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CONFIRMATORY FACTOR ANALYSIS OF THE BIG FIVE PERSONALITY TRAITS AND SELF-REGULATED LEARNING STRATEGIES: VALIDATING MEASUREMENT MODELS FOR INTERNATIONAL CHINESE STUDENTS IN PRIVATE UNIVERSITIES IN SELANGOR

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ABSTRACT

This study utilized confirmatory factor analysis (CFA) to validate measurement models for the Big Five personality traits and self-regulated learning strategies among international Chinese students in Selangor private universities. The research aims to establish a reliable and valid framework for understanding how these personality traits correlate with self-regulated learning practices, particularly in academic achievement contexts. Data were collected from 430 undergraduate students in their second to fourth years of study, using the Big Five Inventory (BFI) and the Motivated Strategies for Learning Questionnaire (MSLQ) as primary instruments. The results from the CFA confirmed the validity and reliability of the measurement models, demonstrating a good fit with the data. This study contributes to the academic literature by providing a robust model for assessing personality and learning strategies, offering valuable insights for educational institutions to enhance learning outcomes and tailor support for international students.

Keywords: *Big Five Personality, Self-regulated Learning Strategy, Cognitive Strategy Use, Self-regulation, Measurement Model*

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INTRODUCTION

Globalization has significantly increased the opportunities for students to pursue higher education abroad, leading to a marked rise in international students over the past decade. In 2012, approximately 4.5 million students were studying abroad, with projections suggesting this number will reach 7.2 million by 2025 (Bohm et al., 2002; Singh & Jack, 2018). According to the Ministry of Education of China, around 662,100 Chinese students were studying overseas in 2019, reflecting an 8.83% increase from 2018. Malaysia has become one of the preferred destinations for these students, attracted by the country's multicultural environment and high standards in higher education (Mitchell, 2018). UNESCO's 2015 statistics highlighted Malaysia as the sixth most popular destination for international students, hosting over 64,482 students, constituting 1.4% of the global international student population.

Malaysia's appeal as an educational hub, particularly for Chinese students, stems from its diverse cultural landscape and the Malaysian government's commitment to enhancing the quality of higher education. This commitment includes revising educational policies to accommodate foreign students better, encouraging them to study in Malaysia (MOHEM, 2013-25; Zhang & Chen, 2012). In this context, Chinese international students represent a significant and growing demographic in Malaysian universities, facing unique challenges and opportunities as they navigate new academic and cultural environments. To support these students effectively, it is essential to understand the factors that influence their academic success.

Personality traits and self-regulated learning (SRL) strategies are critical to determining academic achievement. The Big Five personality traits—Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism—provide a robust framework for analyzing individual differences in behavior, motivation, and learning. Research has consistently shown that conscientiousness correlated positively with academic achievement (Rosito, 2020; Sorić et al., 2017). However, the relationships between the other four personality traits and academic success are less clear, with studies yielding mixed results (Chamorro-Premuzic & Furnham, 2003). SRL strategies, which include goal setting, self-monitoring, time management, and self-reflection, enable students to take an active role in their learning processes and have been identified as key factors in academic success (Daniela, 2015; Zimmerman, 2002).

The role of SRL strategies in academic achievement is well-documented, with cognitive strategies and self-regulation being particularly important. Cognitive strategies involve the organization and elaboration of information, while self-regulation encompasses the ability to manage emotions, behaviors, and learning strategies to achieve academic goals (Fonagy & Target, 2002; Wibrowski et al., 2017). Numerous studies have demonstrated the positive impact of SRL strategies on academic achievement (Pintrich, 2004; Zimmerman, 2002). For instance, Newman (2009), and Ning and Downing (2012) have highlighted the role of self-regulation in enhancing students' learning experiences and outcomes. Despite these findings, there is a significant gap in the literature concerning the impact of these strategies across diverse cultural contexts, particularly among international student populations (Sorić et al., 2017).

Addressing this gap is crucial to deeply understanding the complex relationships between SRL strategies, personality traits, and academic achievements. This study aims to construct and validate a measurement model that explores these associations among Chinese international students in Malaysia. Insights from this research will contribute to the development of personalized educational interventions tailored to enhance learning outcomes and support the diverse needs of students in a globalized educational landscape.

LITERATURE REVIEW

Mobility trends of international students in Malaysia

Malaysia has implemented strategic initiatives to establish itself as a premier educational hub, aiming to attract international students substantially, particularly from China. The Malaysian government's national education blueprint, announced in 2015, set ambitious targets to draw 200,000 international students by 2020 and 250,000 by 2025 as part of the National Higher Education Strategic Plan (2007-2020) (Munusamy & Hashim, 2019). These initiatives include enhancing educational quality, increasing English-taught programs, and fostering global university partnerships. Consequently, by September 2019, Malaysia had 39,099 international students in public universities and 92,415 in private institutions, reflecting the success of these policies (Sharma, 2020).

Chinese students constitute a significant portion of Malaysia's international student population, with approximately 1,345,000 Chinese students studying in Malaysia in 2019 (Statista, 2019). The appeal for Chinese students is driven by competitive tuition fees, affordable living costs, and available English-medium programs. Furthermore, Malaysia has simplified visa processes, offered scholarships, and implemented initiatives to integrate international students into the local community, enhancing their overall experience and solidifying Malaysia's reputation as a desirable study destination. These efforts underscore Malaysia's growing influence in the global education market and its commitment to becoming a leading educational hub in the region.

Big Five Personality

Personality traits can be understood as descriptions of an individual's average tendencies (such as agreeableness, openness to experience, etc.) across various situations and events. These situations may be unintentionally encountered or consciously chosen, uninfluenced by the individual (Fleeson, 2001).

