

The Effect of Intercultural Learning Challenges on Cognitive Load of Indonesian Students Abroad

Ratna Sari Dewi

Department of Industrial and Systems Engineering
Sepuluh Nopember Institute of Technology
Surabaya, Indonesia
ratna@ie.its.ac.id

Aisyah Juliawulan Malahayati

Department of Industrial and Systems Engineering
Sepuluh Nopember Institute of Technology
Surabaya, Indonesia
aisyahjuliawulan@gmail.com

Abstract

The ease of accessing information about education abroad encourages students to continue their study in other countries. However, studying abroad has many challenges. Managing intercultural diversity and overcoming intercultural learning are two of them. These factors affect international students' cognitive load. Furthermore, intercultural aspects have not been considered widely in many studies related to cognitive load, particularly in education. This study analyzes the effect of intercultural diversity and intercultural learning challenges on the cognitive load of Indonesian students in the foreign countries. The data is collected by distributing online questionnaires to 124 Indonesian students studying abroad. In the later stage of this study, Structural Equation Modeling (SEM) is employed to evaluate the significance of relationships among several factors studied. The results showed that intercultural learning challenges have a significant effect on student's cognitive load.

Keywords

Cognitive load, Foreign language, Intercultural learning challenges and SEM.

1. Introduction

Based on the annual report of the Ministry of Research, Technology and Higher Education, every year Indonesian students studying abroad are increasing. Countries that become the destination of Indonesian students to study consist of Australia, USA, Britain, China, Netherland, Germany and Malaysia. Studying abroad certainly has its own challenges, especially in the first year where it requires a lot of adaptation from both the academic and social aspects. Some of the challenges faced by international students, in general, are language difficulties, homesickness, cultural clashes, discrimination, financial problems and unfamiliar education system (Cheung and Lee 2014). This challenge is due to the fact that the country for studying abroad has a different culture and language. So, it can cause confusion and frustration for the students themselves.

Cultural differences among students have been demonstrated to alter the learning process in several research. Due to the substantial cultural disparities in the educational system, overseas students from East Asia have trouble transitioning to the western pedagogical system, according to Wang and Byram (2011). East Asian students are unfamiliar with western education, which emphasizes critical thinking and involves numerous discussions and arguments. This is because students from different cultures have different learning styles and will affect cognition and the way students process the information they get. Therefore, understanding the influence of culture on learning can facilitate instructional design to reduce the cognitive load of students, especially students who study in countries with different cultures. Learning that involves members from several different cultures is known as intercultural learning. Intercultural learning provides benefits and affects student's academic achievement. As a result, it's critical to perform

intercultural learning research aimed at assisting international students with intercultural learning issues, also known as intercultural learning challenges. Managing cultural diversity in the classroom is difficult since each overseas student faces unique problems.

CLT stands for Cognitive Load Theory, and it is a theoretical framework based on understanding of human cognitive architecture (Paas and Van Merriënboer 1994a, Van Merriënboer and Sweller 2010, Paas and Sweller 2012, Ayres and Paas 2012). Paas and Merriënboer first proposed the cognitive load model in 1994, which demonstrated a link between things that produce cognitive strain (causal factors) and elements that can be assessed to quantify cognitive burden (assessment factors). Learner traits, task (environment) features, and their interactions are the components that create cognitive load in this model as shown in Figure 1.

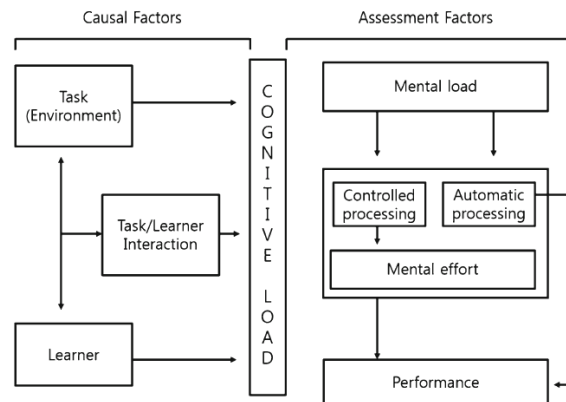


Figure 1. Model of cognitive load theory

Intercultural learning challenges were not taken into account in the Cognitive Load Theory model. As we all know, when students confront difficulties in the learning process, this has an impact on their cognitive load. The load placed on an individual's cognitive system by those involved in the learning process is impacted by the complexity of the study and the knowledge of the individual. As a result, the goal of this research is to see how intercultural learning obstacles affect cognitive load, particularly for Indonesian students studying abroad. This study aims to :

1. Knowing the intercultural learning challenges faced by Indonesian students abroad.
2. Knowing the influence of academic challenges, intercultural challenges, language challenges and research challenges on intercultural learning challenges.
3. Knowing the influence of intercultural learning challenges, task characteristics and learner characteristics on cognitive load.

