Universiti Teknologi MARA
Cawangan Perak

INSPIREd
Virtual Ipoh International Summit on Professionalism, Research and Education 2022

IeGRESAFE 2022

E-PROCEEDING OF

1st INTERNATIONAL E-CONFERENCE ON GREEN & SAFE CITIES 2022

"Sustaining the Resilient, Beautiful and Safe Cities for a Better Quality of Life"

20 & 21 SEPTEMBER 2022

Organisers:

GRESAFE_CITIES
Green Safe Cities, Research Interest Group

The University Of Queensland
AUSTRALIA

Co-organisers:

OFFICE OF RESEARCH, INDUSTRIAL LINKAGES, COMMUNITY & ALUMNI (PJIM&A), SERI ISKANDAR CAMPUS
DEPARTMENT OF BUILT ENVIRONMENT STUDIES & TECHNOLOGY (JABT), FACULTY OF ARCHITECTURE, PLANNING & SURVEYING (FSPU)

https://myse.my/gresafecities2/IeGRESAFE/

e-PROCEEDING OF

1st INTERNATIONAL E-CONFERENCE ON GREEN & SAFE CITIES

"Sustaining the Resilient, Beautiful and Safe Cities for a Better Quality of Life"

ORGANISED BY

Gresafe_Cities RIG
The University of Queensland, Australia
Kampus Hijau UiTM Perak

CO-ORGANISED BY

Research, Industrial Linkages, Community & Alumni Network (PJIM&A)

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e ISBN: 978-967-2776-13-0

Cover Design: Muhammad Falihin Jasmi

Typesetting : Ts Dr Azizah Md Ajis

ORGANISING COMMITTEE

Patron	: Prof. Sr. Dr Md Yusof Hamid
Advisor	: Assoc. Prof. Ts Dr Norhafizah Abdul Rahman
Chairman 1	: Assoc. Prof. Ts Dr Siti Rasidah Md Sakip
Chairman 2	: Assoc. Prof. Sr Dr Nur Azfahani Ahmad
Secretary 1	: Ms Nur'Ain Ismail
Secretary 2	: Ms Nurhidayah Samsul Rijal
Treasurer 1:	: Dr Nor Nazida Awang
Treasurer 2	: Dr Nadiyanti Mat Nayan

MAIN SECRETARIAT

Invitation & Sponsorship	:	Ts Dr Ida Nianti Md Zin (L) Dr Nor Eeda Ali Ms Nur'Ain Ismail Ms Nurhidayah Samsul Rijal Ts Ahmad Haqqi Nazali Abdul Razak
Participation, Registration & Certificates	:	Dr Atikah Fukaihah Amir (L) Ms Marina Abdullah
Graphic & Printing	:	Mr Muhammad Falihin Jasmi (L) LAr Ruwaidah Borhan
Promotion & Website	:	Ts Nur Hasni Nasrudin (L) Ts Sr Dr Asmat Ismail
Information technology (IT & AV) & Media	:	Mr Aizazi Lutfi Ahmad (L) Mr Muhammad Anas Othman Mr Tuan Sayed Muhammad Aiman Sayed Abul Khair
Scientific Reviewers & Publication	:	Assoc. Prof. Sr Dr Thuraiya Mohd (L) – Sc. Reviewer Assoc. Prof. Dr Sallehan Ismail (L) - Journal Assoc. Prof. Sr Dr Siti Aekbal Salleh Assoc. Prof. Dr Kharizam Ismail Assoc. Prof. Ts Dr Siti Akhtar Mahayuddin Assoc. Prof. Sr Dr Nur Azfahani Ahmad Assoc. Prof. Sr Dr Natasha Khalil Dr Puteri Rohani Megat Abdul Rahim Ts Dr Azizah Md Ajis Sr Dr Asmalia Che Ahmad Dr Dzulkarnaen Ismail Dr Lilawati Ab Wahab Ms Marina Abdullah
Event Manager & Moderator	:	Ts. Ahmad Haqqi Nazali (L) IDr Dr Othman Mohd Nor TPr Dr Kushairi Rashid Dr Mohd RofdziAbdullah Ar Haji Azman Zainonabidin
Banquets & Charities	:	Ms Noor Faiza Rasol (L) Mr Afzanizam Muhammad Ms Siti Rohamini Yusoff

CONTRIBUTING FACTORS OF CRITICAL THINKING SKILLS ACQUISITION IN SUSTAINABILITY OF HIGHER EDUCATION: A SYSTEMATIC REVIEW

Norhayati Kassim[1]*, Nur Maizura Ahmad Noorhani[2], Siti Rasidah Md Sakip[3]
***Corresponding Author**
[1,3]Department of Built Environment Studies and Technology,
Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Perak Branch,
Seri Iskandar Campus, 32610 Seri Iskandar, Perak, Malaysia
[2] Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