Conscientiousness has consistently emerged as the most robust predictor of academic success. Conscientious individuals are characterized by their diligence, reliability, and a strong sense of responsibility, which naturally align with behaviors conducive to academic achievement. A meta-analysis by Credé et al. (2016) reinforced the strong positive correlation between Conscientiousness and academic performance, highlighting traits such as persistence, hard work, and organizational skills as critical factors. Further studies, such as those by Richardson et al. (2018), have confirmed that conscientious students are more likely to engage in effective study habits and time management, enhancing their academic outcomes.

Openness to Experience, associated with intellectual curiosity and creativity, has also been linked to academic performance, albeit less consistently than Conscientiousness. Individuals high in Openness tend to engage in deep learning strategies, seeking to understand underlying concepts rather than merely memorizing information. Recent research by Kaufman et al. (2016) found that Openness was a significant predictor of higher-order thinking skills and innovative problem-solving, which are valuable in academic settings. This trait is particularly beneficial in subjects that require critical thinking and creativity, such as the arts and sciences.

Extraversion, characterized by sociability and assertiveness, has mixed effects on academic achievement. While extraverted individuals may benefit from increased participation in classroom discussions and group work, their social nature can also lead to distractions. A study by Komarraju et al. (2019) found that the relationship between Extraversion and academic performance is context-dependent. For instance, extraverts may excel in collaborative learning environments but struggle in

solitary study settings. The nuanced effects of Extraversion suggest that educational strategies should be tailored to leverage the strengths of extraverted students while mitigating potential distractions.

Agreeableness, associated with kindness, cooperation, and trust, has a less direct but notable impact on academic performance. High Agreeableness can facilitate positive relationships with peers and instructors, contributing to a supportive learning environment. However, the direct correlation between Agreeableness and academic achievement is weaker than Conscientiousness. Studies such as those by Poropat (2019) indicate that while agreeable students may benefit from collaborative learning settings, their academic success is more significantly influenced by other personality traits and external factors.

Neuroticism, characterized by emotional instability and anxiety, generally harms academic performance. High levels of Neuroticism can lead to stress and anxiety, which interfere with effective studying and academic tasks. Recent research by Spengler et al. (2016) has demonstrated that students high in Neuroticism are more prone to academic burnout and lower achievement. Interventions aimed at reducing anxiety and promoting emotional stability can be beneficial for these students, helping to mitigate the adverse effects of Neuroticism on their academic performance.

Recent investigations have also underscored the significance of integrative methodologies that consider the interaction between various personality traits and other elements such as motivation, self-regulation, and learning strategies. For instance, Wang et al. (2020) emphasized the function of self-regulated learning as a mediator between personality traits and academic performance. Their findings indicate that interventions to enhance self-regulation skills can amplify the beneficial impacts of traits like Conscientiousness and Openness on educational outcomes. Additionally, there is an increasing interest in the dynamic nature of personality traits and their interactions with the educational milieu. For example, Li et al. (2018) examined how the alignment between students' personality traits and the educational context can affect their academic achievement. Their research suggests that developing learning environments corresponding to students' personality profiles can optimize academic outcomes.

Self-regulated Learning Strategy

The self-regulated learning strategy (SRLs) was defined by Zimmerman (1989, 2002) as the actions and processes that can help obtain skills or information involving learners' purpose, agency and perception. Even though SRLs came from educational psychology, the research suggested that it was also used in language education. Self-regulated learning has three parts, including forethought, self-reflection, and performance (Zimmerman & Campillo, 2003). Besides, SRL can be defined to confirm some aspects of individuals, as well as the concept or ideas to change individuals (Forgas et al., 2011). Self-regulated learning has an important function to develop students' skills in the present society (Google & Canvas8, 2019). According to Pintrich and De Groot (1990), there were two cognitive scales contained and constructed for the motivated strategies for the learning questionnaire (MSLQ), self-regulation and Cognitive Strategy Use. Those two strategies were selected as the mediator for the relationship between the big five personality traits and academic achievement for this study.

Self-regulation is the process that can control and evaluate individuals' behavior and learning (Ormrod & Ellis, 2009). Self-regulation refers to students' involvement level in the learning process with motivation, metacognition, and cognition (Pardo et al., 2016). Self-regulated learning is a productive and positive process. The learners try their best to manage their motivation, cognition, and behavior, which are led and controlled by the environment and objectives to make an effort to achieve the set goals (Pintrich, 2004; Schunk, 2005). Self-regulatory activities can adjust the

relationship between the environment and individuals and their accomplishments (Zimmerman, 2002). Forgas et al. (2009) defined self-regulation as "to change… oneself, or some aspect of oneself, to conform to some idea or concept." Zimmerman (2002) also defined self-regulation as "the selective process by which learners transform their mental abilities into academic skills."