2. Literature Review

2.1 Cognitive Load Theory

In general, cognitive load is described as a multidimensional concept that indicates the stress or load exerted on the cognitive system of pupils when executing various tasks. Students' performance is affected by cognitive load; performance loss happens when the burden is either low (underload) or too high (overload). The learning process can be disturbed in situations of underload and overload (Paas et al. 2004). The Cognitive Load Theory is a theory that is used to assess the efficacy and efficiency of various task features by regulating environmental factors and factoring in learner characteristics. The purpose of cognitive load theory is to explain how learning tasks place a strain on students' abilities to process new information and construct knowledge in long-term memory.

Working memory is linked to cognitive load, which relates to the working memory system's limited capacity and how to effectively handle various types of information (Matheson and Hutchinson 2014). Sweller divides cognitive load into three categories in his Cognitive Load Theory: Intrinsic Cognitive Load (ICL), Extraneous Cognitive Load (ECL), and German Cognitive Load (GCL). Extraneous Cognitive Load (ECL) is a cognitive strain that comes from teaching approaches that are not relevant to the subject matter. Intrinsic Cognitive Load (ICL) is a cognitive load that arises

from the complexity of the material being processed. Germane Cognitive Load (GCL) is a type of cognitive load that develops as a result of attempting to comprehend or grasp the topic (Sweller 2010). When the difference between total cognitive load and working memory processing capacity approaches zero, students suffer overload.

The cognitive load model that was first proposed by Paas and Merrienboer (1994a), this model (Figure 1) shows the relationship between causal factors and cognitive load measurement factors. Task characteristics, learner characteristics, and the relationship between the two are the causal elements or factors that create cognitive load in this model. Meanwhile, mental effort, mental load, and performance are used to determine the cognitive load measuring factor. The cognitive capacity required to process the complexity of an activity is referred to as mental load. The cognitive power that an individual invests in completing a task is referred to as mental effort. The term performance relates to a student's ability to learn. The two characteristics, task characteristics and learner characteristics, always interact and are associated in the learning environment. There will be no learning without students, and there will be no students if nothing is learnt. The expertise-reversal effect (Kalyuga et al. 2003, Kalyuga et al. 2012) and task characteristics-the learner's age (Paas et al. 2001, Van Gerven et al. 2006) have been studied in various CLT research that have focused on the interaction between task characteristics and learner characteristics.

Task characteristics relate to how a task or job is completed as well as the nature of the task related to a particular job. Task characteristics affect cognitive load, where tasks that have a higher complexity can cause cognitive load than simple tasks. Task characteristics are characterized as cognitive demands imposed by the learning task in Paas & Van Merrienboer's (1994a) model, which refers to the task's difficulty, type, or how learning is designed in the learning material. Included in task characteristics and associated with high cognitive load are task complexity, information processing, problem solving and skill variety. The degree to which activities are complicated and difficult to complete is referred to as task complexity. Learning processes that involve very complex tasks require the use of multiple skills and are more demanding and mentally challenging. The amount of data or other information that must be processed is referred to as information processing. The degree to which a job necessitates both ideas/solutions and more active cognitive processing is referred to as problem solving. The degree to which a task necessitates the use of a wide range of talents in order to be completed is referred to as skill variety.

The impact of learner characteristics on learning task performance is crucial because it can have a big impact on how roles are interpreted and how cognitive load affects working memory. Students' cognitive talents, cognitive style, preferences, and prior knowledge are frequently related to aspects that are reasonably constant, i.e. factors that do not change due to the task or tasks. Furthermore, learner traits such as motivation, self-efficacy, and anxiety might affect cognitive load through relatively unstable factors. Motivation, refers to things that allow students to participate and guide themselves in achieving certain goals. Motivation is an important factor in student achievement, such as research by Um et al. (2012) which says that motivation is proven to improve student learning outcomes. Self-efficacy is a person's belief in his or her own ability to plan and execute the actions required to reach a given level of performance. Anxiety, refers to subjective feelings of tension, fear, nervousness and worry experienced by students. In addition, anxiety can also be defined as a threat to students' self-image because they have to be involved in tasks that they are not good at. Anxiety is one of the factors that affect students at every stage of learning. MacIntyre and Gardner (1989) say that anxiety causes the process and performance in learning to decrease and interfere with students' cognitive abilities to absorb and process lessons so that it can reduce learning motivation.

2.2 Intercultural Learning Challenge

Intercultural learning refers to the process of education or learning from cultural diversity and is focused on the phenomenon of cultural interaction (people, cultures, languages, different opinions and views).

- Intercultural Challenge
Intercultural challenges affect the learning process and student academic achievement. The adaption hurdles that international students face when studying in a new country or culture are referred to as intercultural challenges.
- Language Challenge
Language skills, especially English, are the main requirements for studying abroad for Indonesian students. In addition to English, it is also important to master the local language skills used by a country in order to facilitate communication when carrying out daily activities and interacting with local citizens. In addition, language skills also have an impact on students' academics.