*hayati84@uitm.edu.my
nmaizura@uitm.edu.my
sitir704@uitm.edu.my

Abstract

Critical thinking (CT) is a key to sustainable development as it requires the graduates who can think critically in handling built environment projects. This skill is crucial while promising the good quality of decisions made in facing the real working experience. The acquisition of this skill among graduates is different from each other due to various factors such as teachers' factor, students' factor and organisations' factors. Previous studies reveal the empowerment of these skills among graduates is still at average to lower level especially built environment education. Therefore, the aim of this systematic review is to summarize the current literature in the factors that could possibly influence the CT skills among higher education including built environment education by using a systematic review. The review process includes five main methodological steps, namely guided by review protocol, formulation of research questions, systematic searching strategies based on identification, screening, and eligibility on several established databases such as Scopus, Web of Science and Science Direct, followed by quality assessment, and data extraction and analysis. The literature was obtained from three databases Web of Science, Scopus, and ScienceDirect that published articles between 2012 and 2022 on the factor contributing to the acquisition of CT development among higher education students. The review employed the thematic analysis using ATLAS.ti 8 to answer the research question. The results of this paper presented in two forms: quantitative and qualitative data. Paper revealed three main themes namely 1) students factor 2) education factors; and 3) personal factors might influence the acquisition of CT among higher education students. This paper could benefit higher education organizations in finding an alternative way in improving the development of CT skills among students. These findings have significant implications for improving graduates CT skill by improving factors and enabling focused efforts to improve these skills thus could improve the graduate's quality.

Keywords: *Critical thinking skill, analytical thinking skills, cognitive skills, higher education, sustainable education.*

INTRODUCTION

CT is required for freedom of choice, predicting quality, and accountability for one's own judgments (Umrzokova & Pardaeva, 2020). Without this skill students may have poor

thinking which leads to difficulties, wastes time and energy, and creates frustration and sorrow (Paul, Paul & Elder, 2002). The initial step towards sustaining the environment is to provide students with sustainability education. This could be supported by students' CT skill during managing the built environment projects. where the process of CT skill will train students to be more independent and to be mature enough to produce a good decision. The CT skill acquired by graduates during their higher education will support the quality of decision making made during handling the built environment projects. Thus, it could contribute to the success of a sustainable environment. Sustainability knowledge and students' critical thinking abilities are vital for overcoming various environmental concerns. (Ekamilasari & Pursitasari, 2021). However, there is some research reporting our graduates still lack of CT skill (Latif et al., 2019; MOE, 2015; Rodzalan & Saat, 2018). In order to make them able to think critically, there are some factors that might help them enhance these skills.

Since higher education is the last platform of students to go through the academic environment, these skills are very crucial for them as it is intended to provide students with the knowledge, job-related skills, and CT skills that are required for them to prosper in their chosen fields. Looking at the vitality of these skills to the sustainable environment especially, assessing these skills is an important initial step to helping students to be able to think critically in any project decision making. Various past advocates various factors contribute to the acquisition and enhancement of these skills**. (**Park et al., 2021). However, very limited articles summarized factors that contribute to the acquisition of this skill. Therefore, the main focus of this paper is to summarize current literature on factors that possibly influence the student's CT skill in the higher education level through the systematic review method.

The acquisition of CT among students was shown to be influenced by four factors: the lecturers' sound foundation, society, students, and the educational system. (Ikenna, 2022). Personal teacher variables such as age and gender are included, as are professional data such as credentials, duration of teaching experience, position, and school characteristics (split into school type, level of education, and location (Brečka et al., 2022). In addition to cultural background, including the teachers' questioning tactics, group discussions in class, English language competency, and the criteria for grading CT in writing activities (Zhong & Cheng, 2021). The acquisition of this skill not only could contribute to the achievement of the sustainable environment but would contribute to the SDG 4 quality education. This paper attempts to identify more possible factors that influenced the CT skill among higher education students. To construct a relevant systematic review, the current article was guided by the main research question – What are the factors that influence critical thinking skill in higher education?

MATERIALS AND METHOD

In this section, the method used to retrieve articles related to critical thinking in the built environment is discussed. The reviewers used the method called PRISMA, which includes resources (Scopus, Web of Science and Science direct) used to run the systematic review, eligibility and exclusion criteria, steps of the review process (identification, screening, eligibility) and data abstraction and analysis.

