

# EMERGENT CONCEPTUAL DEFINITION AND DEVELOPMENT OF A CONFUCIAN HERITAGE CULTURE SCALE FOR MALAYSIAN CHINESE PRE-UNIVERSITY STUDENTS

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**Abstract:** *This article describes the development of a Confucian heritage culture (CHC) scale, where a conceptual definition of CHC emerged from interdisciplinary perspectives. The scale dimensions adopted interdisciplinary perspectives from history, psychology, political science, and science education. The validity and reliability of the scale were determined. Statistical analysis, conducted through Exploratory Factor Analysis (EFA), suggested a four-factor CHC dimension in a sample of 430 Chinese pre-university chemistry students. The four-factor dimensions were (1) being principled, (2) dependence on the teacher, (3) harmony, and (4) education. The proposed dimensions were then confirmed using Partial Least Squares Structural Equation Modelling (PLS-SEM) with an additional sample of 441 students. The findings were also supported by prior qualitative research, which showed that CHC was associated with being principled, dependence on the teacher, harmony, and education. Based upon confirmed dimensions, the emergent CHC was conceptually defined. The implications for educational policy and practice are discussed.*

**Keywords:** *Chinese values, Confucian heritage culture, chemistry education, exploratory factor analysis (EFA), partial least squares structural equation modelling (PLS-SEM), scale development*

## Introduction

East Asian countries, such as South Korea, Taiwan, Singapore, and Hong Kong, underwent thalidomide-related issues from the early 1960s to the 1990s (Craddock, 2022). Moreover, Singapore, Japan, Taiwan, Macau, Vietnam, Hong Kong, China, and Korea were the top performers in mathematics and science in the Programme for International Student Assessment (PISA) test in 2015 (Meng et al., 2023). These East Asian countries appear to share no other common characteristics besides a strong Confucian heritage culture (CHC), which contributes to their extraordinary mathematics and science learning performances (Craddock, 2022).

Confucianism teaching and the Chinese values inherent in the CHC affect the students' characteristics and worldview perception, which could exist in any classroom setting. In this article, the chemistry classroom was the primary focus. Researchers were paying increasing attention to the effect of Confucian heritage culture on learning. Most previous studies had investigated cultural influences on the perception of these Chinese values (Chen, 2023; Siah et al., 2015; Yu et al., 2023), compared

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and contrasted these values from CHC with Western values (Le, 2024; Ryan, 2016), identified and clarified paradoxes and misconceptions about CHC (Lang & Jing-Schmidt, 2024; Yu et al., 2023; Zhang, 2013) and investigated the learning approach and learning style of CHC students (Foong & Daniel, 2013; Hua & Wang, 2023). However, past literature has not considered the importance of CHC from an integrated perspective of philosophical, psychological, political science, and science education perspectives. Existing research lacks an instrument to measure the dimensionality of constructs and conceptually define the characteristics of CHC from an integrated perspective.

To avoid misconceptions, it is crucial to distinguish the concept of Confucian Heritage Culture (CHC) from classical Confucian philosophy. This article defines CHC not as a static historical doctrine, but as a dynamic and experienced set of beliefs and attitudes that have evolved within modern Chinese communities, particularly in educational contexts. The study focused on Malaysian pre-university Chinese students' learning in chemistry, thereby responding to the call for more context-specific studies, especially those that have been underexplored in previous research. Developing and validating a higher-order CHC construct will contribute to the broader theoretical understanding of cross-cultural influences in education. Hence, the study aimed to address this gap by conceptually defining the CHC construct and developing a CHC measurement scale that captures its multidimensional nature. Thus far, dimensions of a CHC construct have not been compiled, conceptualised, and attested quantitatively as a whole in a single model or definition. The following discussion will unfold how dimensions of the CHC construct were identified from the literature for the study.