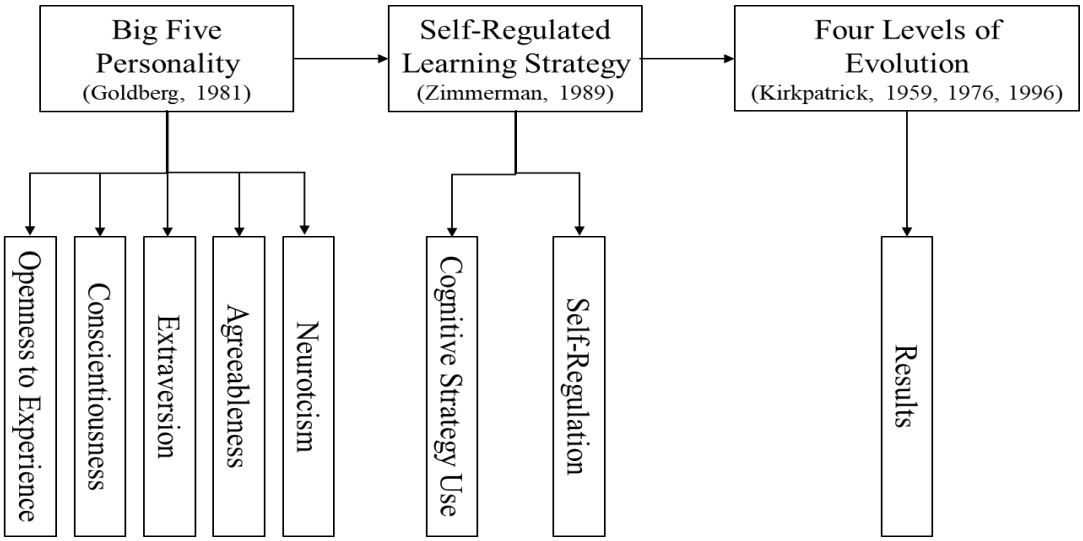
Cognitive Strategy Use has been discovered and used since the 1970s, assisting student success (Winzer, 2008; Zimmerman, 2002). It is a particular method to solve problems, including various kinds of planning, reasoning, arithmetic, etc. It is worth mentioning that cognitive strategy always interacts with aspects not only in the mind (Siegler & Shipley, 1995). It is also called scaffolds, procedural facilitators, or procedural prompts (Yeh et al., 2011). The cognitive strategy offers the learning structure when the problem cannot be solved through a certain procedure. It is quite useful for students attempting to address a learning difficulty, and it can increase efficiency. Students who perform well academically were found willing to use the cognitive strategy in their studies (McEwen et al., 2009). The use of cognitive strategy is one of the cognitive scales constructed by self-regulated learning strategies in the instrument of The Motivated Strategies for Learning Questionnaire (Pintrich & Groot, 1990; Zhang et al., 2017).

Recent research has highlighted the mediating role of SRL in the relationship between personality traits and academic achievement. For instance, Wang et al. (2020) demonstrated that self-regulated learning processes mediate the effects of personality traits like Conscientiousness and Openness on academic achievement. Goebel and Harris (1980) discovered that cognitive strategy use not only contains individual differences but also developmental differences. Moreover, the personality factor can predict the use of cognitive strategy. Another research, from Schur et al. (2015), revealed that strong predictors for gaining a degree were a high level of internal control tendencies and conscientiousness, low extraversion, and a high influence of cognitive ability.

Theoretical framework

The theoretical framework for examining the relationship between the Big Five personality traits and self-regulated learning (SRL) strategies integrates key concepts from personality psychology and educational psychology. As shown in Figure 1, The current study integrates three theoretical frameworks: the Big Five Personality Traits (Conscientiousness, Openness to Experience, Agreeableness, Extraversion, and Neuroticism), Self-Regulated Learning Strategies (self-regulation and cognitive strategy use), and Kirkpatrick's Four Levels of Evaluation, specifically focusing on the results level. These frameworks collectively provide a comprehensive understanding of individual differences in personality, learning management, and the effectiveness of educational interventions in enhancing academic performance.

Figure 1.
Theoretical Framework



CONFIRMATORY FACTOR ANALYSIS

Confirmatory Factor Analysis (CFA) is a statistical technique used to test the validity of hypothesized relationships between observed variables and their underlying latent constructs (Byrne, 2013). CFA is particularly useful in validating measurement models, ensuring that the instruments used accurately reflect the theoretical constructs they are intended to measure (Brown, 2015).

In educational research, CFA has been used to validate scales measuring personality traits, learning strategies, and other psychological constructs. By confirming the factor structure of these scales, researchers can ensure that the instruments are reliable and valid across different populations and settings. This is especially important in cross-cultural research, where measurement invariance needs to be established to make meaningful comparisons across groups (Steenkamp & Baumgartner, 1998).

RESEARCH PROBLEMS

While extensive research has explored personality traits and learning strategies, a significant gap exists in studies focusing on international student populations, particularly within non-Western contexts. Most of the existing literature on the Big Five Personality traits and self-regulated learning (SRL) strategies has been conducted in Western countries, raising concerns about the findings' generalizability to other cultural settings (Schmitt et al., 2007).

Specifically, for Chinese students studying abroad in Malaysia's private universities, we must validate measurement instruments that accurately capture their unique cultural and educational experiences. This study seeks to address this gap by using Confirmatory Factor Analysis (CFA) to validate the measurement models for the Big Five Personality traits and self-regulated learning strategies among international Chinese students in Selangor. This research will contribute to a deeper understanding of how these constructs function in a cross-cultural context.

METHODOLOGY

Research design

For data analysis, this study used various statistical software, including the Statistical Package for the Social Sciences (SPSS, version 25) and Analysis of Moment Structures (AMOS, version 24), The analytical techniques utilized in this research comprised descriptive analysis and Confirmatory Factor Analysis (CFA).

Research approach

The research approach for this study was structured in two distinct phases: a pilot study and a main study. Both phases were designed to validate the measurement models for the Big Five personality traits and self-regulated learning strategies among international Chinese students in private universities in Selangor. The pilot study was conducted to assess the validity and reliability of the research instruments and refine them as necessary, while the main study focused on the comprehensive collection and analysis of data to achieve the research objectives.