PRISMA

The reporting of this systematic review was guided by the standards of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Statement (Moher et.al, 2009) to answer the research question on the factor contributing to the acquisition of CT skill. The general concepts and topics covered by PRISMA are all relevant to any systematic review, not just those whose objective is to summarize the benefits and harms of a health care intervention. This systematic review aims to review the contributing factors affecting the

acquisition of CT in education. Four phases from the PRISMA statement namely identification, screening, eligibility, and data abstraction were involved in the literature search process as shown in Figure 1.

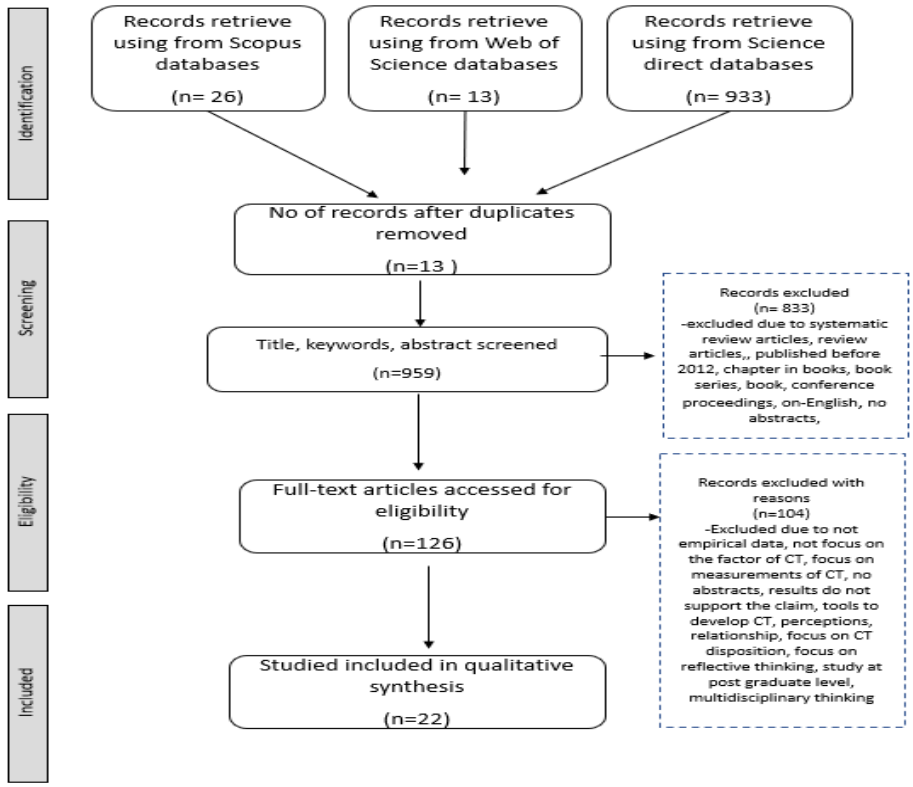
Process of selecting articles for systematic review:

Identification

The sources of the literatures of this review were using three main databases, namely Web of Science, Scopus, and Science Direct in March 2022 after all keywords were identified as shown in Table 1. The Scopus database indexed a total of 409 articles related to the factor contributing to the acquisition of CT, while Web of Science only 29 articles and Science Direct indexed about 957 articles related to the keywords. A systematic literature review of articles informing the factors influencing the acquisition of CT in education was carried out.

Figure 1

Flow Diagram of the paper



(Adopted from Moher et al., 2009)

Table 1
Databases and keywords used for search string.

Databases	Search String	No. Article
Scopus	(TITLE-ABS-KEY (“CT skills" OR “analytical thinking skills) AND TITLE-ABS-KEY (“influences” AND “factor”) OR TITLE-ABS-KEY (“higher education” OR “tertiary education")	26
Web of science	("CT skills” OR “analytical thinking skills") AND ("influences” AND “factor”) AND ("higher education” OR “tertiary education")	13
Science Direct	("CT skills” OR “analytical thinking skills") AND ("influences” OR “factor") AND ("higher education” OR “tertiary education")	933

Screening

A total of 972 articles were successfully retrieved from those databases. The timeline of literature search was from the year 2012 to current. The first screening of articles was to remove the duplicate articles which overlapped from three databases. At this stage three articles were excluded during first stage screening, while 959 articles were screened based on the inclusion and exclusion criteria determined at the second stage. After duplication removal, titles generated by the search were examined by the two researchers independently. Those not related to the research questions through the initial screening of titles, keywords and abstract were excluded. The remaining articles from the 972, only 126 articles were respectable for this paper. First criteria are the publication year where only the articles published in 2012 to 2022 only were selected. Next, type of documents which only research papers that offer empirical data were examined. Thus, the publication of the review paper including systematic review, meta-synthesis, book, book series, chapter in book and conference proceedings were excluded in this paper. In addition, the articles written in English are only considered for the next stage.

