.260	0.114	0.196	0.230					
OPT	0.442	0.646	0.584	0.142	0.061	0.231				
PER	0.496	0.613	0.366	0.120	0.064	0.271	0.645			
UNB	0.139	0.205	0.083	0.124	0.375	0.330	0.120	0.061		
UNC	0.147	0.271	0.141	0.225	0.495	0.592	0.218	0.258	0.603	

Formative second-order construct analysis. To examine the convergent validity of the reflective-formative second-order construct, a global indicator is used to summarise the essence of PtAL construct by conducting redundancy analysis as suggested by Chin (1998). The model for the assessment of formative second-order construct of PtAL is shown in Appendix L. As seen in Table 7.14, the formative constructs of PtAL formative measures yield path coefficients of 0.654, less than 0.60 (for exploratory research) (Hair et al., 2016), thus, the formatively measured constructs have sufficient degrees of convergent validity.

Besides, the multi-collinearity between indicators is assessed. Based on the results shown in the Table 7.14, the predictors of PtAL construct (ACT, APP, CON, DIS, EMB, EXM, OPT, PER, UNB, and UNC) satisfy the inner VIF values and they are consistently below the threshold value of 0.5 (Hair et al., 2016) and also 3.3 (Diamantopoulos & Siguaw, 2006). Therefore, it can be concluded that collinearity does not reach critical levels in the formative construct.

Table 7.14
Convergent validity and collinearity assessment

Construct	Convergent validity	Inner VIF
ACT	0.654	1.278
APP		1.439
CON		1.349
DIS		1.135
EMB		1.290
EXM		1.222
OPT		1.723
PER		1.599
UNB		1.342
UNC		1.660

Lastly, the significance and relevance of the outer weights of the formative constructs are examined. The bootstrapping procedure using 1000 resamples is used to assess the significance of weight of the formative indicators. The result in Table 7.15 show that all formative indicators' weight are above the recommended value of 0.1 (Lohmöller, 1989). Besides, the Table 7.15 also reveals that all formative indicators except DIS and EMB indicators, are having significant t-values and therefore provided an empirical support to retain all the indicators (Hair et al., 2016). DIS formative indicator is retained although it is not having significant t-values because after reviewing it from the theoretical basis, it is found that DIS and EMB are theoretically suitable to measure negative attitude of PtAL.

Table 7.15

Testing of significance of weights

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	**P Values**
ACT → LP	0.223	0.217	0.024	9.215	**0.000**
APP → LP	0.174	0.17	0.014	12.057	**0.000**
CON → LP	0.215	0.21	0.023	9.166	**0.000**
DIS → LP	0.058	0.102	0.075	0.775	**0.439**
EMB → LP	0.055	0.053	0.029	1.922	**0.055**
EXM → LP	0.076	0.073	0.014	5.385	**0.000**
OPT → LP	0.269	0.263	0.021	12.68	**0.000**
PER → LP	0.312	0.304	0.027	11.769	**0.000**
UNB → LP	0.090	0.087	0.023	3.909	**0.000**
UNC → LP	0.233	0.223	0.045	5.171	**0.000**

Findings for the Analysis of Structural Model

Prior to assessing the structural model, it is important to ensure that the lateral collinearity issue (predictor-criterion collinearity) is not present in the structural model, so that the collinearity issue will not mislead the findings in a stealth way even though the criteria of discriminant validity (vertical collinearity) are met (Kock & Lynn, 2012). The collinearity issue could occur when two variables that are hypothesised to be causally related measure the same construct. Table 7.16 presents the outcome of lateral collinearity test of the model in this study. As shown in the table, the inner VIF value is below 3.3 (Diamantopoulos & Siguaw, 2006), showing that lateral collinearity is not a concern in this study.

Table 7.16

Lateral collinearity assessment

	CHC	LP
CHC		1.00
LP		

Table 7.17 illustrated the results of path-coefficient assessment using bootstrapping procedure for the hypothesised relationship. The relationship is found to have t-value >1.96, thus significant at 0.05 level of significance (Hair et al., 2016). In other words, CHC has a significant relationship with PtAL. Specifically, the predictor of CHC (β=0.413, $p<0.05$) has a positive relationship with PtAL, which explains 17.1% of the variance in LP. This result supports our H_3 alternative hypothesis in this study, that is CHC has a significant relationship with PtAL, in fact, the CHC has a positive effect onto PtAL. Meanwhile, the coefficient of

determination, R^2 value of 0.171 is above the 0.13 value as suggested by Cohen (1988) and indicates a moderate model.

Table 7.17

Path coefficient, coefficient of determination, effect size, and predictive relevance assessment

Relationship	Std. beta	Std. error	t-value	P value	decision	R^2	f^2	Q^2
CHC → LP	0.413	0.039	10.461	0.00	supported	0.171	0.206	0.169

Next, the effect size, f^2, is assessed to examine the relative impact of a predictor construct on an endogenous construct. Sullivan and Fein (2012) asserted that "While a p-value can inform the reader whether an effect exists, the p-value will not reveal the size of the effect. In reporting and interpreting studies, both the substantive significance (effect size) and statistical significance (p-value) are essential results to be reported". To measure the effect size, Cohen (1988) guideline is used; values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects respectively. From the Table 7.17, the f^2 value is 0.206 indicates that CHC has a medium effect in producing the R^2 for PtAL.

In addition, the predictive relevance of the model is examined using the blindfolding procedure. If the Q^2 value is larger than 0, the model has predictive relevance for a certain endogenous construct (Geisser, 1975; Hair et al., 2016; Stone, 1974). In this study, the Q^2 value of 0.169 is more than 0, indicating that the model has sufficient predictive relevance over PtAL construct.