## CHC Dimensions in Literature

Confucianism has deeply influenced Chinese culture over the centuries, particularly within the family and community. To better understand Chinese culture, it is essential to grasp the fundamental principles underlying Confucian teachings (Hong et al., 2022; Wu & Lee, 2021). These are now discussed

### *Confucianism and Hierarchy/Social order*

Confucianism emphasises hierarchy and social order. It promotes the idea of filial piety and ritual rites, giving parents authority over their children. This is reflected in a verse from the *Analects* (the English text of the translation is provided at the bottom of the Chinese verse):

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，虽有粟，吾得而食诸？’

Translation: Duke Jing of Qi asked the Master about governing. The Master replied, “Ruler, minister, father, son.” The Duke said, “Wonderful! If the ruler is not like a ruler, the minister is not like a minister; the father is not like a father, the son is not like a son, then even if there were food, would I get to eat?”

Hierarchy and respect are closely tied in Chinese culture. Hofstede's study linked the high Power Distance Index (PDI) to hierarchical systems with existential inequality (Hofstede et al., 2010; Primecz, 2025). China, Singapore, and Malaysia exhibit high PDI scores, reflecting significant acceptance of unequal power distribution, especially in family settings. Hofstede's study suggests that the power distance observed in different countries stems from family values, which are then carried over into other aspects of life.

Respect for elders and teachers is a fundamental virtue in CHC. Students are expected to show respect to teachers by standing up and greeting them when they enter the classroom. They also wait to speak until permitted. Tran (2013) interviewed CHC students. His findings revealed that,

although students agreed teachers should be respected, this did not mean they were passive or obedient. Thus, does *respect* contribute to the characteristics of students with a CHC background?

### *Confucianism and Knowledge*

Confucianism stressed the importance of education and self-cultivation in its teachings. For example, Zhu Xi (朱熹) was renowned as one of the leading Confucian scholars during the Neo-Confucian era. He stressed the importance of education and self-cultivation for learning so that one can understand the principle (human nature) and energy (气). He had related his teaching of the School of Principle (理学) with the Great Learning in Book of Rites 《礼记·大学》, as reflected in the following verse:

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。

Translation: Extending knowledge and investigating things to acquire 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 the people properly, and peace for all will be achieved.

CHC, grounded in Confucian values, continued to highly value education. In a paper review on higher education in East Asia and Singapore, tuition costs funded by households rather than the state had been increasing, indicating the high attention given by families to education (Jiang et al., 2022).

Consequently, there has been debate over the motivational drive, specifically extrinsic motivation versus intrinsic motivation, among CHC students; however, CHC students are more appropriately regarded as possessing achievement motivation (Qian & Lau, 2024).

Through the re-examination of the complexities of the Chinese education system in feudal dynasties as well as contemporary China and rapid social change in Asian societies, the examination heritage has been revealed as playing a dominant role (Stearse et al., 2023), however there has been debate whether it is the influence of Confucianism or the influence of mass examination system due to modernisation that had caused the examination competition (Jiang et al., 2022). One is reminded not to be “over-confucianised” over the research area of CHC. The question is, does *education* contribute to the characteristics of students with a CHC background?

### *Confucianism and Perseverance*

For Confucians like Zhuxi and others in the Confucian tradition, education and self-improvement were top priorities. Moreover, they taught that the way to achieve this was through sheer perseverance – having that ‘do not give up’ attitude (Rainey, 2010). Perseverance is essential to Chinese students because it shows their ability to push themselves to become better people. It is also an important aspect of virtue according to Confucianism and is key to succeeding in life. A person needs perseverance to see tasks through to completion. Even under extreme circumstances, such as a lack of materials or support, perseverance is highly valued as a trait for success. Past research indicates that Chinese students with a strong sense of perseverance are better at delaying gratification, in contrast to those students who lack this trait and seek immediate gratification (Gao et al., 2025; G. Li, 2025).

Within Chinese communities, parental influence — the way parents raise their children often reflects traditional Confucian teachings that emphasise the virtues of diligence, perseverance, self-reliance, and duty (G. Li, 2025). In Confucian philosophy, it is also emphasised that educational achievements are determined not solely by innate talent, but also by a person’s effort, determination, perseverance, and patience (Gao et al., 2025; Stearse et al., 2023). Empirical evidence from Li’s (2025) research indicated that CHC students, when faced with academic problems, begin to solve the problems with great perseverance. Western researchers agreed that perseverance is rooted in Confucian values.