- **Academic Challenge**
Academic challenges include challenges related to differences in the learning process and understanding of lecturers as well as the education system applied in the country that is the study destination. Where differences in terms of academic processes can affect students' performances.
- **Research Challenge**
Research provisions in each country are certainly different, this is a challenge for international students in improving their research skills. Moreover, research skills when needed for future career goals.

2.3 Hypothesis

The hypothesis derived from the literature review that were tested in the model are listed below :

1. H1 : There is a significant relationship between academic challenge and intercultural learning challenge.
2. H2 : There is a significant relationship between intercultural challenge and intercultural learning challenge.
3. H3 : There is a significant relationship between language challenge and intercultural learning challenge.
4. H4 : There is a significant relationship between research challenge and intercultural learning challenge.
5. H5 : There is a significant relationship between intercultural learning challenge and cognitive load.
6. H6 : There is a significant relationship between learner characteristic and cognitive load.
7. H7 : There is a significant relationship between task characteristic and cognitive load.

3. Methods

The primary data for this study came from online surveys that were prepared and delivered to Indonesian students studying abroad that use a foreign language in their learning process, including both English and the local language. A Likert scale with a score of 1 (strongly disagree) to 5 (strongly agree) is used in the survey. The participants in this study were selected from a group of Indonesian students studying abroad in the STEM (Science, Technology, Engineering, and Mathematics) fields at both the undergraduate and graduate levels.

The poll received 124 responses from Indonesian students in Taiwan, Malaysia, Thailand, South Korea, Japan, China, Germany, Turkey, the United Kingdom, the Netherlands, Norway, France, Belgium, the United States, and Australia. In terms of gender, males made up 46 percent of the population, while females made up 54 percent. While 68 (55%) of those surveyed were between the ages of 18-24, 45 (36%) were between the ages of 25-31, 5 (4%) were between the ages of 32-38, and 1 (1%) were between the ages of 39-45. Undergraduate students accounted for 23 percent of the total, while graduate students accounted for 77 percent.

Respondents who use English as the language of learning were 66 (53%), while respondents who use foreign language other than English were 13 (11%) consisted of German, Turkish, French, Mandarin and Korean. And respondents who use two languages (English and local language) were 45 (36%) consisted of English-Turkish, English-Mandarin, English-French, English-Japanese, English-Korean, English-Malay, English-German and English-Thai.

4. Data Collection

The data was gathered through an eight-section survey created specifically for the study. The first portion was utilized to look into the students' demographic information. The second component, which consisted of three items, was called cognitive load (CL). The task characteristics (T) portion, which consisted of four items, was the third section. Learner characteristics (L) was the fourth segment, which consisted of three items. The intercultural learning challenges were in the fifth, sixth, seventh, and eighth sections. To put it another way, the fifth segment was made up of four components to look at the academic obstacles (AC). The multicultural problems were investigated in the sixth segment, which consisted of three items (ICC). The language challenges (LC) were investigated in the seventh portion, which had nine items, and the research challenges were investigated in the eighth section, which included three things (RC). SmartPLS 3.0 software was used to analyze the data, with the major use being SEM to assess the model's construct validity. The constructs employed in this investigation are listed in Table 1.

Table 1. Constructs of the study

Construct	Code	Indicator	Reference
Cognitive Load (CL)	CL1	Lecture assignments are difficult to complete	Krell 2015, Krell 2017
	CL2	I need a lot of effort in doing my coursework properly	
	CL3	My understanding of the topic being studied improves significantly	Paas 2003, Morrison et al. 2014
Learner Characteristic (L)	L1	In class, I prefer materials that arouse curiosity even though difficult to learn	Credé and Phillips 2011
	L2	Considering the difficulty of the material, lecturers and my abilities, I think I will do well this semester	Minter and Pritzker 2017
	L3	During the exam, I think about the consequences of failing	Hwang et al. 2013, Wehrwein et al. 2007
Task Characteristic (T)	T1	Simple and uncomplicated lecture assignments	Maynard and Hakel 1997
	T2	Lecture assignments require me to analyze a lot of information	
	T3	Lecture assignments often involve problems that I have never encountered before	
	T4	Lecture assignments require me to use different skills to complete	
Academic Challenge (AC)	AC1	The academic system in the country of study is different from Indonesia	Yassin et al. 2020
	AC2	In my first year in the country where I studied, I had academic difficulties	
	AC3	Academic difficulties affect my achievement in the first year	
	AC4	The teaching methodology in the country of study is different from Indonesia	
Intercultural Challenge (ICC)	ICC1	I felt the cultural difference when I first arrived in the country where I studied	Yassin et al. 2020
	ICC2	Difficult to adapt to the culture in the country where I study	
	ICC3	When I first arrived in the country where I studied, I wanted to preserve/maintain my culture	
Language Challenge (LC)	LC1	My foreign language skills were low when I first arrived in the country where I studied	Yassin et al. 2020
	LC2	In my first year in the country where I studied, it was difficult for me to understand the lecturer's accent when speaking	
	LC3	In the first year in the study country, the lecturers speak so fast that I can't understand it	
	LC4	The lecturer uses language terms that I don't know	
	LC5	In my first year in the country of study, I have a limited foreign language vocabulary	
	LC6	In my first year in the country where I studied, I couldn't express myself well in a foreign language	
	LC7	In my first year in the country where I studied, my writing skills in a foreign language were low	
	LC8	In my first year in the country where I studied, my foreign language grammar was not good	
	LC9	In the first year in the country where I study, my reading skills in foreign languages are not good	
Research Challenge (RC)	RC1	My research background is low in the first year in the country where I study	Yassin et al. 2020
	RC2	My research skills/ability is low in the first year in the country where I study	
	RC3	I have difficulty in writing the research/project required in the first year in the country where I study	