Findings for the Descriptive Analysis

The second batch of new sample consisted of 441 Chinese pre-university students from different programmes. Of these, 283 males and 158 females (64.2% and 35.8% respectively) between ages of 18 to 20 (378 aged 18 (85.7%), 48 aged 19 (10.9%), 15 aged 20 (3.4%)). Of these 441 Chinese students, 19% are from Selangor, 12% are from Kuala Lumpur, 11% are from Penang, 10% are from Johor, 9% are from Sabah, 8% from Sarawak, 7% from Perak, 5% are from Melaka, 19% are from other states. More details about the type of primary school, type of secondary school, parents' ability to speak Chinese, and parents' ability to read Chinese of these 441 Chinese students, are projected as below.

Table 7.18

Respondents' profile

		n	%
Gender	Male	283	64.2
	Female	158	35.8
Age	18	378	85.7
	19	48	10.9
	20	15	3.4
States	Selangor	84	19
	Kuala Lumpur	53	12
	Penang	49	11
	Johor	43	10
	Sabah	40	9
	Sarawak	35	8
	Perak	31	7
	Melaka	22	5
	Others	84	19
Type of primary school	SK	0	0
	SJK (Cina)	441	100
	SJK (Tamil)	0	0
	International school	0	0
	Homeschooling	0	0
Type of secondary school	SMK	307	69.6
	Chinese Independent School	23	5.2
	SMJK	100	22.7
	International school	8	1.8
	Homeschooling	3	0.7
Parents' ability to speak Chinese	Yes, can	441	100
	No, cannot	0	0
Parents' ability to read Chinese	Yes, can	430	97.5
	No, cannot	11	2.5

Discussion

The third research objective of this study was to explore the relationship between CHC and PtAL for the selected Chinese pre-university chemistry students, and thus the research model and conceptual definition of CHC and PtAL were determined at the same time. The present study was a first attempt to empirically examine this relationship in the context of Chinese pre-university chemistry students. Before the relationship between CHC and PtAL was examined, the dimensionality of both CHC and PtAL models were validated to establish the conceptual definition of CHC and PtAL. Hence the following discussion discussed on 1) the interpretation of the findings based on model validation of CHC, 2) the interpretation of the findings based on model validation of PtAL, and 3) the relationship between CHC and PtAL.

Model Validation of CHC. This study uses a multi-dimensional scale to assess the CHC of Chinese pre-university chemistry students and to establish a conceptual definition of CHC. While previous studies have also used multi-dimensional scales to assess CHC (Hofstede et al., 2010; Liu & Feng, 2015; Matthews, 2000; Siah et al., 2015; Tan et al., 2007; The Chinese Culture Connection, 1987; Wang, Liu, Sun, Lim, & Chatzisarantis, 2010), but none have developed CHC as a single integrated construct. Few studies have assessed individual dimensions of CHC and examined the effects of these dimensions on various aspects of students' behaviours such as argumentation skill (Foong & Daniel, 2013), and students' perceptions of teachers' behaviours (Stork & Hartley, 2011). However, the present study assessed CHC as an integrated formative construct and the results of the assessment of the measurement model demonstrated the acceptability of CHC as an

integrated formative construct inclusive of Principled, Dependence on Teacher, Harmony, and Education, and the model has been validated to consist of first-order reflective constructs. This findings are supported by prior qualitative research findings showing that CHC is associated with Principled, Dependence on Teacher, Harmony, and Education. (Liu & Feng, 2015; Nguyen et al., 2005; Stork & Hartley, 2011; Tran, 2013).

Assessing CHC as an integrated construct is quite consistent with the basic definition of the CHC concept, that CHC is the setting of an ethnically Chinese social value system derived from the Confucian ethos (Biggs, 1998; Zhang, 2013). Moreover, the findings demonstrated the acceptability of having developed Principled, Dependence on Teacher, Harmony, and Education as first order reflective construct, and CHC as second order reflective-formative construct. In other words, the results verified the establishment of Principled, Dependence on Teacher, Harmony, and Education constitute formative dimensions of CHC. Although previous studies might not have examined CHC as higher order construct, when the findings of these earlier studies are examined more closely in terms of categorising these constructs as totality of Chinese values, and many times these constructs are combined with other constructs which are often not applicable into classroom setting in forming the totality of Chinese values (Hofstede et al., 2010; Matthews, 2000; Siah et al., 2015; The Chinese Culture Connection, 1987), the results of the present study are quite consistent with the findings of these past studies.

The most interesting finding was that the Dependence on Teacher was revealed as part of characteristics of CHC. The finding was unexpected and suggests that Dependence on Teacher is not the teaching of Confucianism, but rather a

characteristic formed in the CHC community through the rapid social change and modernisation within the Asian culture. This finding in the present study is in agreement with O'Dwyer (2016) assertions that CHC thesis needs to be drawn from the perspective of philosophical, psychological and political science.

Consistent with findings by Tran (2013), we found that the other constructs of Principled, Harmony, and Education are the major themes of CHC. As discussed in the previous chapter (Chapter 5 Development of Confucian Heritage Culture Scale), although the findings from the previous chapter lead to the combination of Principled into a single construct, as well as revealing the mean score of Harmony construct appeared to be at the midpoint "neutral" as perceived by the respondents, these decisions are supported through the analysis of measurement model and analysis of formative second order construct for CHC, the findings show that the Principled, and Harmony, both of the constructs constitute the formative construct of CHC. In other words, the findings demonstrated the acceptability of having Principled, and Harmony (together with the other constructs) are to be integrated into CHC single construct.

Siah et al. (2015) found that hierarchy, industriousness, harmony, conflict avoidance and adaptation are the major themes in traditional Chinese values. A possible explanation for this is that these major themes are rooted in Confucianism. As mentioned in the teaching of Confucianism:

> 物格而后知至；之至而后意诚；意诚而后心正；心正而后身修；身修而后家齐；家齐而后国治；国治而后天下平；自天子以至于庶人。
> Extending knowledge and investigating things to obtain knowledge and education, then to sincerity, then to a right mind and heart, to the cultivation of the person, to the taking care of the family, and governing of the people properly, and peace for all will be achieved.