The concept of perseverance is closely related to Long-Term Orientation (LTO) in the context of Chinese values. According to Hofstede's research, countries such as Malaysia, Singapore, and China exhibit varying degrees of LTO. A low LTO score is seen in Malaysia. This phenomenon contrasts with the high LTO scores found in Singapore and China, which have large Chinese populations. LTO is regarded as possessing perseverance in the face of slow results, a sense of shame, and respect for circumstances and others, which aligns with past literature's findings (Dai & Chen, 2024; Hofstede et al., 2010). Perseverance in the high LTO pole reflects Confucian teachings. Thus, this article justifies the need to measure the degree of perseverance within Chinese communities in Malaysia with a CHC background.

### *Confucianism and Teachers*

In China, the influence of Confucianism has led to the development of the examination culture. This examination culture has persisted through different dynasties and has even influenced many other Western countries, such as France and Germany (Xiao et al., 2023).

Research has shown that students from a Chinese cultural background are heavily reliant on teachers, preferring a teacher-centred teaching style and showing reluctance to participate in group discussions. Students often see their teachers as the ultimate authority of knowledge, with little regard for the views of their peers. In a qualitative research study conducted by Liu and Feng (2015), teachers, elderly persons, or even textbooks were regarded as authorities of knowledge. It had been deeply ingrained in students' minds that the correct answers could only exist in teachers' minds or in books. This leads to the question of whether the *dependence on teachers* affects students from a Chinese cultural background.

### *Confucianism and Conflict*

Confucius advocates that real learning occurs when one learns through active reflection, questioning, and seeking answers by observing *li* (manners) — the rules of proper behaviour. The Confucian philosophy does not support the concept of spoon-feeding and relying solely on the teacher to preserve their dignity. The concept of maintaining harmony, avoiding conflict, and saving face has been reflected in various CHC literature sources (Dai & Chen, 2024; Xu et al., 2024). As such, driven by the cultural emphasis on social harmony, Asian students often tend to avoid conflict in face-to-face classroom environments to preserve social harmony (Le, 2024). The result of this cultural phenomenon has contributed to a hierarchical teachers-students relationship, with students who tend to accept the teachers' answers without questioning or challenging them (Liu & Feng, 2015). Consequently, students lack the opportunity and the courage to communicate fully with their teacher. Moreover, teachers do not expect students to provide innovative ideas, but instead want them to memorise correct answers and follow preset procedures in the hope that students will make fewer mistakes (Hong et al., 2022).

In an interview conducted by Tran (2013), a student mentioned the importance of saving the teacher's face, which led him to avoid confronting the teacher in class; instead, he chose to discuss the matter with his peers or approach the teacher after class to clarify his understanding.

The concept of harmony has been associated with low Individualism (IDV) in Hofstede's study (Hofstede et al., 2010; Primecz, 2025). With a low IDV score, countries such as Malaysia, Singapore, and China are considered collectivist societies, characterised by strong family relationships and a tendency to avoid conflict (Chen, 2023; Saravanamuthu, 2008). Hofstede's study also measures the Uncertainty Avoidance Index (UAI) to determine the degree of tolerance for uncertain situations. Malaysia, Singapore, and China display relatively low UAI scores, indicating resistance to change and a preference for active learning situations (Kim & Lee, 2025; Yang & Lin, 2023).

When considering the IDV and UAI scores of these three countries, the existing research on CHC learners appears to contradict Hofstede's findings, particularly for Singapore and China (Craddock,

2022; Gao et al., 2025). Several studies have demonstrated that CHC students may be reluctant to participate in active learning due to a combination of factors, including fear of being ridiculed, shyness, low confidence, and a desire to maintain harmony and avoid conflict (Dai & Chen, 2024; Wang et al., 2025). Additionally, *dependence on teachers* and issues of *respect* may lead students to adopt a passive approach to *maintaining harmony* and saving face with their teachers and peers.

Considering these observations, the question arises: Does the aspect of *harmony* significantly influence students with a CHC background?

### Other constructs

The constructs for this study were derived from a review of other relevant scales (Table 1) and by analysing the existing research and consensus within the CHC literature (Table 2).