5. Results and Discussion

5.1 Evaluation of Measurement Model

The measurement model for each latent variable concept is tested in the outer model evaluation. The reflecting indicators assessed in the evaluation or testing of the outer model are the validity and reliability values. Except for second order structures, all variables in this study incorporate reflective indications. Convergent validity and discriminant validity were used to assess the validity of the outer model for reflective indicators, while composite reliability and Cronbach alpha were used to test the reliability of the outer model for reflective indicators. However, only composite reliability values were used in this investigation because the Cronbach alpha assessment yielded a lower result when compared to composite reliability.

The goal of convergent validity is to determine the validity of each indicator-latent variable link. The outer loading value shows the convergent validity value. According to Hair et al (1998), outer loading between 0.5-0.6 is regarded to meet the minimum level of validity. The outer loading value limit employed in this investigation is 0.5. There are 25 indicators with an outer loading value larger than 0.5 in the first iteration, and as many as four indicators with an outer loading value less than 0.5, notably indicators L1, L2, CL3, and ICC3. As a result, indications with an outer loading value greater than 0.5 are declared valid, while those with an outer loading value less than 0.5 are declared invalid and removed from the model. After removing the indicators from the model that have an outside loading value of less than 0,5, the outer loading value for the second iteration is calculated. And to determine the construct's reliability based on the composite reliability value, which must be 0.7.

Table 2. Convergent validity and reliability

Construct	Indicator	Outer Loading	Composite Reliability	Average Variance Extracted (AVE)
Cognitive Load (CL)	CL1	0,889	0,891	0,804
	CL2	0,904		
Anxiety			1,000	1,000
	L3	1,000		
Task Characteristic (T)	T1	0,732	0,839	0,566
	T2	0,728		
	T3	0,747		
	T4	0,801		
Academic Challenge (AC)	AC1	0,557	0,817	0,538
	AC2	0,869		
	AC3	0,869		
	AC4	0,577		
Intercultural Challenge (ICC)	ICC1	0,730	0,788	0,653
	ICC2	0,879		
Language Challenge (LC)	LC1	0,713	0,923	0,573
	LC2	0,625		
	LC3	0,715		
	LC4	0,669		
	LC5	0,849		
	LC6	0,841		
	LC7	0,788		
	LC8	0,796		
Research Challenge (RC)	RC1	0,900	0,929	0,814
	RC2	0,930		
	RC3	0,876		

From Table 2, all indicators and constructs are declared valid and reliable based on the value of outer loading and composite reliability and Figure 2 illustrates the measurement model.