Having educated in a multicultural environment has been regarded highly by the Chinese people in CHC. The level of commitment to education is reflected in their willingness to pay for education fees, time and effort to nurture their children in character building and academic. Siah et al. (2015) found that Chinese students perceived self-development is the most important cultural value. This result suggested that development of oneself is related to their ability to contribute to society; hence they regarded education as important. Our findings also supported the idea's by Huang and Gove (2012) that certain Confucian values such as value of education and harmony will not be affected by age in a significant way, in other words these value are slow to change. Therefore, these values (Education and Harmony) have been measured and confirmed successfully as characteristics of CHC.

The discussion above revealed the importance of education in CHC as reflected in the statistical analysis in the present study. Then, how does CHC perceive the value of *respect*?

Siah et al. (2015) found students perceived Confucian ethos such as respect as important. Huang and Gove (2012) reported that the virtue of filial piety and hierarchy are portraited first in the family context and have been extended to school, organisation, and society level. Respect, being an essential part of the teaching of *li*, has been articulated by Confucius. Confucius inferred a disciple that he lacked respect and modesty, and extrapolated his potential development that he would not be able to contribute much to society and live a graceful life with dignity, and therefore will be a burden to society like a thief. (原壤夷俟。子曰：‘幼而不孫弟，长而无

述焉，老而不死，是为贼。’以仗叩其胫。). The finding of the present study is also consistent with Tan (2013) which has pointed out that respectful to one's superior and stressing the hierarchical roles and cultivating oneself. This is in line with Confucius teaching shown in the following verse:

> 子谓子产，‘有君子之道四焉：其行己也恭，其事上也敬，其养民也惠，其使民也义。’
> The Master talked about Zichan, "He possessed four qualities of *junzi*: he was polite in his conducts, respectful in serving his ruler and superiors, caring and generous in governing his people, and his conducts are appropriate for his people.

Did Confucianism advocate harmony? The answer is yes, and it is through the teaching of *He*. But have Confucianism teach his followers to avoid confrontation leading to be passive learners? The answer is no, to the interpretation and understanding of the researcher. Then why would the students become passive, does not speak up, or avoid confrontation? And, how much of this concept of harmony is affecting the CHC, and thus affecting students' behavior in AL?

Our findings further support the idea by Huang and Gove (2012) that Chinese promotes the concept of harmony in human relationships. To maintain harmony, avoiding conflicts is the quickest way. However, the real teaching of Confucianism is to articulate their disagreements with their superiors or parents appropriately with the observance of *li*, as mentioned in the *Analects*:

> 子曰：‘事父母几谏，见志不从，又敬不违，劳而不怨。’
> The Master said, "When you noticed the mistakes of your parents during serving them, explain and advise to them accordingly, if your parents do not agree, you still need to be respectful, and continue serving them without blames and complains.

Besides, Confucius also advocates the concept of learning through active reflection, asking and seeking answers to questions, through *li*. Supported by the teaching in *Analects*:

> 子曰：‘学而不思则罔，思而不学则殆。’
> The Master said, "Study without thinking will become lost and confused. Think without learning will become tired and has no outcome.

In line with Tan's (2013) idea, the researcher therefore thinks that the possible explanation for these result is due to the rapid social change and modernisation in Southeast Asia and East Asia which contribute to Asian values. Another possible explanation could be due to the misinterpretation on the real teaching of Confucianism by the masses.

New-Confucianism believed that the oppressive government did not practice the "real" Confucianism (or pure doctrine), in fact, the development of the "real" Confucianism was stopped by them, because the "real" Confucianism would advocate ideas of democracy and expressing disagreement in accordance of *li*. Therefore, what was understood and practiced by the masses were not the real teaching of Confucianism leading to misinterpretation by the masses.

Model Validation of PtAL. This study uses a multi-dimensional scale to assess the PtAL of Chinese pre-university chemistry students and to establish a conceptual definition of PtAL. While previous studies have also used multi-dimensional scales to assess PtAL (Covill, 2011; DeMonbrun et al., 2017; Littlejohn & Foss, 2010; Martinie, Milland, & Olive, 2013; Struyven, Dochy, & Janssens, 2008; Gilbert, 2012), few have developed PtAL as a single integrated construct (DeMonbrun et al., 2017). Most studies have assessed individual dimensions of PtAL and examined the effects of these dimensions on various aspects of students' behaviours such as seating arrangement (Lofty, 2012), argumentation (Kulatunga, Moog, & Lewis, 2013), and critical thinking (Keeley, 2014). However, the present study assessed PtAL as an integrated formative construct and the results of the assessment of the measurement model demonstrated the acceptability of PtAL as an integrated formative construct inclusive of Action, Perceived Value, Application into Life, Examination, Disappointed with Self, Uncomfortable, Confidence, Optimistic, Embarrassment, and Unbothered, and the model has been validated to consist of first-order construct. This findings are supported by prior qualitative research findings showing that PtAL is associated with Action, Perceived Value, Application into Life, Examination, Disappointed with Self, Uncomfortable, Confidence, Optimistic, Embarrassment, and Unbothered (Aguinis, Gottfredson, & Joo, 2013; DeMonbrun et al., 2017; Mentor & Gay, 2013; Metzger, Hartsell, & Flanagin, 2015; Pundak, Herscovitz, Shacham, & Wiser-Biton, 2009).