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

**Table 1. Selected Past Studies Relevant to the Dimensions of a CHC Scale**

Constructs	Past studies
Respect	(Hofstede et al., 2010; Le, 2024; Tran, 2013; Xiao et al., 2023)
Education	(Hsu, 2021; Pham, 2021; Pham & Pham, 2021; Steare et al., 2023; Yuen et al., 2017)
Perseverance	(Gao et al., 2025; G. Li, 2025; R. Li, 2025; Xiao et al., 2023)
Teacher dependence	(N. J. Kim et al., 2022; Le, 2024; J. Wang, 2013; Xu et al., 2024; Zhan, 2021)
Harmony	(Dai & Chen, 2024; Gao et al., 2025; Hsu, 2021; Le, 2024; Wang et al., 2025; Xu et al., 2024)

Source: Compiled by authors

**Table 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 agency Public information Two-way asymmetrical Two way symmetrical Personal influence Cultural interpreter Power distance Uncertainty avoidance Femininity Masculinity Individualism Collectivism	48

**Table 2. Selected Past Studies Relevant to Chinese Values Scale (continued)**

Author(s)	Year	Scale	Target group (sample)	Constructs	Total of items
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	

Source: Compiled by authors

The article will now turn to how the final dimensions of the CHC construct were conceptualised and the scale developed.

## Method and Procedures

### Sample

The development of the CHC measuring scale was conducted in two phases, and data were collected from two independent samples (the first sample consisted of 430 students, and the second sample consisted of 441 students) from several higher education institutions and schools in Malaysia. Purposive sampling, a non-probability sampling technique, was adopted in both samples when recruiting the participants (Chuah et al., 2015; Himschoot, 2012; Ting et al., 2015). These measures substantially helped achieve the study's goal of representing a well-defined population: Malaysian Chinese pre-university chemistry students. While acknowledging that purposive sampling challenges the assumption of independence, which is an implicit requirement for specific inferential statistics, and yet random sampling was not feasible for accessing this specific population, the researcher has taken several measures to promote the independence of respondents. The survey process was facilitated by a research assistant who was not affiliated with the institution to maintain neutrality. The respondents were informed that participation was voluntary and that their responses would be kept anonymous and confidential.

When recruiting participants, only pre-university Chinese students were selected. The participants were recruited from a cohort of students across three large pre-university institutions. The selection of Chinese pre-university students within the chemistry context was a deliberate methodological decision. The pre-university education level is deemed a critical developmental stage in the Chinese educational system because it is often characterised by intense academic pressure (e.g., preparation for the academic examination) where cultural values profoundly shape students' learning attitudes, motivation, and well-being (Jiang et al., 2022; Steare et al., 2023).

In addition, a few inclusion criteria were adopted in this study to ensure the sample's homogeneity:

- (1) The participants for this study must have registered for chemistry in the pre-university science programmes.
- (2) The participants must be Chinese.

- (3) The participants' parents must be able to speak and/or read Chinese.
- (4) The participants must have provided informed consent.

Students who did not meet all four criteria were excluded from the analysis. The criteria for including parental ability to speak and/or read Chinese aim to reflect the level of CHC of participants, as past literature has pointed out that parental and family influence have greatly impacted CHC's ways of respecting the elderly, commitment to education, and the need to persevere.

The researcher obtained research ethics clearance (Approval Number: 2017-5-30) from the Tunku Abdul Rahman University of Management and Technology Research Ethics Committee. The participants were briefed and gave written consent before starting the survey.

The data for both samples were collected via a paper-based survey method. The first sample consisted of 430 students recruited voluntarily from different pre-university programmes, i.e. Form 6, A-Level, Diploma, and Foundation programmes. There were 241 males and 189 females (56% and 44%) between the ages of 18 and 20 (248 aged 18 (57.7%), 141 aged 19 (32.8%), 41 aged 20 (9.5%)). The sample represented the 13 states and 1 Federal Territory of Malaysia. The second sample, also recruited voluntarily, consisted of 441 students. There were 283 males and 158 females (64.2% and 35.8%) between the ages of 18 and 20 (378 aged 18 (85.7%), 48 aged 19 (10.9%), and 15 aged 20 (3.4%)). This second sample also represented nine states and one federal territory of Malaysia.