Table 2
Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Timeline	2012-2022	<2012
Document types	Article journal (empirical data)	Review article, book, chapter in book, book series, conference proceeding
Language	English	Non-English

Eligibility

The third stage of the review is known as eligibility with a total of 126 articles were considered to this stage. At this stage, the main contents of all articles were thoroughly scrutinized based on inclusion criteria to answer the research questions. A total of 104 articles were excluded due to exclusion criteria consisted of articles which were non empirical data, paper done to paper done at primary and secondary school level and articles did not focus on the factors of the acquisition of CT (e.g., teachers’ perception, the measurement of CT, tools

to develop CT, relationship of CT to other thinking and CT disposition). Finally, only a total of 22 articles were remaining for the next stages.

Data Abstraction and analysis

Next stage is the qualitative data analysis stage. This systematic review employed qualitative content analysis using thematic analysis using Zairul (2020) approach. All of the 22 metadata established in Mendeley finally move to ATLAS.ti 8 to be analysed. The thematic review approach using ATLAS.ti software in data clarification is much easier and systematic. In the first round of coding 32 code groups were created. Later, all code groups were grouped into several themes to answer the research question. The importance of this review is to fulfill the research question "What influencing factors contribute to the acquisition of CT of higher education students". Finally, the three main themes were identified namely education factors, students' factors and personal factors. The findings of this review will be presented in two parts: Quantitative finding and Qualitative findings.

FINDINGS

The figure 1 shows the PRISMA flowchart of exclusion and inclusion criteria employed in this study. After the duplication, 959 articles were identified and gathered from three databases. After those 833 articles were excluded during the process of title, keyword and abstract screening. The remaining 126 articles were eligible for inclusion. There are several reasons not to include the 104 articles, they were 1) the data is not empirical data, 2) not focus on factor of CT skill, 3) articles without abstract, 4) focus on perceptions, 5) study done at postgraduate level, and 6) involved the multidisciplinary thinking. The findings of this review were presented in two forms; quantitative and qualitative findings.

Quantitative findings

As the databases of using the phrase "critical thinking" OR "analytical thinking" is robust, this review only focuses on journal articles. Total the 22 metadata from journals recorded and analysed using Atlas.ti software and exported into a form of table in the following explanation. All metadata taken from 14 journals mostly in education journals are involved. These research strings are either directly referred or indirectly mentioned in the discovered 23 papers from numerous journal sources, namely Thinking skill and creativity, Procedia - Social and Behavioural Sciences, Teaching and teacher education, etc. The most popular journal published the articles related to CT is Nurse Education Today. This is because the CT skill in nursing education is very taken into consideration of their practice.

Table 3
Articles reviewed base on journals

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Arab World English Journal		1								
Assessment And Evaluation in Higher Education					1					
Computers In Human Behavior	1									
Enfermería Clínica								1		1
Frontiers In Psychology										1
GMS Journal for Medical Education								1		
Heliyon										1
International Journal of Nursing Studies								1		
Linguistics And Education				1						
New Educational Review						1				
Nurse Education Today		1	1						1	
Procedia - Social and Behavioral Sciences	1			1						
Teaching And Teacher Education	1									
The International Journal of Management Education				1						
Thinking Skills And Creativity							1		1	

The quantitative results of the findings were presented in Table 4. As can be seen in Table 4 this review produced 3 major themes and 32 sub-themes related to the research question. The three main themes were identified namely education factors (9 sub-themes), students' factors (14 sub-themes) and personal factors (9 sub-themes). The results of this review provided a comprehensive analysis of the required elements on the contributing factors that influences the acquisition of CT. As shown in table 4, the most discussed factors are related to the educations factors. Under this theme teaching method is the most discussed by scholars on its importance to the CT development. The rest of the factors have only been discussed at least once by different authors. While the second theme is students' factors presented the most sub-theme discussed is the educational level followed by research and year of study. Other sub-theme at least mentioned once by different scholars. The third theme is the personal factor been discovered from the review. Gender and cultural are more discussed compared to other sub-themes that contribute to the acquisition of CT skill in higher education.