Assessing PtAL as an integrated construct is consistent with the basic definition of the PtAL concept, that PtAL is the participation, engagement, and emotion of students toward active learning (Finelli et al., 2014; Fredricks & McColskey, 2012; Shekhar et al., 2015; Trowler, 2010; van Veen, Krug, Schooler, &

Carter, 2009). Moreover, the findings demonstrated the acceptability of having developed Action, Perceived Value, Application into Life, Examination, Disappointed with Self, Uncomfortable, Confidence, Optimistic, Embarrassment, and Unbothered as first order reflective construct, and PtAL as second order reflective-formative construct. In other words, the results verified the establishment of Action, Perceived Value, Application into Life, Examination, Disappointed with Self, Uncomfortable, Confidence, Optimistic, Embarrassment, and Unbothered constitute formative dimensions of PtAL. Although previous studies might not have examined PtAL as higher order construct, when the findings of these earlier studies are examined more closely in terms of categorising these constructs as totality of students' resistance, and many times these constructs are combined with other constructs which are often measuring other constructs such as course satisfaction, and teachers' attribute when conducting AL (Shekhar et al., 2015; Struyven et al., 2008), the results of the present study are quite consistent with the findings of these past studies.

Surprisingly, what is different in this study compared to other studies is that the present study found Chinese students prefer AL. This result agree with the findings by Kember (2000) that although there are widespread of beliefs that CHC students tend to resist the introduction of student-centred learning activities and prefers to be passive learners, however the conclusion in Kember's study was that this is only perceptions and was not grounded on facts. The present study with empirical evidence matches Kember's claim that students prefer AL.

The results show some dissonance between the perception of teacher (the researcher) with the students' perception. As like most of the past literature, the

researcher would have hypothesised that student would score lowly on the PtAL Scale, thus showing not preferring AL. This discrepancy could be due to the lack of cultural understanding, preconceived ideas or other hidden factors. Our explanation for this result in consistent with Baker and Clark (2010) that cultural understanding is needed for New Zealand teachers to understand better on international students especially who come from CHC background to bridge the gap between their past educational experiences and typical educational practices in New Zealand. Baker and Clark reported that there have been significant cultural differences shown in international students in their perception on group learning. Generally, in their study, they found that Chinese students prefer individual learning more than teamwork, felt a waste of time in group learning, and prefers competitive learning. Therefore, the present study also show contradicting result from that of Baker and Clark (2010) and Nguyen et al. (2005).

As discussed in the previous chapter (Chapter 6 Development of Preference to Active Learning), although the findings from the previous chapter revealed the mean score of Examination construct appeared to be at the midpoint "neutral" as perceived by the respondents, these decisions are supported through the analysis of measurement model and analysis of formative second order construct for PtAL, the findings show that the Examination construct constitute the formative construct of PtAL. In other words, the findings demonstrated the acceptability of having Examination (together with the other constructs) are to be integrated into PtAL single construct. This finding is supported by past literature (Morrison, 2006; Tan & Yates, 2011; Tsai et al., 2011) that Chinese students regard examination and grades highly.

In general, through the validation of both CHC and PtAL models, CHC is now defined as the extent of experienced culture (beliefs and attitude) to which Chinese people who has shared strong Confucian heritage possesses characteristics in principled, dependence on teacher, harmony, and education; while PtAL is now defined as the extent to which a student possesses qualities in action, perceived value, application into life, examination, disappointed with self, uncomfortable, confidence, optimistic, embarrassment, and unbothered when engaging in AL activities in a chemistry classroom.

Predictive Relationship. Although learning of a CHC student can be affected by many factors, the findings of the present study point out that CHC is significantly related, in fact with positive effect to Chinese students' preference to AL in a chemistry learning. Hence, the H_3 alternative hypothesis is supported, with an added value, that the relationship is actually a positive effect. In fact, what is shown by Liu and Feng (2015), and Tan et al. (2007) have now been quantitatively measured and our results are complementing the previous qualitative findings. Therefore, the findings of the present study supported the third hypothesis, H_3, that there is a significant relationship between CHC and PtAL, with CHC having positive effect onto PtAL, for the selected Chinese pre-university chemistry students. In other words, if the Chinese students perceived the experienced culture (beliefs and attitude) who has shared a strong Confucian heritage outweighed the costs and problems of engaging in AL to be rewarding, they were inclined towards or preferring AL; and if they perceived that the costs and problems of engaging in AL outweighed the experienced culture (beliefs and attitude) and not to be worthwhile, they were resisting, not inclined towards or not preferring AL.

Nevertheless, the findings of the present study obtained from structural model analysis show that the structural model is a moderate model with medium effect. In other words, other than CHC cultural factors are related to PtAL, there are also other factors relating to PtAL. The model also gives sufficient predictive relevance over PtAL. Congruent with past findings (Abdullah et al., 2012; Campos-Sánchez et al., 2014; Hsiung, 2012; Mustapha, Nik Abd Rahman, et al., 2010; Sand-Jecklin, 2007), other factors such as learning style, learning approach, personality, motivational aspect, teacher attributes etc. could also contributing to Chinese students' preference to AL. In fact, the result is consistent with that of Struyven et al. (2008) there could

be other reason such as lecturers' pace of instruction and clarity that could also influence students' preference to a particular teaching instruction.

Due to the exploratory of relationship between CHC and PtAL, the present study provides a new development of theory on students' preference to AL that CHC culture influence PtAL that can be explained from the theories of purposive behaviorism, constructivism, and cognitive dissonance theory.

The present study provides further evidence that, among Chinese students, development of chemistry learning need to be done through communication, argumentation, and negotiation as in AL activities, and this is affected by cultural context. It seems that the result of the present study is supported by Lin et al. (2013) where science is cultural-dependent.

The findings in the present study corroborates the ideas of Penfold and van der Veen's (2014) that the learning approach (deep or surface learning) adopted by Hong Kong Chinese students is related with cultural factor. This also accords with past literature by Lizzio, Wilson, and Simons (2002) who suggested that personal and situational factors influence students' learning process and thus the learning outcomes. The learning process shall determines the conceptions of learning-and-teaching whether employing student-centred or teacher-centred learning; student-centred learning is related with deep learning, and teacher-centred is related to surface learning approach (Biggs, 1996; Penfold & van der Veen, 2014). In the context of this study, the personal experience or feelings gained by students during schooling experience will influence students' learning process and therefore determine their choice of employing student-centred or teacher-centred learning. The findings of the current study have proven this argument.