## Procedures

The CHC Scale was developed as a data collection tool to assess the extent to which Chinese pre-university chemistry students demonstrate CHC dimensions. The scale development process can be stated in six steps: (1) identifying dimensions, (2) generating an item pool, (3) inclusion of items, (4) pretest, (5) first version of the scale, and (6) second version of the scale.

### *Step 1: Identifying Dimensions*

To associate a theoretical concept of CHC that explains the complex context of CHC, the researcher conducted a comprehensive iterative review of the past literature to understand the underlying dimensions of CHC. To achieve this, several other relevant scales were reviewed, drawing on research related to CHC and common agreements among studies on CHC. Subsequently, five dimensions were derived and proposed from the literature, namely (1) respect, (2) perseverance, (3) dependence on the teacher, (4) harmony, and (5) education.

### *Step 2: Generating Item Pool*

In the second step, an item pool with 30 items was generated based on the five proposed dimensions identified in the first step. Centred on the established guidelines found in past literature, it can be said that more items were not necessarily better, but using a single item was not a good alternative; hence, a minimum of three items per dimension was recommended (Diamantopoulos et al., 2012; Hayduk & Littvay, 2012).

### *Step 3: Inclusion of Items*

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 in these fields who have at least 3 years of experience were contacted to form the panel, provided they consented and were willing to participate in this research. The consultation with the expert panel was conducted through an interview and a questionnaire. After the experts' in-depth examination of each item and after receiving their feedback, some items were revised

in terms of their grammar and structure. For instance, “For 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 consisted of 30 items.

#### *Step 4: Pretesting*

In the fourth step, following expert validation, two cognitive interviews using a debriefing method were conducted with a purposively selected sample of 10 pre-university students who were representative of the target population but did not participate in the main study. This step is vital to ensure that targeted respondents can understand the instructions and statements (Neuert & Lenzner, 2015). Findings from the cognitive pretesting suggested there is no need to revise any part of the items.

#### *Step 5: First Version of the Scale*

In this fifth step, the first version of the scale was finalised. The scale was measured on a 5-point Likert scale, with 1 indicating “strongly disagree,” 2 indicating “disagree,” 3 indicating “neutral,” 4 indicating “agree,” and 5 indicating “strongly agree.” The first version of the questionnaire was administered to 430 students. The CHC Scale was developed and administered in the English language. This decision was made because English is the primary medium of instruction in the Malaysian pre-university program where the study was conducted, and the participants were proficient in the language. To mitigate any potential threats to trustworthiness arising from language, the cognitive interviews specifically probed for any difficulties in comprehending or interpreting the English-language items. Data was analysed using the IBM SPSS 20 software for the Exploratory Factor Analysis (EFA).

#### *Step 6: Second Version of the Scale*

In this step, the second version of the questionnaire was administered to 441 students following the completion of EFA. The data were analysed using SmartPLS 3 software for measurement and structural model analyses.

### **Result**

#### *Phase 1 - Exploratory Factor Analysis (EFA)*

Before analysis, the data were screened and cleaned, during which any cases with missing data were discarded. The assumptions of EFA were checked and verified. The sample size was deemed adequate, meeting the minimum requirement of five cases per construct (Hair & Alamer, 2022), and there were no extreme outliers (Pallant, 2020). Although the Kolmogorov-Smirnov test revealed a violation of normality, a common occurrence with large sample sizes, the Normal Q-Q Plot confirmed that the data were normally distributed. Thus, the distribution of data was considered reasonably normal.

EFA was performed on the 30 items using Principal Components Analysis with Promax rotation to identify the underlying dimensions of the CHC Scale. The suitability of data for factor analysis was confirmed by a Kaiser-Meyer-Olkin value of 0.84, which exceeded the recommended value of 0.6 (Kaiser, 1970, 1974), and a significant Bartlett’s Test of Sphericity (Bartlett, 1954; Hair & Alamer, 2022). In accordance with established literature (Matsunaga, 2010; Sarstedt et al., 2023), items were eliminated if they had factor loadings below 0.3, exhibited cross-loadings over 0.1, demonstrated item-total correlations of below 0.3 in reliability analysis (Hair, Black et al., 2014) or were inconsistent with the theoretical basis of the scale.