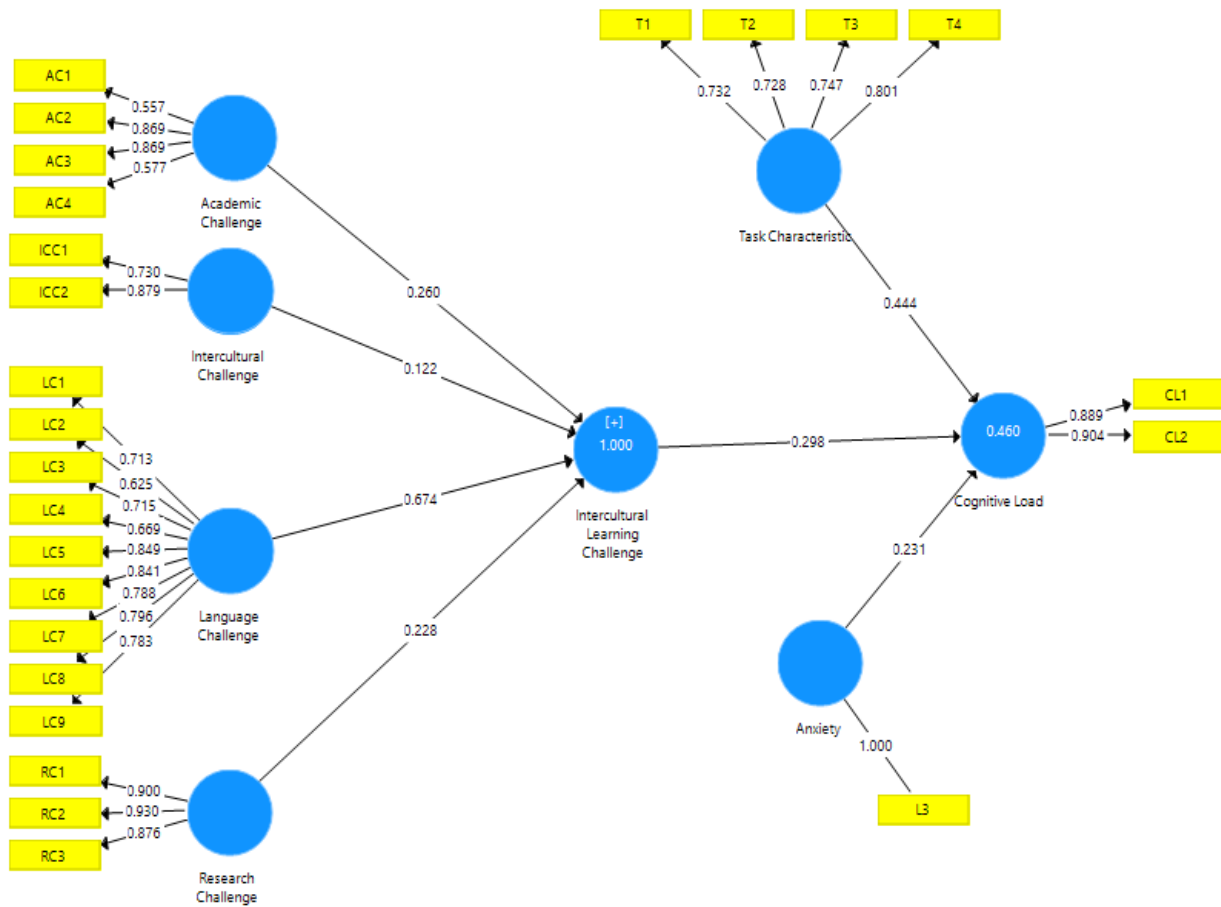


Figure 2. The measurement model

The goal of discriminant validity is to make sure that each indication of a latent variable is distinct from the indicators of other latent variables. The value of cross loading on a construct or latent variable with indicators must be greater than the value of cross loading on other constructs to demonstrate discriminant validity. Furthermore, the Average Variance Extracted (AVE) value reveals discriminant validity. The AVE value is judged valid if it is less than 0,5, according to Ghozali (2014). Table 2 shows that all constructs have an AVE value greater than 0,5 and are thus declared valid.

Table 3. Cross-loadings

	T	Anxiety	CL	ICC	LC	AC	RC
T1	0,732	0,240	0,511	0,313	-0,003	0,245	0,124
T2	0,728	0,125	0,334	0,125	-0,097	0,069	-0,073
T3	0,747	0,197	0,341	0,191	0,075	0,067	0,096
T4	0,801	0,213	0,371	0,225	0,066	0,092	0,021
L3	0,273	1,000	0,442	0,195	0,216	0,338	0,296
CL1	0,423	0,384	0,889	0,435	0,311	0,459	0,261
CL2	0,579	0,410	0,904	0,431	0,160	0,407	0,264
ICC1	0,263	0,109	0,341	0,730	0,248	0,167	0,186
ICC2	0,274	0,194	0,424	0,879	0,302	0,438	0,272
LC1	-0,136	0,129	0,051	0,191	0,713	0,276	0,210
LC2	-0,038	0,065	0,047	0,123	0,625	0,420	0,202
LC3	0,064	0,142	0,176	0,356	0,715	0,404	0,163
LC4	0,208	0,285	0,344	0,389	0,669	0,465	0,275
LC5	-0,063	0,134	0,100	0,190	0,849	0,274	0,296
LC6	-0,052	0,080	0,088	0,228	0,841	0,310	0,227
LC7	0,003	0,143	0,183	0,225	0,788	0,284	0,327
LC8	-0,094	0,110	0,169	0,169	0,796	0,310	0,203
LC9	-0,072	0,213	0,192	0,224	0,783	0,384	0,385
AC1	0,140	0,271	0,281	0,260	0,340	0,557	0,179
AC2	0,158	0,267	0,388	0,350	0,427	0,869	0,355
AC3	0,210	0,370	0,439	0,359	0,400	0,869	0,471
AC4	0,150	0,009	0,224	0,152	0,233	0,577	0,223
RC1	0,117	0,297	0,257	0,246	0,284	0,377	0,900
RC2	0,018	0,213	0,169	0,253	0,238	0,382	0,930
RC3	0,138	0,284	0,341	0,280	0,390	0,432	0,876

Based on Table 3, all construct correlation values with their indicators when compared to other constructs have a greater value. This shows that the indicators in this study have been able to explain the constructs and prove that all of the indicators are valid.