The findings of the present study reflect a significant relationship between CHC and PtAL, especially by the Chinese pre-university chemistry students, and experiencing cognitive dissonance while participating in AL activities. Sweeney, Hausknecht, and Soutar (2000) refer to the consumer's feelings that one may have been influenced against his/hers beliefs (Parumasur & Parumasur, 2016). Cognitive dissonance theory has normally been investigated in the business and marketing research. In the present study, however, the Chinese students reported that they did not have negative emotional state and that they preferred AL. As pointed out by Bell (1967), some consumers may not be cognitively dissonant, because dissonance may be influenced by the personality type of the consumer. Therefore, the researcher, from the findings of the present study although revealed that students did not experience negative emotional state, however, the students should not be assumed that cognitive dissonance did not occur. Instead, the researcher argued that dissonance may have occurred but did not affect students' preference to AL, they continued liking AL despite their emotional states has been aroused. One possible explanation to this phenomenon could be due to the reason proposed by Bell (1967) that personality type also influence dissonance. A student who is more self-confidence would have experience lower dissonance.

The statistical findings obtained from the present study show that the CHC is moderately related to students' PtAL. But how does the CHC is related to PtAL from the theoretical perspective? In the section below, the theoretical explanation grounded on purposive behaviorism theory, cognitive dissonance theory, and constructivism shall detail the relationship.

Applying Hofstede's (2010) cultural dimension theory, when a child has been born in a Chinese family, the human nature is inherited within her genes that determine her physical and basic psychological functioning. With the human ability, the child can feel love, joy, sadness, fear, anger, and shame. However, how the child does to these feelings or expresses these feelings is governed by culture. This is the first step in environment where the child is exposed and learned the cultural traits. When the child is sent to a primary Chinese school, allowing her to expose and learn from the CHC learning environment including the teaching and learning style, socially acceptable ways of communicating with adults, teachers, and friends. On the other hand, the personality of the child is inherited and partly learned from the environment, both influencing her personal experiences.

The findings of the present study are congruent with Hofstede's (2010) cultural dimensional theory, that values are the deepest manifestations of culture, rituals, heroes, and symbols are subsumed under practices. These four manifestations of culture can be represented as the skins of an onion, values are the core of onion, symbols is the most superficial layer of skin, with heroes and rituals in between. In the present study, the two constructs of Principled as well as Education which strongly adhere to the characteristics of CHC, could be represented as the core of characteristics of CHC, and forming the core values of CHC. Whereas, the Dependence on Teacher and Harmony could be the socially essential practices in CHC which are regularly copied from other culture, visible to an outside observer (which are then normally viewed as passive learning and obedience); however, the cultural meaning of Dependence on Teacher and Harmony are invisible and lies precisely and only in the way these practices are interpreted by the Chinese students, because it has been the practice since young so even if they do not realise that they

have been cultivating these culture and practices. These practices evolved and developed as the society rapidly changes. As discussed earlier, Confucianism teaching has not advocated dependence on teacher, but the findings from the present study revealed that it has been a practice in CHC. Meanwhile, Confucianism teaching advocated harmony (*He*), however, the findings from the present study revealed that students with CHC background has strong opinion but are shy to admit regarding harmony issue. These show that the cultural traits will evolve according to rapid social change.

Supported by constructivism and cognitive dissonance theory, Chinese students in an AL environment are externally stimulated and guided from teachers or more capable peers through social interaction. Cognitive conflicts may happen during these interactions. The knowledge of students grow from students' actual development level to students' potential development level, when relating the incoming new information with old information which has been stored in their existing cognitive structures (Liu & Ju, 2010; Tolman, 1932; Vygotsky, 1978). If the new information can be linked and assimilated to the old information, a cognitive equilibrium has achieved. However, if the new information cannot be linked to the old information, and the old information needs to be changed to deal with the new information, accommodation and cognitive disequilibrium are said to have happened (Piaget, 2013).

However, the conflicts of a Chinese students experienced in an AL environment is not restricted to cognitive conflicts; other form of experience gained from the external environment (AL environment) such as contradictory beliefs, opinions, and attitudes can arouse an unpleasant emotional state (Festinger, 1957;

Matz & Wood, 2005; Piaget, 2013; Tolman, 1932). For example, when a student believes that being silent and not expressing himself is a form of showing respect to others or some student feel that doing AL is a waste of time as information searching by themselves may be less accurate than the one provided by teachers. These internal views may contradict with the external view experienced from social values and CHC background.

Grounded on purposive behaviorism theory and cognitive dissonance theory, the findings of the present study showed that the dissonances experienced by the Chinese students are influencing the students' PtAL. The students' actions of responding to the AL environment which are the internal representations acquired from the experiences, including values, beliefs, and attitudes in the CHC environment, are statistically shown to be affecting students' action qualities, perceived values, life applications, examinations, self-disappointments, comfort, confidence, optimism, embarrassment, and concerns subsumed in the PtAL construct. If the students perceived that the beliefs and attitude resulted from CHC outweigh the costs and problems of AL, then the students would prefer AL, and vice versa.

The findings of the present study are also congruent with the Hofstede's cultural dimensional theory that the values of a culture are broad and tend to prefer certain states of affairs over others. In the present study, the findings show that the CHC is a continuum, some Chinese students possess narrow and limited scope of CHC while some possess broad and extensive scope of CHC. This apply the same on the continuum of PtAL.

Returning to the question of "Would the values, beliefs, and attitudes embedded in CHC students affect their preference to active learning?" The answer has been clearly revealed in the present study.