Pilot study

The pilot study evaluated the appropriateness and clarity of the selected questionnaire instruments for the target population—international Chinese students. This phase was crucial for ensuring that respondents could easily comprehend and accurately complete the survey, thereby enhancing the reliability and validity of the data collected in the main study. Given that the instruments had been previously used in various cultural contexts, it was necessary to modify certain items based on feedback from the pilot study to align with the specific characteristics of the current sample.

A sample of 72 students from the University of Malaya were selected for the pilot study. This sample size was chosen in line with recommendations from existing literature, which suggests a minimum of 70 participants to ensure accurate reliability testing (Teare et al., 2014). The researcher distributed printed questionnaires to Chinese students from mainland China across different faculties, with the assistance of lecturers who permitted data collection after regular class sessions. The feedback from this pilot study was used to refine the questionnaire, ensuring that any ambiguous or unclear items were revised before proceeding to the main study.

Main study

Following the successful completion and refinement of the instruments in the pilot study, the main study was conducted to collect comprehensive data for confirmatory factor analysis (CFA). The primary goal of the main study was to validate the measurement models for the Big Five personality traits and self-regulated learning strategies within the context of international Chinese students at private universities in Selangor.

For the main study, a sample of 430 valid responses was collected from undergraduate students in their second to fourth years of study across six private universities in Selangor. The data collection utilized the Big Five Inventory (BFI) and the Motivated Strategies for Learning Questionnaire (MSLQ) as the primary instruments. The data obtained were then subjected to CFA using AMOS software to test the validity and reliability of the proposed measurement models. The results from the main study provided a robust framework for understanding the interaction between personality traits and self-regulated learning strategies, contributing valuable insights to the field of educational psychology and offering practical recommendations for enhancing academic outcomes among international students.

Research locale

All target universities in this study are located in Selangor, a state in West Malaysia, which is one of the 13 states of the country. Selangor is recognized as Malaysia's largest economic contributor in gross domestic product (GDP) (DOS, 2016). According to the Ministry of Higher Education Malaysia, Selangor is home to four public universities, 23 private universities, nine private university branches, three foreign private university campuses, and 94 colleges. The abundance of educational resources and high-quality university facilities make Selangor an attractive destination for international students from various parts of the world.

For this study, six private universities were selected based on their high enrollment numbers of Chinese undergraduate students within their international student population. The designated universities are as follows:

1. Xiamen University Malaysia
2. Limkokwing University of Creative Technology
3. SEGi University
4. Taylor's University
5. INTI International University
6. Sunway University

Sample

In this study, a sample of 430 Chinese undergraduate students from six private universities in Selangor was selected for research. The target population comprised students in their second, third, and fourth years of study. Statistical data from the official websites of these universities indicated a considerable presence of international students, particularly from China. This context provided a robust sample for an in-depth examination of Chinese international undergraduate students within these institutions.

Data collection was facilitated through distributing hardcopy questionnaires. Before distribution, respondents were asked to confirm their status as Chinese international undergraduates from mainland China, specifically in their second to fourth years of study. Once confirmed, hardcopy questionnaires were administered, each requiring approximately 20 to 30 minutes for completion. Throughout the data collection process, the researcher recorded responses to address the research objectives and analyzed the collected data thoroughly.

The questionnaire administration was designed to accommodate multiple respondents simultaneously. Informed consent was obtained from each respondent before the distribution of the questionnaires. Upon receiving consent, the respondents were provided with the questionnaire, and the researcher remained available to clarify any questions or items that the respondents found challenging. Upon completion, the researcher collected the questionnaires. Respondent selection was based on specific demographic criteria, including their year of study (second to fourth year) and a minimum age of 18.

Instrument

The questionnaire contained eight pages, including a cover page and an introductory page. It was divided into three distinct sections, each with its heading, with the first section collecting background information about the respondents. The second section assessed the Big Five personality traits using the Big Five Inventory (BFI) developed by John and Srivastava (1999). The third section measured cognitive strategy use and self-regulation through the Motivated Strategies for Learning Questionnaire (MSLQ) by Pintrich and DeGroot (1990). The entire questionnaire utilized a five-point

Likert scale (1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree) to gauge respondents' attitudes.

The measurement items were parceled and subsequently recorded with new identifiers (Bandalos, 2002). The study focused on seven constructs—five associated with the Big Five personality traits and two with self-regulated learning strategies—resulting in 19 new codes instead of the original 66 items. Specifically, items related to extraversion (EXT) were parceled into EXTA and EXTB; agreeableness (AGR) into AGRA, AGRB, and AGRC; conscientiousness (CON) into CONA, CONB, and CONC; neuroticism (NEU) into NEUA and NEUB; and openness to experience (OPE) into OPEA, OPEB, and OPEC. For the self-regulated learning strategies, cognitive strategy use (CSU) was parceled into CSUA, CSUB, and CSUC, while self-regulation (SR) was parceled into SRA and SRB. The detailed parceling process is as follows,

Table 1.
List of the Measurement Items for Big Five Personality and Self-regulated Learning Strategy Use

Constructs	Coding	Measurement Items
Extraversion (EXT)	EXTA	E1: Is Talkative
		E2: Is reserved
		E3: Is full of energy
		E4: Generates a lot of enthusiasm
	EXTB	E5: Tends to be quiet
		E6: Has an assertive personality
		E7: Is sometimes shy, inhibited
		E8: Is outgoing, sociable
Agreeableness (AGR)	AGRA	A1: Tends to find fault with others
		A2: Is helpful and unselfish with others
		A3: Starts quarrels with others
	AGRB	A4: Has a forgiving nature
		A5: Is generally trusting
		A6: Can be cold and aloof
	AGRC	A7: Is considerate and kind to almost everyone
		A8: Is sometimes rude to others
		A9: Likes to cooperate with others
Conscientiousness	CONA	C1: Does a thorough