Six items were eliminated individually, and four factors with an eigenvalue greater than one were extracted. Based on the literature review, five dimensions were initially proposed: (1) respect,

(2) education, (3) perseverance, (4) dependence on the teacher, and (5) harmony. Following the EFA, items designed initially for 'respect' and 'perseverance' were found to have high cross-loadings and clustered into a single factor. This new factor, which captures a sense of duty, persistence, and responsibility, was labelled 'Principled' to reflect its comprehensive nature better. Thus, upon conducting EFA, they were labelled as principled, dependent on the teacher, and focused on harmony and education. All items had a loading of more than 0.3 in their corresponding factors. The item-to-total correlations ranged from 0.3 to 0.9. Appendix A shows the results of EFA. The total variance explained was 49.18%, with a Cronbach's alpha value of 0.60, which is above the acceptable threshold for an exploratory study (Hair & Alamer, 2022; Hair, Black et al., 2014).

### *Phase II – Partial Least Squares-Structural Equation Modelling (PLS-SEM)*

#### *Assessment of the reflective measurement model*

The measurement model was evaluated using composite reliability (CR), factor loading, convergent validity, and discriminant validity. As shown in Appendix B, the CR values met the minimum requirement of 0.6, an acceptable value since this study aimed to explore the key target dimensions of CHC and develop theories in CHC, which was exploratory research (Amusa & Hossana, 2024; Hair, Black et al., 2014). Besides, the loadings of all indicators exceeded the recommended value of 0.5 (Hair, 2016). Likewise, the average variance extracted (AVE) exceeded the threshold value 0.5 (Sarstedt et al., 2023).

Discriminant validity was assessed using cross-loadings, the Fornell-Lacker criterion, and Henseler's heterotrait-monotrait (HTMT) criterion. The results revealed that the outer-loading of each indicator was greater on its respective construct than its cross-loadings on other constructs, and no cross-loading scores differed by  $\leq 0.1$ . This denoted that each item clearly defined one construct. Using the Fornell-Larcker criterion, the results revealed that the square root of AVE of each construct was greater than the correlations with other constructs in the model. According to the HTMT criterion, the results showed that the HTMT values for all constructs are below 0.85 and 0.90. In conclusion, the result analysis indicated that the discriminant validity was achieved.

#### *Assessment of formative second-order construct analysis*

In EFA, the term for a latent variable is a dimension. Conversely, the standard term for a latent variable in PLS-SEM is a construct. This section will use the term 'construct' to refer to latent variables within the context of PLS-SEM.

To examine the convergent validity of this formative second-order construct of CHC, the path coefficient was 0.720, more than the recommended value of 0.60 (Chin, 1998; Sarstedt et al., 2023); thus, the formatively measured constructs had sufficient degrees of convergent validity. Besides, the multicollinearity between indicators was assessed. The predictors of CHC constructs (DEP, EDU, HAR, RDI) satisfy the inner VIF values, and they were consistently between the threshold value of 0.5 – 3.3 (Diamantopoulos & Siguaw, 2006; Sarstedt et al., 2023). Thus, it can be concluded that collinearity did not reach critical levels in the formative construct.

Lastly, the significance and relevance of the outer weights of the formative constructs were examined. All weights exceeded the recommended value of 0.1 (Lohmöller, 1989) and had significant t-values. Therefore, the results analysis provided empirical support for retaining all the indicators (Hair, 2014).

### **Discussion**

An emergent conceptualisation of CHC from the study can be defined as the extent of experienced culture (beliefs and attitudes) to which people of Chinese descent share strong Confucian heritage

characteristics in being principled, being dependent on teachers, being inclined to harmony, and placing importance on education.

Subsequently, the study developed a scale to measure the extent of CHC characteristics experienced by Chinese pre-university chemistry students. In doing so, a firm process was followed to explore the dimensions of CHC and provide a reliable and valid scale. Results from the EFA suggested a four-factor structure for the CHC Scale, using a sample of 430 Chinese pre-university students. Then, the proposed factor structure was confirmed by PLS-SEM with a different sample of 441 Chinese pre-university students. The reliability statistics demonstrated that the current scale had good internal consistency.