Chapter Summary

In this chapter, the model validation on CHC construct was firstly done, through analysing its measurement model followed by analysis its formative second-order construct. Secondly the model validation on PtAL construct was done, through analysing its measurement model followed by analysing its formative second order construct. Thirdly the structural model is then analysed.

The present study has validated two models, as well as its dimensions—the CHC model and PtAL model. Hence, the present study has conceptually defined CHC and PtAL—CHC is defined as the extent of experienced culture (beliefs and attitude) to which Chinese people who have shared strong Confucian heritage possess characteristics such as being principled, dependence on teacher, harmony, and education; while PtAL is defined as the extent to which a student possesses qualities such as action qualities, perceived values, life applications, examinations, self-disappointments, comfort, confidence, optimism, embarrassment, and concerns when engaging in AL activities in a chemistry classroom.

Besides, the present study has also shown that CHC is significantly related to PtAL among Chinese pre-university students, other factors are also relating it. In fact, the CHC has positive effect on PtAL. Hence, the present study supported the third alternative hypothesis, H_3. In view of that, the present study provides a new theory on students' preference to AL. The final research model is shown in Figure 7.1.

Final research model

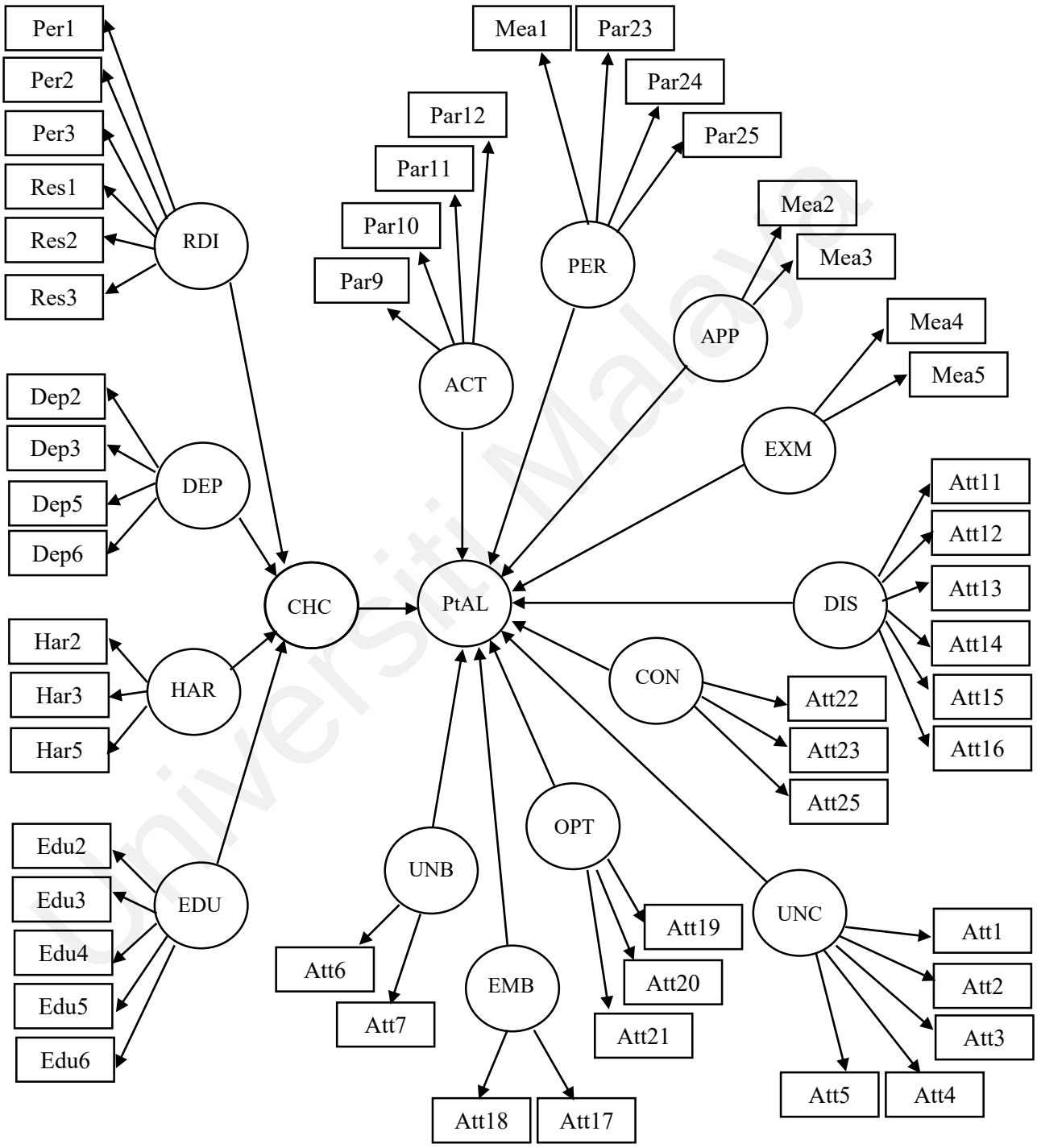


Figure 7.1 Final research model

Chapter 8 Summary, Implications and Conclusion

Summary

Due to the numerous past literatures reporting that students with a CHC background resisted AL and are more inclined towards passive learning, as well as research on AL are mostly conducted in Western countries but not in Asian context, leading to Asian teachers faced resistance when adopting to educational borrowing, especially when implementing AL in CHC classroom. These sparked the initiative to conduct the present study.

Using an interdisciplinary study which adopts perspectives from history, psychology, political science, and science education, aimed to achieve three objectives and answer three research questions. With the development of the two scales (CHC and PtAL Scales), the present study achieved its' first two objectives; the conceptual definition of CHC and the development of CHC Scale to measure the characteristics of Chinese pre-university chemistry students who come from CHC, and secondly, the conceptual definition of PtAL and the development of PtAL Scale to measure the extent of Chinese pre-university chemistry students' preference to AL. It found that four constructs described the characteristics of the sample, namely Principled, Dependence on Teacher, Harmony, and Education. Whereas, ten constructs described the extent of the sample in preferring AL, namely Action, Perceived Value, Application into Life, Examination, Uncomfortable, Unbothered, Disappointed with Self, Embarassment, Optimistic, and Confidence.