Table 4

	Education Factor									Student's Factor														Personal Factor							
	Teaching Method	Training	Education atmosphere	Teacher Education	Teacher' role	Education Media	Educational Intervention	Institutional Factor	Pedagogical Approach	Research	Reading ability	Emotional intellect	Year of Study	Field of Study	CT Disposition	Education level	GPA	Individual Belief	Intention to paper	Language Proficiency	Learning attitude	Learning style	Motivation for Success	Parents' Education	Parents' Occupation	Personal status	Self-esteem	Age	Child-rearing	Gender	Cultural
Liu (2016) validity																	1														
Bell (2015)															1																
Sasson (2018)	1																														
Liu (2019)																											1		1		
Varenina (2021)																															
Ardian (2019)																1															
Saadé (2012)	1																														
Yang (2012)					1																										
Ayçiçek (2021)		1																													
Dewi (2021)																1															
Martyn (2014)									1																						
DeWaelsche (2015)								1												1											1
Kavenuke (2020)													1											1	1						
López (2020)							1																								
Gloudemans (2013)																1															
Faramarzi (2019)													1														1				
Bouanani (2013)																		1													
Park (2021)										1																					1
Nedelová (2017)				1																											
Rodzalan (2015)														1																1	
Mahapoonyanont (2012)	1		1			1					1	1							1		1		1			1			1		
Landa-Blanco (2021)										1																					

Table 5
Authors to a theme table

	Education Factor	Personal Factor	Student Factor
Liu (2016)			√
Bell (2015)			√
Sasson (2018)	√		
Liu (2019)		√	
Varenina (2021)			√
Ardian (2019)			√
Saadé (2012)	√		
Yang (2012)	√		
Ayçiçek (2021)	√		
Dewi (2021)			√
Martyn (2014)	√		
DeWaelsche (2015)	√	√	√
Kavenuke (2020)		√	√
López (2020)	√		
Gloudemans (2013)			√
Faramarzi (2019)		√	√
Bouanani (2013)			√
Park (2021)		√	√
Nedelová (2017)	√		
Rodzalan (2015)		√	√
Mahapoonyanont (2012)	√	√	√
Landa-Blanco (2021)			√

As shown in table 5, all 22 scholars discuss three main themes. Students' factors are the major factors that contributed to the acquisition of CT of higher education which 14 out of 22 scholars are discussing on the factors that influence the CT skill. The result from this table can be concluded that the students' factors are significant factors that contribute to the CT skill. Next only nine out of 22 scholars discussed the education factor's theme. While the least discussed factors are personal factors, when only 7 out of 22 scholars are discussing those factors.

Table 6
Theme to year publication

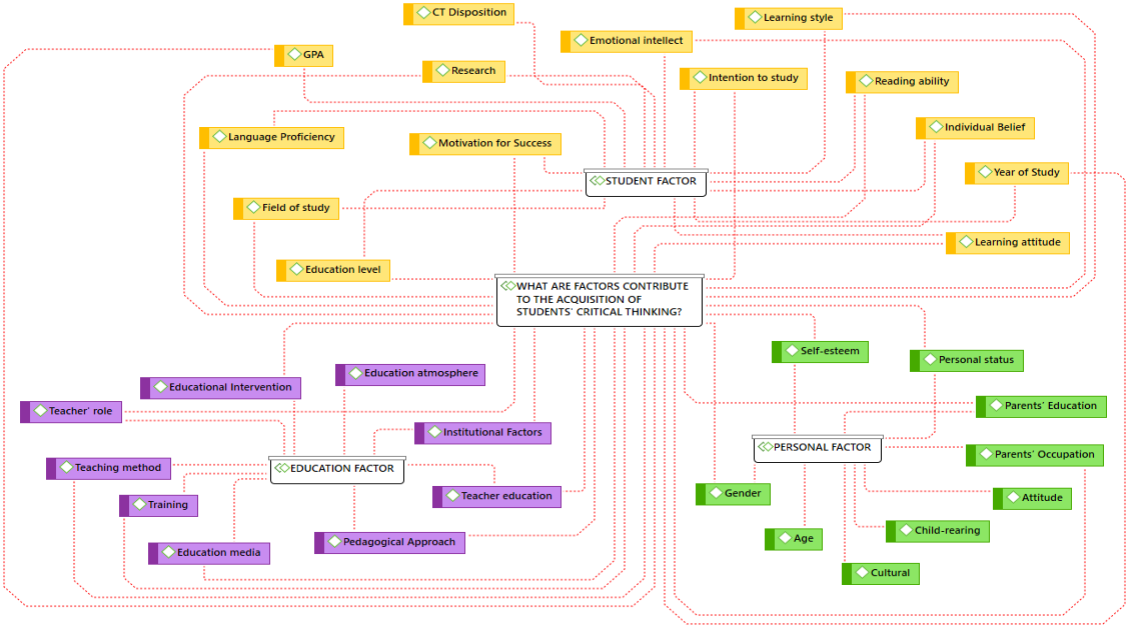
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Education Factor	5		1	1		1	1		1	1
Personal Factor	2			2				3	2	1
Student Factor	5	2		3	1			2	1	4
	12	2	1	6	1	1	1	5	4	6

Table 6 shows the trends of discussing factors from 2012 to 2021. The education and students factor found the most discussed factors in 2012 but gradually decreased from 2013 to 2021. Starting 2019 to 2021, research on the CT factors seem increasing. It can be concluded that contributing factors on the acquisition of CT among higher education students become an interest to many scholars starting in the year 2019.