Constructs	Coding	Measurement Items
(CON)		C2: Can be somewhat careless
		C3: Is a reliable worker
	CONB	C4: Tends to be disorganized
		C5: Tends to be lazy
		C6: Perseveres until the task is finished
	CONC	C7: Does things efficiently
		C8: Makes plans and follows through with them
		C9: Is easily distracted
Neuroticism (NEU)	NEUA	N1: Is depressed, blue
		N2: Is relaxed, handles stress well
		N3: Can be tense
		N4: Worries a lot
	NEUB	N5: Is emotionally stable, not easily upset
		N6: Can be moody
		N7: Remains calm in tense situations
		N8: Gets nervous easily
Openness to experience (OPE)	OPEA	O1: Is original, comes up with new ideas
		O2: Is curious about many different things
		O3: Is ingenious, a deep thinker
	OPEB	O4: Has an active imagination
		O5: Is inventive
		O6: Values artistic, aesthetic experiences
	OPEC	O7: Prefers work that is routine
		O8: Likes to reflect, play with ideas
		O9: Has few artistic interests
		O10: Is sophisticated in art, music, or literature

Constructs	Coding	Measurement Items
Cognitive Strategy Use (CSU)	CSUA	CSU1: When I study for a test, I try to put together the information from class and from the book
		CSU2: When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly
		CSU3: It is hard for me to decide what the main ideas are in what I read
		CSU4: When I study I put important ideas into my own words
	CSUB	CSU5: I always try to understand what the teacher is saying even if it doesn't make sense
		CSU6: When I study for a test I try to remember as many facts as I can
		CSU7: When studying, I copy my notes over to help me remember material
		CSU8: When I study for a test I practice saying the important facts over and over to myself
	CSUC	CSU9: I use what I have learned from old homework assignments and the textbook to do new assignments
		CSU10: When I am studying a topic, I try to make everything fit together
		CSU11: When I read materials for this class, I say the words over and over to myself to help me remember
		CSU12: I outline the chapters in my book to help me study
		CSU13: When reading I try to connect the things I am reading about with what I already know
Self-regulation (SR)	SRA	SR1: I ask myself questions to make sure I know the material I have been studying
		SR2: When work is hard I either give up or study only the easy parts
		SR3: I work on practice exercises and answer end of chapter questions even when I don't have to
	SRB	SR4: Even when study materials are dull and uninteresting, I keep working until I finish

Constructs	Coding	Measurement Items
		SR5: Before I begin studying I think about the things I will need to do to learn
		SR6: I often find that I have been reading for class but don't know what it is all about
	SRC	SR7: I find that when the teacher is talking I think of other things and don't really listen to what is being said
		SR8: When I'm reading I stop once in a while and go over what I have read
		SR9: I work hard to get a good grade even when I don't like a class

RESULTS AND DISCUSSION

Pilot test

A pilot study was conducted with 72 questionnaires distributed. However, only 65 were fully completed and usable for this research. The detailed distribution of respondents is presented in Table 2. The sample comprised 25 males (38.5%) and 40 females (61.5%). Most respondents (52.3%) were between 20 to 22 years old. There were 17 respondents (26.2%) aged 23 to 25, while 20% were aged 17 to 19. Only one respondent was over 25 years old. Regarding the year of study, 40% of the respondents (25) were in their second year, 26.2% were freshmen, 20% were in their fourth year, and 15.4% were third-year students.

Table 2 also presents the distribution of respondents by GPA, divided into six groups. The largest group (33.8%) had GPAs between 3.3 to 3.7. The second-largest group (29.2%) had GPAs between 3.0 to 3.3, followed by 21.5% of respondents with GPAs above 3.7. Less than 10% of respondents fell into the lower GPA categories: 7.7% had GPAs between 2.3 to 2.7, 4.6% had GPAs between 2.7 to 3.0, and the lowest percentage (3.1%) had GPAs between 2.0 to 2.3.

Regarding CGPA, respondents were similarly distributed into six categories. The largest category (35.4%) had CGPAs between 3.0 to 3.7, followed by 30.8% in the 3.0 to 3.3 range. The third-largest group (18.5%) had CGPAs above 3.7. Nearly equal proportions of respondents (7.7% and 6.2%, respectively) had CGPAs between 2.7 to 3.0 and 2.3 to 2.7. The smallest group (1.5%) had CGPAs between 2.0 to 2.3.

Table 2.
The Distribution of Respondents

Variables	Category	Frequency	Percentage
Gender	Male	25	38.5
	Female	40	61.5
Age	17-19	13	20
	20-22	34	52.3
	23-25	17	26.2
	25 above	1	1.5
Year of Study	Year 1	17	26.2
	Year 2	25	38.5
	Year 3	10	15.4
	Year 4	13	20
GPA	3.7 and above	14	21.5
	3.3-3.7	22	33.8
	3.0-3.3	19	29.2
	2.7-3.0	3	4.6
	2.3-2.7	5	7.7
	2.0-2.3	2	3.1
CGPA	3.7 and above	12	18.5
	3.3-3.7	23	35.4
	3.0-3.3	20	30.8
	2.7-3.0	5	7.7
	2.3-2.7	4	6.2
	2.0-2.3	1	1.5

Table 3 presents the reliability test results from the pilot study for the Big Five personality traits and self-regulated learning strategies. All Cronbach's alpha coefficients based on standardized items for the Big Five personality traits exceed 0.6, indicating significant reliability. Specifically,

conscientiousness demonstrated the highest reliability coefficient at 0.702, followed by extraversion at 0.700. Neuroticism exhibited the lowest reliability, with Cronbach's alpha of 0.643.