Furthermore, the present study also achieved its' third research objective and answered its' third research question, as well as confirming the findings and

constructs found in the first two research questions. These are done by validating both of the CHC Scale and PtAL Scale and their corresponding research model, and exploring the relationship between CHC and PtAL. The findings define CHC among Chinese pre-university chemistry students through a reflective-formative second order construct, as well as PtAL through a reflective-formative second order construct also. The research findings appear to support the third research hypothesis that there is a significant relationship between CHC and PtAL. However, the research findings also show that students' preference to AL is also affected by other factors that yet to explore. In addition, this study also developed a theory to explain the relationship between CHC and PtAL among selected Chinese pre-university chemistry students, from the perspective Hofstede's cultural dimensional theory, purposive behaviorism theory, constructivism, and cognitive dissonance theory.

This study is different when compared to other studies from the following aspects:

1) Using an interdisciplinary study which adopts various perspectives such as history and political science as well as philosophy in reviewing and discussing Confucianism and CHC, psychology and science education perspectives in reviewing and discussing theories of learning and teaching.
2) The present study developed two scales, namely CHC Scale and PtAL Scale.
3) The present study conceptually defines two constructs using statistical analysis. These two constructs are CHC and PtAL. The CHC is defined as the extent of experienced culture (beliefs and attitude) to which Chinese

people who has shared strong Confucian heritage possesses characteristics in being principled, dependence on teacher, harmony, and education. PtAL is defined as the extent to which a student possesses action qualities, perceived values, life applications, examinations, self-disappointments, comfort, confidence, optimism, embarrassment, and concerns when engaging in AL activities in a chemistry classroom.

4) The present study assessed the CHC construct and PtAL construct each through an integrated reflective-formative second order construct.
5) The present study revealed a significant relationship between CHC and PtAL, with CHC a having positive effect onto PtAL, for the selected Chinese pre-university chemistry students.
6) The present study revealed that the structural model is a moderate model with medium effect. In other words, other than CHC cultural factors are related to PtAL, there are also other factors relating to PtAL.
7) The model gives sufficient predictive relevance over PtAL.

Implications

Developing new instrument model is useful for research as the present study helps better understand a phenomenon by conforming to all psychometric tests. This study provides several implications for the theoretical, methodological and empirical standpoints.

Theoretical implications. Firstly, from the theoretical standpoint, the result of this study challenges the views of those who see CHC learners as passive and resisting AL. However, the preference of AL is related with cultural factors. Before this, there have been many discussions with no true empirical findings, discussing how students' preference to AL is affected by cultural factors. The findings in the present study provide further support for the hypotheses.

Secondly, the present study is supported by purposive behaviourism theory, cognitive dissonance theory, constructivism, and Hofstede's cultural dimensional theory, provided a new theoretical explanation on how Chinese students perceived cultural values and practices from the perspective of CHC and explained how these cultural values and practices affect Chinese students' PtAL--the actions of Chinese students when they strive toward their learning goal is based upon beliefs and attitude resulted from CHC (Tolman's purposive behaviorism theory). The CHC is measured by Principled, Dependence on Teacher, Harmony, and Education. Principled, and Education are the core values of CHC, while Dependence on Teacher and Harmony are the socially essential practices of CHC (Hofstede's cultural dimension theory). When Chinese students participate in AL activities, through interaction with teacher

and peers within their Zone of Proximal Development (Vygotsky's constructivism), processes such as assimilation, accommodation and/or cognitive equilibrium may occur during cognitive conflicts (Piaget's constructivism). Other than cognitive conflicts, other forms of experience gained such as contradictory beliefs and socially essential practices, may cause dissonance (Festinger's cognitive dissonance theory). The dissonance will be measured by Action Qualities, Perceived Values, Life Applications, Examination, Self-Disappointments, Comfort, Confidence, Optimistic, Embarrassment, and Concerns.

Methodological implications. Firstly, the present study does not merely define new measurement scales but also taken a step further to verify that they effectively fall into the concept of CHC and PtAL in their aggregated form. The dimensionality of both of the CHC and PtAL constructs are validated and thus contributed to the conceptual or methodological standpoints. It is essential to realise that the structural paths coming in and going out would be impacted when the measurement model is mis-specified and thus leading to erroneous path coefficient (Jarvis et al., 2003), thus this study has addressed the concern. Moreover, as mentioned by Kuppelwieser, Putinas, and Bastounis (2017) that a measurement scale is not considered good (or worth publishing) just because it is presented in a new and underdeveloped field because nobody has proposed a measurement tool for it, or because it has been used several times before. So, what it is a good measurement scale? A good measurement scale is when and if it meets reliability and validity criteria, as shown in the present study. In other words, the present study has conceptually defined two measurement scales (CHC and PtAL Scales), which meets reliability and validity criteria.

The second contribution to methodological standpoint, relates to defining reliable and valid scales for evaluating each CHC and PtAL constructs, including those underrepresented or doubtful from the literature. They include Dependence on Teacher, as well as Harmony in the construct. Not only is the Dependence on Teacher and Harmony are identified as the more important constructs of CHC but it is also one of the main characteristics of CHC. Similarly, Principled, and Education highly influences CHC; this result confirms that the Chinese values are still regarded highly in CHC community. However, developing a measurement scale that merges Principled with Harmony sub-constructs could be an avenue to explore in the future.

Due to the first and second methodological implication as described above, the definition and validation of the dimensionality of the CHC and PtAL which the researcher proposed are a first that arguably filling the gap in the existing research, contributing to the theoretical and methodological standpoints. In view of this, the third methodological implication, is that this research ranks among the few studies that have implemented second-order reflective-formative construct validation, even if the number of methodological studies on this method is on rise.