Qualitative Findings

Figure 2

A network view on how to answer research questions through thematic review.



The qualitative result of this paper is using the network of themes produced by Atlas.ti software as presented in Figure 2. The interesting diagram helps in visualising the main and sub-theme of the result. Three main themes as discussed earlier which each consisted of many sub-themes. As presented in the figure above, students' factor is the major theme contributing to the acquisition of CT among graduates.

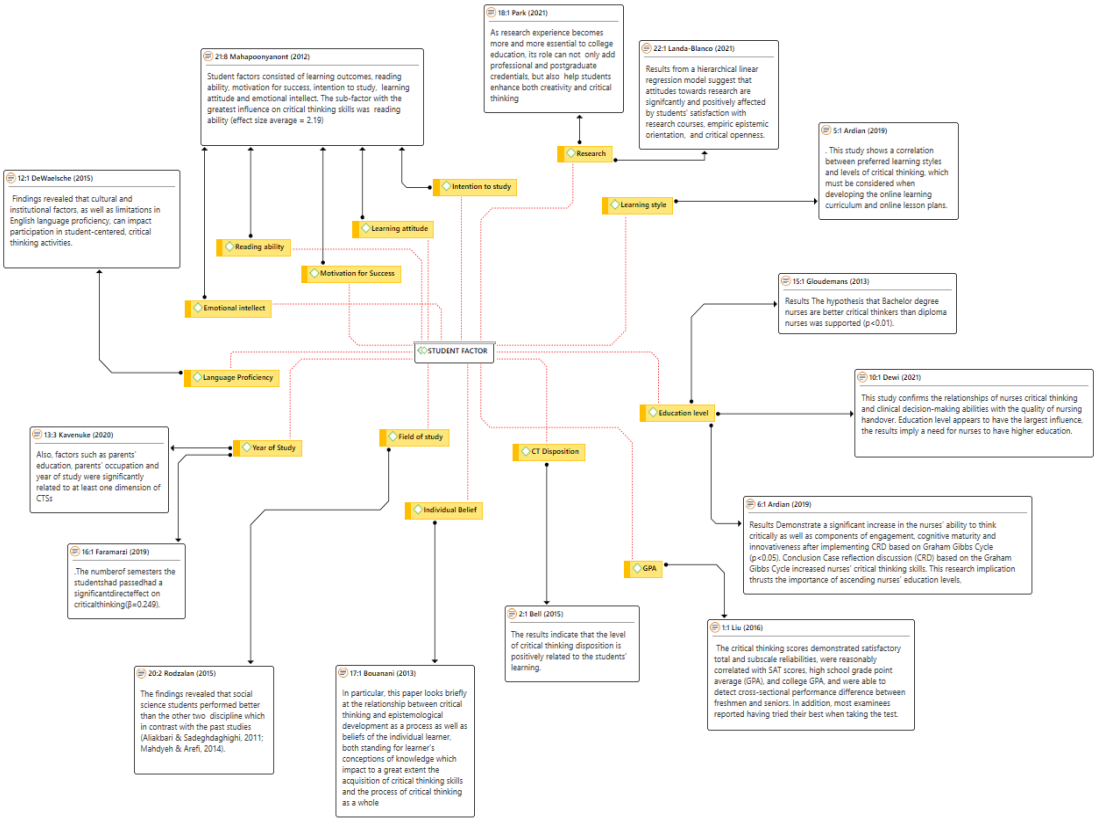
Theme 1: Students Factor

A network of literature evidence for students' factors influencing CT in higher education is shown in Figure 3. This thematic analysis revealed 14 sub-themes of students' factors to answer the research questions. Education level seems to be the most important factor among students that contribute to the acquisition of CT skill. This review found the previous study revealed the bachelor's degree level better than diploma level (Gloudemans, 2013). The education level found to be significant implication in enhancing the CT skill (Dewi et al., 2021; Ardian et al., 2019). Other sub-themes are attitude towards research (Park et al., 2021; Landa-Blanco et al., 2021) , learning style (Ardian et al., 2019), GPA (Liu et al., 2016), CT disposition (Bell & Loon, 2015), individual belief (Bouanani, 2013).), field of study (Rodzalan & Saat, 2015). year of study (Faramarzi & Khafri, 2019), language proficiency (DeWaelsche, 2015). emotional intellect, reading ability, motivation for success, learning attitude and intention to paper (Mahapoonyanont, 2012). Aside from cultural background, the instructors' questioning strategies, group discussions in class, English language ability, and the criteria for assessing critical thinking in writing exercises are all important considerations (Zhong & Cheng, 2021). Previous studies reveal the correlation between preferred learning styles and levels of critical

thinking, which must be considered when developing the online learning curriculum and online lesson plans. (Varenina et al., 2021). Other student- related factors are students' poor motivation, the misconception of learning goals, and students' lack of preparedness for higher-order thinking. (Gunawardena & Wilson, 2021). This section concluded that the education experience, students' character and belief most contributed to the maturity in thinking critically.