Table 3 further illustrates the reliability analysis of the self-regulated learning strategy measures. The Cronbach's alpha coefficients indicate acceptable reliability and good internal consistency across the instruments. Cognitive Strategy Use achieved a Cronbach's alpha of 0.800, signifying strong reliability. Self-regulation yielded Cronbach's alpha of 0.604, the lowest among the variables examined in this study, yet still within acceptable limits, as suggested by previous research (Griethuijsen et al., 2015; Taber, 2018).

Table 3.
Results of the Pilot Test: Reliability of the Big Five Personality and the Self-regulated Learning Strategy Use

Variables	No. of Items	Cronbach's Alpha Based on Standardized Items
Big Five Personality		
Extraversion	8	0.700
Agreeableness	9	0.650
Conscientiousness	9	0.702
Neuroticism	8	0.643
Openness to Experience	10	0.644
Self-regulated Learning Strategy		
Cognitive Strategy Use	13	0.800
Self-Regulation	9	0.626

The Kaiser-Meyer-Olkin (KMO) test assesses the suitability of data for factor analysis by indicating the adequacy of sample size and the degree of intercorrelation among variables. A KMO value close to 1 suggests high suitability for factor analysis, with values above 0.5 generally considered acceptable (Analysisinn, 2020). In this study, all variables demonstrated KMO values exceeding 0.6, indicating substantial overlap or strong partial correlation among the variables (Table 4). Specifically, Cognitive Strategy Use exhibited the highest KMO value at 0.754, followed by agreeableness at 0.749, while self-regulation had the lowest value at 0.602.

Additionally, Bartlett's Test of Sphericity yielded a significant p-value of 0.000 for all variables, confirming the presence of significant correlations among the variables and supporting the validity of the pilot test conducted in this study.

Table 4.
Results of the Pilot Test: Validity of the Big Five Personality and the Self-regulated Learning Strategy Use

Variables	No. of Items	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity
Big Five Personality			
Extraversion	8	0.652	0.000
Agreeableness	9	0.749	0.000
Conscientiousness	9	0.673	0.000
Neuroticism	8	0.661	0.000
Openness to Experience	10	0.721	0.000
Self-regulated Learning Strategy			
Cognitive Strategy Use	13	0.754	0.000
Self-Regulation	9	0.602	0.000

The pilot study confirmed the fitness and accuracy of the questionnaire instruments for the main study by demonstrating significant correlations with the sample of international Chinese students. The results indicated that respondents comprehended the questions effectively, and the instruments accurately measured the Big Five personality traits and self-regulated learning strategies. Feedback from the pilot study led to some necessary refinements, ensuring the clarity and precision of the questionnaire items. This validation process affirmed that the instruments are reliable and appropriate for the main study, providing a solid foundation for analyzing the interaction between personality traits and learning strategies among the target sample.

Main Study

Data were gathered in the main study from 430 international Chinese undergraduates across six private universities in Selangor using the validated instruments from the pilot phase. The data collection utilized the Big Five Inventory (BFI) and the Motivated Strategies for Learning Questionnaire (MSLQ) as the primary instruments. The analysis of the collected questionnaires provided key insights and findings, which are detailed as follows:

Descriptive Statistics

In this study, 430 participants were surveyed, with females comprising a majority at 59.3% and males accounting for 40.3%. The predominant age group among respondents was 20 to 22 years, making up 50% of the sample. Those aged 17 to 19 represented 30.5%, while 17.7% were between 23 and 25 years old. Only a small fraction, 1.8%, were over 25.

In academic standing, most participants were in their second year of study, representing 61.2% of the sample. Third-year students accounted for 37.7%, while a minimal proportion, 1.1%, were in their fourth year.

Validity and Reliability Assessment

According to Field (2013), the concept of validity pertains to the degree to which a measurement accurately reflects what it measured. Ghauri and Gronhaug (2005) argue that validity signifies how well the data collected represents the actual scope of the research inquiry. Confirmatory Factor Analysis (CFA) serves a crucial role in not only evaluating the validity and reliability of individual items but also in assessing the overall measurement model. In this study, internal consistency reliability testing was conducted, with Cronbach's coefficient alpha chosen as the primary indicator due to its widespread application in assessing the internal coherence of scales and instruments.

Table 5 provides the Big Five personality traits and self-regulated learning strategies reliability analysis results as assessed through standardized items. All Big Five personality traits' Cronbach's alpha coefficients exceeded 0.6, confirming substantial reliability. Among these traits, Extraversion demonstrated the highest reliability with a coefficient of 0.835, while agreeableness showed the lowest at 0.760. Conscientiousness and neuroticism also showed strong reliability, with coefficients of 0.820 and 0.819, respectively.

The analysis revealed acceptable reliability and internal consistency for the self-regulated learning strategies. Cognitive strategy use achieved a Cronbach's alpha of 0.781, indicating strong reliability, whereas self-regulation exhibited a higher coefficient of 0.868, ranking it as one of the most reliable measures among all variables in this study.

Table 5.
Cronbach's Alpha Results

Items	Cronbach's Alpha Based on Standardized Items
Extraversion	0.835
Agreeableness	0.760
Conscientiousness	0.820
Neuroticism	0.819
Openness to experience	0.805
Cognitive Strategy Use	0.781
Self-regulation	0.868

Correlational Analysis

This study selected Pearson correlation analysis to thoroughly examine the relationships between the constructs. Per Tacbachnick and Fidell (1996), the Pearson correlation coefficient ranges from -1.00 to +1.00, with values of -1.00 or +1.00 signifying a perfect correlation between two variables. Generally, strong correlations are identified when the coefficient is less than -0.50 or greater than

+0.50. Nonetheless, coefficients approaching -1.00 to -0.81 or +0.81 to +1.00 are considered very high, potentially indicating multicollinearity issues (Burns & Bush, 2000).