Fourthly, this study has also provided a guideline to the future researchers to perform and validate reflective-formative second-order constructs, using the recent PLS-SEM approach.

Practical implications. First of all, these measurement instruments enable practitioners, educators, and faculty management team to better understand and implement that active learning, especially chemistry learning in higher learning institution. Implementing this measurement instrument allows practitioners and educators to get a very clear and comprehensive picture of the characteristics of Chinese students and their preference to AL that should be identified first and foremost to better understand students in the classroom.

This valuable and precise information also helps practitioners and educators to consider the different sub-constructs of CHC; including Principled, Dependence on Teacher, Education, and Harmony, to identify the underlying characteristics of Chinese pre-university chemistry students. Besides, it also helps practitioners and educators to consider the different sub-constructs of PtAL: including Action qualities, Perceived Values, Life applications, Examinations, Self-disappointments, Comfort, Confidence, Optimism, Embarrassment, and Concerns. Thus, faculty management and curriculum development team should encourage teachers to design their lessons which promote AL among Chinese pre-university chemistry students after understanding their cultural background, behavior, and attitude towards AL. Faculty management is expected to be more tolerance and supportive when teachers who implement AL in chemistry classroom experience resistance AL from the Chinese students.

A second important implication of the present study can be derived from the findings on the conceptual definition of CHC which forms the theoretical model of CHC. The valuable information of CHC derived from and discussed in the present study helps to inform and provide deeper and better understanding about CHC

Chinese community in Malaysia. With this, the findings about CHC can be applied easily into the education field. The Ministry of Education Malaysia will definitely gain benefits from adopting the present study in their aspirations to strengthen values education in Malaysian higher learning institution and develop national identity among student, in which these students will become compassionate, caring and altruistic to guide them in making ethical decision. As the same, students who have had built better understanding about CHC Chinese community, will have a strong national identity and therefore will balance the development of global citizenship which was aspired by the Ministry of Education Malaysia. The prospect and success of values education can be achieved if Malaysian embraces cultural diversity, through deeper understanding and respect of each other. The findings of the present study can serve as the key for understanding Malaysian cultural diversity.

Besides, the findings of the present study would also be useful particularly for the national-type (Chinese) school and Chinese independent school to successfully cultivate values education. Although many of these schools which have existed for a long time and a whole school ethos encompassing Chinese values and Confucian philosophy can be found, by adopting and applying the findings from the present study into their school leadership, teachers in these schools and learning institutions will make an effort to embody the culture successfully that aligns with their highest values aspirations and throughout the school life, including in the classroom, canteen, corridors, bulletin board, so that these values will live as a society reality.

As the third practical implication, findings of the present will benefit other people or group who are interested with preserving cultural heritage, such as Ministry of Tourism and Culture, as well as Ministry of Unity, Culture, Arts and Heritage of

Malaysia, or to any other organisation and/or countries who want to understand more about CHC and embrace the uniqueness of cultural diversity.

Suggestion for Future Studies

Firstly, due to the discovery of students perceiving "neutral" on Examination and Harmony constructs whereby the underlying reason of why the respondents chose or behaved at such could not be revealed from the statistical result, but the present study can put forward the possibility of the idea of the situation, therefore, this lead to the first suggestion to further study on these areas to unfold the underlying reason for choosing "neutral".

Another suggestion for future studies is to measure the change of dissonance in Chinese students, since the researcher argued that dissonance may have occurred during their participation in AL activities but did not affect their preference to AL (they continued to prefer AL) despite their emotional states has been aroused, in order to confirm the change of dissonance does occur.

Lastly, the third suggestion for future studies is to test the acceptability of the developed model (Figure 7.1) in this study will reflect the reality through data or not. In other words, it is to test the model whether will fit the data or not.

Conclusion

If the reader refers back to the snapshot described in the Introduction section (Chapter 1 Introduction), it is now clear that Sue may have been too eager to introduce active learning into the classroom before first understanding that some students who may be too deeply rooted in CHC to participate willingly.

Based on the findings, it can be said that Confucian heritage culture (CHC) is a cultural phenomenon based upon a very strong foundation in Confucianism, whereas preference to active learning (PtAL) is based on students' individual preferences. Nevertheless, the two scales developed based upon literature has brought together the history and philosophy of Confucianism; political science of Confucianism; the evolution of Confucianism to the present day of CHC; learning psychology of cognitive dissonance theory applied in active learning and science education in active learning due to the use of chemistry students as the sample. These perspectives of history and philosophy, political science, psychology, and science education are all brought together in this study, which have not been done before. Therefore, one of the conclusions that can be made from this study is, all these perspectives can be linked together, to understand the phenomena of Chinese students' supposedly resisting AL.

The final model revealed that the psychology of CHC students has somewhat influenced the historical understanding of Confucianism. Over the years, the original teaching of Confucianism has been modified. What has emerged in the Chinese community is different from what were taught from Confucianism. It appears that over the years, the interactions of various aforementioned perspectives (that are infused in the developed scales in the present study) have influenced the original

Confucianism culture in the classroom. Thus, it could be that the values and beliefs that they hold are not solely based on Confucianism teaching.

Although the present study has found that CHC students somewhat prefer AL, but their behavior and attitude may not be reflecting what they do, which many a time have led most of the teachers teaching CHC students to think that they do not prefer AL, including the researcher of the present study. This discrepancy and misunderstanding has given another important conclusion that it is important to have a deep cultural understanding and holistic perspectives of the CHC phenomena.

This study brings enhanced insights regarding Confucian influence and its values and how it can influence student's choice and preference in AL. It is also important to keep in mind the diversity of cultural experience in the CHC community. Each Chinese students and family may bring their kaleidoscope of experiences, thereby shaping their practices and behavior differently in chemistry learning.

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