Figure 3

A network of literature on students' factors using Atlas.ti 8



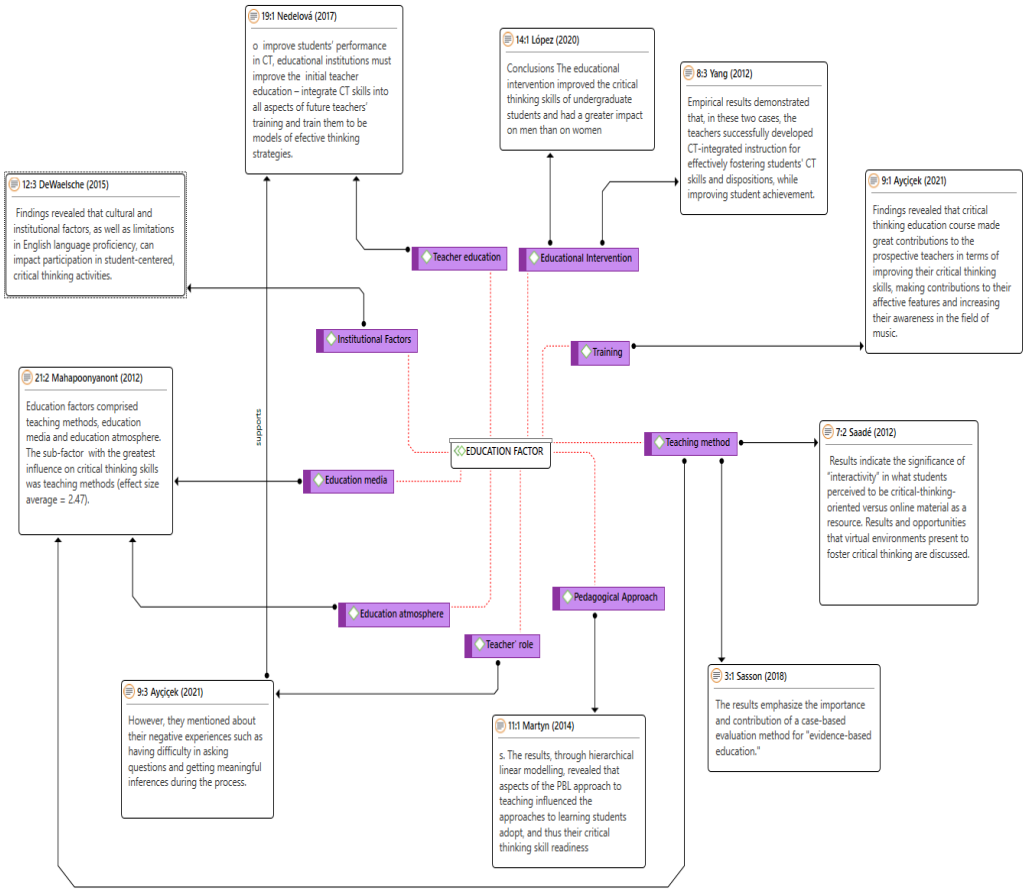
Theme 2: Education Factor

Another factor that was found to have an impact on the ability to think critically is the education factor (Figure 4). The comprehensive review revealed that the most common factor under this theme is the teaching method aligned with a paper by Terblanche & De Clercq (2020). Other than that, in supporting the good teaching method to enhance the CT skills ability, the role of educator plays an important role in conducting the class (Rodzalan, et al., 2015; Lee et al., 2019). Next the sub-themes are related to teacher's factors which include the teacher's education (Šukolová & Nedelová, 2017).), teacher's role in supporting the CT skill in the classroom and CT training to teachers (Ayçiçek, 2021). This review also initiated other sub-themes under this category namely pedagogical approach, education atmosphere, education media, institutional factor, and educational intervention. The problem based-learning (PBL) and evidence-based learning could be the method to support the CT develeopment (Martyn et al., 2014; Sasson et al., 2018). The key factor in an educational process is not just the things to be taught or who the instructor is, but how the materials are delivered and how the teacher generates a conducive class climate. To boost students' success, several elements must be considered while constructing a quality and suitable classroom environment (Slameto, 2017). Education institutions and students must collaborate to improve graduates' CT and

problem-solving skills through changes in teaching methodologies, strengthened academic programmes, and other intervention initiatives. (Lee et al., 2019). The review on these themes summarized that a teacher's knowledge and their competency in CT skill influence the method of teaching CT to the students thus supporting the students' acquisition of CT skill.