Then comparison is made between the square root value of AVE and the correlation between constructs in the model seen from the Fornell-Larcker Criterion value as follows:

Table 4. Discriminant validity using the fornell-larcker criterion

	AC	Anxiety	CL	ICC	LC	RC	TC
Academic Challenge	0,734						
Anxiety	0,334	1,000					
Cognitive Load	0,485	0,440	0,897				
Intercultural Challenge	0,406	0,191	0,486	0,808			
Language Challenge	0,465	0,190	0,229	0,316	0,757		
Research Challenge	0,433	0,297	0,290	0,285	0,336	0,902	
Task Characteristic	0,180	0,265	0,532	0,301	-0,017	0,068	0,753

Table 4 shows that all reflective constructs had sufficient discriminant validity, with the square root of AVE being greater than the correlations.

5.2 Second-Order Construct Evaluation

From the second-order construct to the first-order construct, which is the dimension, the second-order construct is evaluated. In this study, the second order construct is formative, which means the significance value is weighted and the validity and reliability tests are no longer required (Ghozali 2014). The P-value, where an indicator is regarded valid if it has a p-value less than 0.05, can be used to determine the importance of the concept or formative latent variable's weight. A multicollinearity test was also performed to determine the importance of the weights on the formative construct by looking at the VIF (Variance Inflation Factor) value. The VIF threshold value used in this study is 2.5.

Table 5. Significance value of weight and VIF

Second Order Construct	First Order Construct	Nilai Weight	P - Values	VIF
Intercultural Learning Challenge	Academic Challenge	0,260	0,000	1,540
	Intercultural Challenge	0,122	0,000	1,243
	Language Challenge	0,674	0,000	1,338
	Research Challenge	0,228	0,000	1,282

Because all variables have a P-value of less than 0.05 and a VIF value of less than 2.5, all first-order constructs are declared valid for second-order constructs, according to Table 5.

5.3 Evaluation of Structural Model

The structural model (inner model) is tested after the measurement model (outer model) is fulfilled. The structural model, also known as the inner model, is used to estimate the correlation between latent variables. Path coefficients, path significant (p-value), and variance explained were used to evaluate the structural model (R^2).

The variance explained (R^2) is used to determine the structural model's predictive power in explaining the effect of the exogenous latent variable on the endogenous latent variable. R^2 is with values between 0.67, 0.33 and 0.19 indicating strong, moderate, and weak models, respectively (Chin 1998). The higher the R^2 score, the better the proposed research model's prediction model.

Table 6. Results of variance explained (R^2)

Variabel	R^2	R^2 Adjusted
Cognitive Load	0,460	0,446
Intercultural Learning Challenge	1,000	1,000

From Table 6, the R^2 value for each variable is in the range of 0.460 – 1.000. Based on Chin (1998), in this study the cognitive load variable is moderate because it approaches the value of 0.33 while the intercultural learning challenge variable is strong because it approaches the value of 0.67.

After the structural model review stage is completed, hypothesis testing is performed. This stage is used to see if the research hypothesis stated in the research model is accepted or not. The hypothesis is accepted if the path coefficient value is more than 0,1 and the p-value is less than 0,05. Hypothesis testing utilizes a significant value, at least at = 0,05. Path coefficient values in the range of -0.1 to 0.1 are regarded inconsequential by Hass and Lehner (2009), although values more than 0.1 are significant values and are directly proportional, while values smaller than 0.1 of -0.1 are significant values and are inversely proportional. All pathways in this study had a coefficient value greater than 0.1. Table 7 shows that all hypotheses are accepted because the path coefficient value is more than 0.1 and the p-value is less than 0.05, as required.

Table 7. Results of hypothesis

Hypothesis	Path	Path Coefficients	p-values	Results
H1	AC -> ILC	0,260	0,000	Accepted
H2	ICC-> ILC	0,122	0,000	Accepted
H3	LC -> ILC	0,674	0,000	Accepted
H4	RC -> ILC	0,228	0,000	Accepted
H5	ILC -> CL	0,298	0,000	Accepted
H6	Anxiety -> CL	0,231	0,004	Accepted
H7	TC -> CL	0,444	0,000	Accepted

5.4 Discussion

The results of the study indicate that the academic challenge has a significant effect on the intercultural learning challenge, because it has a path coefficient value of 0.260 (greater than 0.1) and a p-value of 0.000 (less than 0.05) so that it meets the requirements for hypothesis testing. This is in accordance with Zhang's (2013) research which shows that academic problems are one of the challenges faced when a student studies or studies in a country that has a different culture from his home country, especially in the first year of college.