The emergence of the 'Principled' factor, integrating aspects of perseverance and respect, suggests that for our student sample, these concepts are not separate but are fused into a single characteristic of dutiful commitment. The descriptive analyses revealed a very high mean score for the dimension of "Principled." Following the past literature (Chen, 2023; Yu et al., 2023), they have also mentioned that the Chinese community, including the students and parents, highly regards respect. The virtue of being principled and persistent, as stressed in the Analects by Confucius, was upheld in education and other areas, including many Confucian business corporations. Therefore, the finding on the dimension of Principled represents part of the characteristics of CHC.

The findings in this study support the dimension of Dependence on Teacher, as it represents a characteristic of CHC. The finding was unexpected, as Dependence on the Teacher was not the teaching of Confucianism but rather a characteristic formed in the CHC community through rapid social change and modernisation within Asian culture. Nevertheless, this finding aligns with past literature assertions that the CHC literature should be drawn from the perspectives of philosophy, psychology, and political science (Choong, 2019). Therefore, unexpectedly, the findings confirmed that the Dependence on Teacher dimension was measuring and representing part of the characteristics of CHC.

The study found that the 'Harmony' dimension represents part of the characteristics of CHC. Chinese students viewed non-confrontational communication and conflict avoidance as necessary, a view consistent with past literature. However, the mean score of this Harmony dimension appeared to be "neutral," which challenges the traditional beliefs. Nonetheless, the study confirmed that the Harmony dimension measures part of CHC's characteristics.

The findings in the present study provide statistical evidence that aligns with those of previous studies examining the importance of education and self-cultivation in the context of CHC (Gao et al., 2025; Jiang et al., 2022; Tan, 2013). It was encouraging to observe that the respondents highly regard education and view it as a means of self-education to pursue one's own goals and achieve personal success (Wang & Rao, 2022). Chinese students view educational success as a means to a better life and a more fulfilling education as essential in CHC (Jiang et al., 2022). Undoubtedly, the Education dimension represents a key characteristic of CHC.

This study diverges from past literature by assessing CHC as an integrated formative construct rather than as separate dimensions. The measurement model was successfully validated using PLS-SEM, confirming that the CHC construct comprises four reflective first-order constructs: being principled, dependence on the teacher, harmony, and valuing education. This four-factor structure aligns with recent qualitative findings, thereby establishing the construct validity of the new CHC Scale.

Furthermore, the findings suggest that the modern psychology of CHC students reflects a modified version of classical Confucianism. The values and beliefs of today's students are not solely based on ancient teachings but have evolved through the influence of various historical, psychological, and modern educational perspectives. This indicates that contemporary CHC is a dynamic cultural construct, distinct from its original philosophical form.

## Limitations of the Study

The main constraints of this research stem from the nature of the sample and the instrumentation. The generalisability of this study is constrained by the use of a purposive sample, which consisted solely of Malaysian students who, in turn, exhibited significant internal diversity in CHC exposure due to varied educational backgrounds, such as vernacular, national, and independent school systems. Furthermore, the administration of the questionnaire in English, while practical, could have resulted in a loss of subtle cultural nuances that a native-language instrument might have captured.

## Conclusion and Implications

In conclusion, this study conceptualised the definition for the CHC construct and developed and validated a comprehensive CHC Scale. The emergent CHC construct in this study is defined as the extent of experienced culture (beliefs and attitudes) to which people of Chinese descent share strong Confucian heritage characteristics in being principled, being dependent on teachers, being inclined to harmony, and placing importance on education.

The primary implication of this study is the provision of a validated instrument for educators and researchers, which has direct applications for pedagogical practice. The CHC scale can be used to (a) identify specific cultural learning orientations in students (e.g., high 'Dependence on Teacher'), allowing for tailored pedagogical approaches like structured scaffolding; (b) facilitate cross-cultural research by providing a quantitative measure of CHC; and (c) help students and teachers in multicultural classrooms better understand their own and others' educational perspectives. An important pedagogical implication of this study for educators, is that the understanding of students' 'dependence on the teacher' is a key cultural characteristic. Rather than viewing it as passivity, it can be seen as a readiness for structured guidance. Therefore, teaching strategies that combine explicit instruction with scaffolded opportunities for independent inquiry may be particularly effective.