Table 6.
Correction Matrix-Main Variable

Variables	EXT	AGR	CON	NEU	OPE	CSU	SR
EXT	1.000						
AGR	.372**	1.000					
CON	.221**	.284**	1.000				
NEU	-.373**	-.249**	-.374**	1.000			
OPE	.262**	.226**	.278**	-.095*	1.000		
CSU	.143**	.349**	.314**	-0.085	.297**	1.000	
SR	.143**	.251**	.484**	-.176**	.298**	.621**	1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 6 illustrates the correlation between the variables under investigation. However, there are no strong correlations among the seven variables analyzed in this study, suggesting that multicollinearity is unlikely to pose a problem in subsequent analyses. Out of the total correlations, 19 were statistically significant at the 0.01 level, and one was significant at the 0.05 level (NEU and OPE, r=-.095). Additionally, one correlation was non-significant (NEU and CSU, r =-0.085).

The analysis revealed that Cognitive Strategy Use (CSU) and Self-Regulation (SR) have moderate and positive correlations with each other, with the strongest relationship observed between these two variables (r=0.621). This suggests that individuals who effectively use cognitive strategies may exhibit strong self-regulation skills and vice versa.

CSU demonstrated positive correlations with Agreeableness (AGR, r=0.349), Conscientiousness (CON, r=0.314), and Openness to Experience (OPE, r=0.297). Although the correlation between CSU and Extraversion (EXT) was weaker, it remained positive. These findings imply that individuals who exhibit traits such as CON, AGR, OPE, and EXT are more likely to utilize cognitive strategies effectively. Conversely, CSU showed a negative and weak correlation with Neuroticism (NEU, r=-0.085), indicating that higher levels of NEU are associated with lower usage of cognitive strategies and vice versa.

SR exhibited a strong positive correlation with CON (r=0.484), followed by positive correlations with OPE (r=0.298) and AGR (r=0.251). Similarly to CSU, the correlation between SR and EXT was weak but positive (r=0.143). These results suggest that individuals characterized by CON, OPE, AGR, and EXT are more likely to engage in self-regulation. Conversely, SR had a weak and negative correlation with NEU (r=-0.176), indicating that higher levels of NEU are associated with lower levels of self-regulation and vice versa.

These findings lead to the preliminary conclusion that cognitive strategy use and self-regulation positively influence personality traits, except NEU. The data suggests that enhancing cognitive strategies and self-regulation can beneficially affect individuals' personalities, particularly in fostering traits such as CON, AGR, OPE, and EXT.

Measurement Model

The measurement factors from Extraversion (EXT) to Openness to Experience (OPE) are encompassed within the Big Five personality construct, while Cognitive Strategy Use (CSU) and Self-Regulation (SR) fall under the self-regulated learning strategy construct. This study tested a total of 19 measurement items, which were implemented by the researcher after parceling. The comprehensive measurement model is depicted in Figure 2. All items were systematically organized into the questionnaire, requiring respondents to use a five-point Likert scale to provide their answers and complete the survey.

This study utilized Confirmatory Factor Analysis (CFA) to further validate the overall measurement model. Table 7 outlines the regression weights of the model. Each of the 19 items exhibited non-zero loadings on the seven factors, indicating significant contributions to these factors. The direction and magnitude of the factor loadings were statistically and substantively significant, affirming the robustness of this measurement model. There were no offending estimates for the model, and the internal consistency estimates conformed well to the standards necessary for all measured items.

These findings underscore the reliability and validity of the measurement model used in this study, as evidenced by the significant loadings and acceptable fit indices. The CFA results confirm that the items effectively capture the underlying constructs of the Big Five personality traits and self-regulated learning strategies, providing a solid foundation for further analysis and interpretation of the data.

Table 7.
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
EXTB	<---	EXT	1.000			
EXTA	<---	EXT	1.399	.145	9.622	***
AGRB	<---	AGR	1.000			
AGRA	<---	AGR	1.117	.113	9.924	***
CONB	<---	CON	1.000			
CONA	<---	CON	.763	.062	12.279	***
NEUB	<---	NEU	1.000			
NEUA	<---	NEU	.886	.109	8.161	***
OPEB	<---	OPE	1.000			
OPEA	<---	OPE	1.126	.103	10.977	***
CSUB	<---	CSU	1.000			
CSUA	<---	CSU	1.027	.087	11.737	***
SRB	<---	SR	1.000			
SRA	<---	SR	1.196	.086	13.901	***
CSUC	<---	CSU	.973	.089	10.914	***
AGRC	<---	AGR	.759	.076	9.950	***
CONC	<---	CON	.923	.069	13.297	***
OPEC	<---	OPE	.468	.067	6.940	***
SRC	<---	SR	.858	.078	11.020	***

The model estimation results, presented in Table 8, provide an in-depth examination of the measurement model for the Big Five personality traits and self-regulated learning strategies. This model includes the constructs of Extraversion (EXT), Agreeableness (AGR), Conscientiousness (CON), Neuroticism (NEU), Openness to Experience (OPE), Cognitive Strategy Use (CSU), and Self-Regulation (SR). The χ^2 statistic for the model is significant (χ^2 = 365.82; df = 2.793; $p < 0.001$), indicating a good fit between the hypothesized model and the observed data.