Furthermore, the results of the study also show that the intercultural challenge has a significant effect on the intercultural learning challenge, because it has a path coefficient value of 0.122 (greater than 0.1) and a p-value of 0.000 (smaller than 0.05) so that it meets the test requirements. hypothesis. This is in accordance with the research of Bethel et al. (2020) which states that cross-cultural transitions require a person to learn new skills in order to adapt well in unfamiliar cultural environments and other changes in their daily lives, including in the learning process. The language challenge also has a significant effect on the intercultural learning challenge, because it has a path coefficient value of 0.674 (greater than 0.1) and a p-value of 0.000 (less than 0.05) so that it meets the requirements for hypothesis testing. This is in accordance with the research of Yassin et al. (2020) which states that language difficulties are the most common challenges faced by international students. Another study showed that 24% of international students found a lot of new vocabulary during the learning process in the classroom, making it difficult for them to understand learning (Sidhu 2015). In addition, language difficulties also make international students unable to communicate with lecturers and friends, especially countries where the main language of instruction is in a foreign language other than English. The language challenge variable also has a greater influence on the intercultural learning challenge and cognitive load when compared to the other three variables, namely academic challenge, intercultural challenge and research challenge. This shows that language difficulties are the most common challenges faced by Indonesian students when studying abroad.

And the research challenge also has a significant effect on the intercultural learning challenge, because it has a path coefficient value of 0.228 (greater than 0.1) and a p-value of 0.000 (smaller than 0.05) so that it meets the requirements for testing the hypothesis. This is in accordance with the research of Sorkos et al. (2020) which states that research skills are skills that must be possessed by students, especially students at the master's and doctoral levels. In addition, most international students usually carry out research projects to solve problems that exist in their home countries. Therefore, this research skill is important for international students to have. The results showed that the task characteristic had a significant effect on cognitive load, because it had a path coefficient value of 0.444 (greater than 0.1) and a p-value of 0.000 (less than 0.05) so that it met the requirements for testing the hypothesis. This is in accordance with the previous cognitive load theory model which states that cognitive load is influenced by task characteristics.

Furthermore, the results of the study also show that learner characteristics, especially anxiety, have a significant effect on cognitive load, because they have a path coefficient value of 0.444 (greater than 0.1) and a p-value of 0.004 (smaller than 0.05) so that it meets hypothesis testing requirements. This is in accordance with the research of Chen and Cheng (2009) which states that students who have high anxiety during the learning process also have a high cognitive load. Initially, the latent learner characteristics consisted of three indicators, but two indicators, namely motivation and self-efficacy, had an outer loading value of less than 0.5 so that both indicators were eliminated from the model. And the intercultural learning challenge also has a significant effect on cognitive load, because it has a path coefficient value of 0.298 (greater than 0.1) and a p-value of 0.000 (smaller than 0.05) so that it meets the requirements for hypothesis testing. This is in accordance with Quan's (2016) research which states that studying abroad and studying in a different

culture from the country of origin presents many challenges and difficulties for international students. These challenges will then affect the cognitive load of these students. Variables that affect intercultural challenges such as academic challenges, intercultural challenges, language challenges and research challenges also have an indirect effect on cognitive load based on their respective p-values, namely 0.001 ; 0.003 ; 0.000 and 0.001 (less than 0.05).

Academic challenges, intercultural challenges, language challenges, and research challenges all have an impact on the intercultural learning challenges, according to the research findings. Cognitive load is also influenced by task characteristics, student characteristics, and the intercultural learning challenge. This is in line with the findings of Yassin et al. (2020), who found that every international student faces problems when studying in a country other than his own. These problems will have an impact on students' cognitive load, which will have an impact on their academic achievement.

Based on the research that has been done, when an Indonesian student is going or is studying abroad, he must be prepared for the challenges he will face. The challenge that has the most influence on cognitive load is the language challenge. Meanwhile, the challenge that has the least effect on cognitive load is the intercultural challenge. This shows that language is something that must be learned when Indonesian students will or are studying in other countries, especially countries where the main language of instruction is not English. In addition, this research can also be used by universities that accept international students to formulate regulations and policies regarding curriculum and learning processes by taking into account the challenges that students will face when studying in a country that has a culture and language of instruction that is different from their home country.

6. Conclusion

Based on the research that has been done, the following conclusions can be drawn:

1. The most experienced intercultural learning challenge for Indonesian students who study abroad is the language challenge where the path coefficient value of the language challenge is 0.674, which is higher than other challenges.
2. The results of hypothesis testing between the academic challenge, intercultural challenge, language challenge and research challenge variables show that all of these variables have a significant effect on the intercultural learning challenge with a p-value of 0.000 for each variable.
3. The results of hypothesis testing between task characteristic, learner characteristic (anxiety) and intercultural learning challenge variables show that all of these variables have a significant effect on cognitive load with a p-value of 0.000; 0.004; 0.000 in a row.