Beyond the classroom, the conceptualised CHC construct bridges theory and educational policy by challenging the deficit-based model assumptions that often underpin policy decisions. Historically, traits like 'dependence on the teacher' have been misconstrued as a universal weakness to be corrected. This study provides the empirical evidence to reframe these traits as valid characteristics of a coherent cultural learning orientation. This gives policymakers a data-driven justification to shift from "one-size-fits-all" mandates to more equitable, evidence-based policies. The result is the promotion of an educational system designed to leverage the inherent strengths of all learners, rather than forcing them to conform to a single, culturally-specific model of success.

## Notes:

<sup>1</sup> Portions of the literature review and data in this study are extracted from the first author's doctoral dissertation, with a significant addition and update of data. All reused text has been thoroughly paraphrased to reflect current analysis. The original source is: Choong, S. H. (2019). Relationship between Confucian heritage culture and preference to active learning among Chinese pre-university students [Doctoral dissertation, Universiti Malaya].

<sup>2</sup> The author(s) declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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**Appendix A. Factor Structure and Reliability Analysis for the CHC Scale with 4-Factor Model and 24 Items.**

Item code	Items	Factor	Item loading (threshold >0.3)	Item communalities (threshold >0.3)	Cronbach's alpha (threshold >0.6)	Minimum CITC (threshold >0.3)
Res1	Greeting my teacher is a sign of respect.	1	.605	.454	0.848	0.349
Res2	Following instructions or orders from teachers is a sign of having confidence in the teacher.		.569	.413		
Res3	I show respect for my teacher by being polite to him/her.		.700	.559		
Res4	Adapting to behaviours and patterns of groupmates ensures that the group is able to perform better.		.590	.395		
Res5	Support for one another is important to ensure the group is working well.		.746	.545		
Res6	Tolerance of each other is important for the success of a group.		.707	.490		
Per1	Perseverance is an important trait in a student.		.749	.588		
Per2	Persistence is a good characteristic of a student.		.642	.470		
Per3	Students who persevere will eventually enjoy success in the end.		.502	.424		
Per4	Perseverance and not relying on the teacher alone will eventually lead me to learning more.		.366	.398		
Edu2	My family highly expects me to have obtained knowledge from my studies.	2	.401	.347	0.777	0.427
Edu3	I study hard so that I can achieve good grades.		.604	.542		
Edu4	I hope I can bring pride to my family with good results.		.680	.582		
Edu5	With good results, I can get a good job with a good salary to take care of my family.		.732	.613		
Edu6	Getting good result may help me to pursue my dream job.		.724	.597		
Dep2	I am fully dependent on teachers to provide me with answers.	3	.752	.644	0.743	0.415
Dep3	I am fully dependent on teachers to provide me with guidance.		.740	.643		
Dep5	I prefer to rely upon my teachers to provide extra reference rather than to look for myself.		.653	.586		
Dep6	Other sources of knowledge recommended by teachers are more reliable compared to references found by students.		.456	.433		

**Appendix A. Factor Structure and Reliability Analysis for the CHC Scale with 4-Factor Model and 24 Items (continued).**

Item code	Items	Factor	Item loading (threshold >0.3)	Item communalities (threshold >0.3)	Cronbach's alpha (threshold >0.6)	Minimum CITC (threshold >0.3)
Har1	In a conflict, I would choose to remain silent as I lack confidence in myself.	4	.400	.371	0.682	0.388
Har2	A person who is shy in nature will not choose to be actively involved in a learning activity.		.526	.439		
Har3	A person who is to avoid conflict will choose not to voice their opinions.		.705	.570		
Har4	In order to not humiliate someone, I will choose not to correct another person even when he/she is wrong.		.517	.442		
Har5	Being timid or shy in nature, one might choose to remain silent so as not to draw attention.		.563	.459		

**Appendix B. Assessment of Internal Consistency, Indicator Reliability, and Convergent Validity of the Final Measurement Model**

Construct	Indicator	Loading (threshold > 0.5)	Cronbach's alpha	rho A	CR (threshold > 0.6)	AVE (threshold >0.5)	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					