The model fit indices further support the adequacy of the measurement model. The Goodness of Fit Index (GFI) is 0.93, indicating a good fit. The Tucker-Lewis Index (TLI) is 0.885, and the Comparative

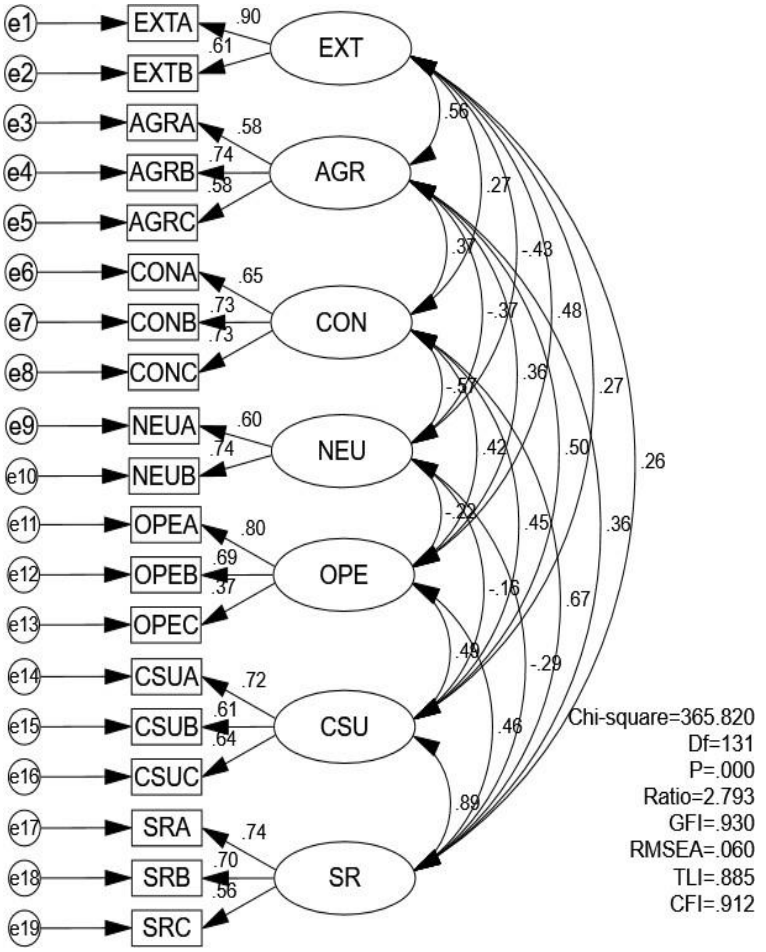
Fit Index (CFI) is 0.912, both close to or above the threshold of 0.90, suggesting an acceptable fit. Additionally, the Root Mean Square Error of Approximation (RMSEA) is 0.06, which falls within the acceptable range, indicating a reasonable fit of the model to the data.

In summary, the model fit statistics demonstrate that the measurement model aligns well with the empirical data. These findings validate the constructs of the Big Five personality traits and self-regulated learning strategies, confirming that the model provides a reliable and valid framework for further analysis. This strong model fit supports the theoretical relationships among the constructs, paving the way for more nuanced investigations into their interactions and impacts on educational outcomes.

Table 8.
Measurement Model Fit Index

Fit Indicates	χ2	χ2/df	GFI	TLI	CFI	RMSEA
	365.82	2.793	0.93	0.885	0.912	0.06
	P<0.001					

Figure 2.
Measurement Model



CONCLUSION

This study implemented a comprehensive construct combining the Big Five personality traits and self-regulated learning strategies, utilizing two integrated questionnaires to assess international Chinese undergraduates in Selangor. The measurement model included five dimensions under the Big Five personality and two dimensions under self-regulated learning strategies, incorporating 19 measurement items that collectively contributed to the model. The results indicate that the model fit, validity, and reliability all meet acceptable standards. Specifically, the constructs of Extraversion (EXT), Agreeableness (AGR), Conscientiousness (CON), Neuroticism (NEU), Openness to Experience (OPE), Cognitive Strategy Use (CSU), and Self-Regulation (SR) all positively correlate within this measurement model. These factors not only fulfill but enhance the model, suggesting that the implementation practice can be more effective with additional learning strategies to make the model more comprehensive. A notable finding is the positive relationship between cognitive strategy use and personality, as well as between self-regulation and personality, except Neuroticism.

This research has several significant implications. Firstly, it contributes to developing a framework that integrates personality traits, cognitive strategy use, and self-regulation, offering a foundation for future research. Secondly, understanding the relationship between the Big Five personality traits and self-regulated learning strategies can help students gain deeper self-awareness and make more informed decisions based on their characteristics. Thirdly, the study provides universities with valuable insights into student behavior, enabling educators to tailor their teaching strategies to better support individual student needs, thereby enhancing academic progress. However, the study has certain limitations. The sample was limited to international undergraduate students from China, which may restrict the generalizability of the findings to a broader international context. Additionally, the study focused on measuring the model implementation rather than performance outcomes, potentially overlooking the mediating and moderating effect on the factors.

Future research can address these limitations by exploring the measurement scale in different countries and among various student populations. Further studies could also incorporate additional factors to refine and expand the model. Additionally, developing a full structural model that includes academic achievement could provide deeper insights into the relationships between personality, self-regulated learning strategies, and academic achievement.

In conclusion, this study offers a valuable framework for understanding the interplay between personality traits and self-regulated learning strategies by providing a basis for future research and practical applications in educational settings. Educators and researchers can develop more effective strategies to support student learning and development by enhancing our understanding of these dynamics.

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