References

- Ayres, P., and Paas, F., Cognitive load theory: new directions and challenges, *Applied Cognitive Psychology*, no. 26, pp. 827–832, 2012.
- Cheung, K., and Lee, G., Tips for international students' success and Adjustment, *ISEJ-International Student Experience Journal ISEJ*, vol. 2, no. 1, 2014.
- Chin, W. W., Issues and opinion on structural equation modeling, *MIS Quarterly*, vol. 22, no. 1, pp. 7–16, 1998.
- Credé, M., and Phillips, L. A., A meta-analytic review of the motivated strategies for learning questionnaire, *Learning and Individual Differences*, vol. 21, no. 4, pp. 337–346, 2011.
- Hair, J., Anderson, R., Tatham, R., and Black, W., *Multivariate Data Analysis: with readings*, Prentice-Hall, New Jersey, 1998.
- Krell, M., Evaluating an instrument to measure mental load and mental effort using item response theory, *Cogent Education*, vol. 4, no. 1, pp. 1–6, 2015.
- Krell, M., Evaluating an instrument to measure mental load and mental effort considering different sources of validity evidence, *Cogent Education*, vol. 4, no. 1, 2017.
- Maynard, D. C. and Hakel, M. D., Effects of objective and subjective task complexity on performance, *Human Performance*, vol. 10, no. 4, pp. 303–330, 1997.
- Minter, A., and Pritzker, S., Measuring adolescent social and academic self-efficacy: cross-ethnic validity of the SEQ-C, *Research on Social Work Practice*, vol. 27, no. 7, pp. 818–826, 2017.
- Paas, F., and van Merriënboer, J. J. G., Instructional control of cognitive load in the training of complex cognitive tasks, *Educational Psychology Review*, vol. 6, pp. 51–71, 1994a.
- Paas, F., Camp, G., and Rikers, R., Instructional compensation for age-related cognitive declines: effects of goal

- specificity in maze learning, *Journal of Educational Psychology*, vol. 93, no. 181, 2001.
- Paas, F., Touvinen, J. E., Tabbers, H., and Van Gerven, P. W. M., Cognitive load measurement as a means to advance cognitive load theory, *Educational Psychologist*, vol. 38, no. 1, pp. 63–71, 2003.
- Paas, F., Renkl, A., and Sweller, J., Cognitive load theory: instructional implications of the interaction between information structures and cognitive architecture, *Instructional Science*, vol. 32, pp. 1–8, 2004.
- Paas, F., and Sweller, J., An evolutionary upgrade of cognitive load theory: using the human motor system and collaboration to support the learning of complex cognitive tasks, *Educational Psychology Review*, no. 24, pp. 27–45, 2012.
- Sweller, J., Element interactivity and intrinsic, extraneous, and germane cognitive load, *Educational Psychology Review*, vol. 22, no. 123–138, 2010.
- Van Merriënboer, J. J. G., and Sweller, J., Cognitive load theory in health professional education : design principles and strategies. *Medical Education*, 44, 85–93, 2010.
- Wehrwein, E. A., Lujan, H. L., and DiCarlo, S. E., Gender differences in learning style preferences among undergraduate physiology students, *Advances in Physiology Education*, no. 31, pp. 153-157, 2007.
- Yassin, A. A., Razak, N. A., Qasem, Y. A. M and Saeed, M. A., Intercultural learning challenges affecting international students' sustainable learning in Malaysian Higher Education Institutions, *Sustainability*, no. 12, pp. 1-19, 2020.

Biographies

Ratna Sari Dewi. Ratna received her B.E. degree in Industrial Engineering and M. Tech. Degree in Industrial and System Engineering from Institut Teknologi Bandung (ITB), Indonesia, in 2003 and 2005, respectively. In 2017, she received her PhD degree in Industrial Management from National Taiwan University of Science and Technology (NTUST), Taipei, Taiwan. Her PhD research was on Human Factors/Ergonomics. She joined the Department of Industrial and Systems Engineering, Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia in 2008 where she is currently an assistant professor and the Head of Ergonomics and Work System Design Laboratory. Her research interests are Human-Computer Interaction, UI/UX, Visual Ergonomics, Display Design, Work System Design, Occupational Health and System Safety, and Virtual Reality. She is a member of Perhimpunan Ergonomi Indonesia and International Ergonomics Associations.

Aisyah Juliawulan Malahayati. Wulan is currently a master student of Engineering and Industrial Systems, Sepuluh November Institute of Technology. She was born on July 10, 1997. She started her formal education in 2003 at Madrasah Ibtidayah Negeri Drien Rampak Meulaboh, then in 2009 continued to Madrasah Tsanawiyah Negeri Model Meulaboh-1, then in 2012 continued her education to State Senior High School 10 Fajar Harapan Banda Aceh. Furthermore, in 2015 she was accepted at the Department of Chemical Engineering, Sepuluh Nopember Institute of Technology, Surabaya.