Figure 4

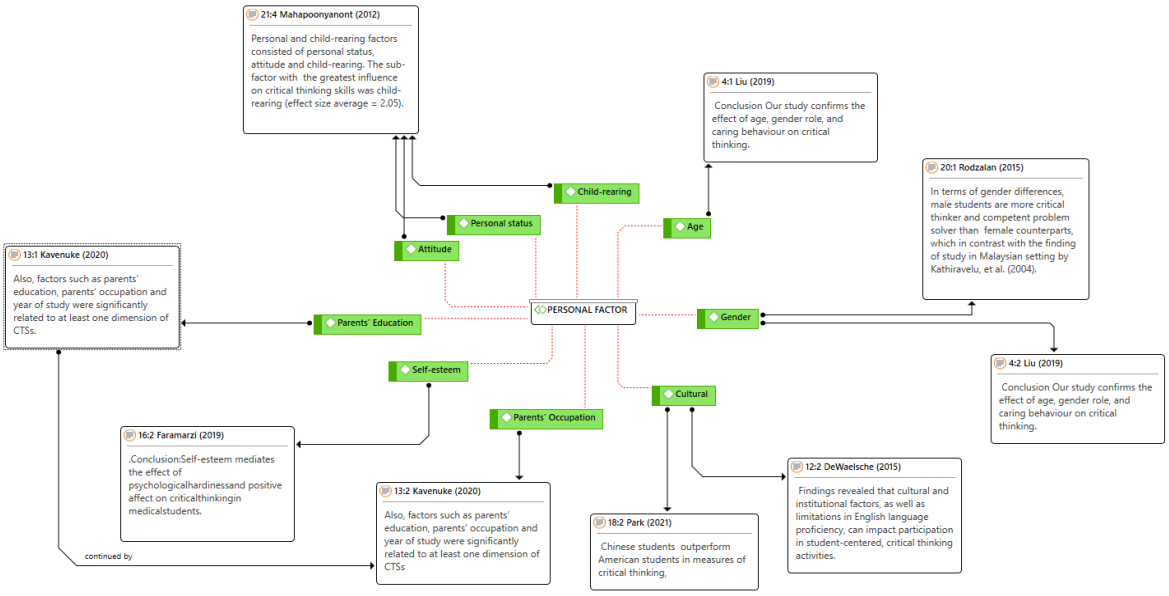
A network of literature on education' factors using Atlas.ti 8



Theme 3: Personal Factor

Personal factor's theme consists of 9 sub-themes found to be contributed to the acquisition of CT skill as shown in Figure 5. Those sub-themes are age, gender, cultural, parents' occupation and education, self-esteem, attitude, personal status and child-rearing. Regarding gender, male students are more critical thinkers than female students (Rodzalan & Saat, 2015). While related to culture, Chinese students found to be better than American students in CT measurement (Park et al., 2021). As for the conclusion in this section, the personal factors consisted of demographic characteristics as well as parent's backgrounds such as parents' education and occupation (Kavenuke et al., 2020) found to influence at least one dimension of CT skills.

Figure 5
A network of literature on personal' factors using Atlas.ti 8



DISCUSSION

This systematic review involves 22 articles from various education fields. It summarized the literature related to the factors that might influence the acquisition of CT among higher education students to answer the research question "What are the factors that influence critical thinking skill in higher education?". This paper revealed three main themes and 32 sub-themes were identified based on the systematic review carried out by current research. The first theme discussed the students' factor which consisted of about 14 sub-themes. they are elements related to a student's characteristic to the learning process (learning style, learning attitude, individual belief, emotional intellect, CT disposition), students' skill (reading ability, research skill, language proficiency), student's education experience (year of study, field of study, GPA, education level) and motivation (motivation to success, intention to study). The students' poor motivation, the misconception of learning goals, and students' lack of preparedness for higher-order thinking found to influences their readiness to think critically (Gunawardena and Wilson, 2021).

Second, the education's factor involved the teacher's role and their competency in CT and their approach in teaching CT in the classroom. These findings aligned with the study by Brečka et al., (2022) where teacher characteristics such as age and gender and professional characteristics including the qualifications, length of teaching experience, position, and school characteristics (divided into the type of school, stage of education, and location. In fact many previous studies revealed the importance of teachers' competency in CT influence the students' CT skill. (Rodzalan & Saat, 2015; Abdellatif & ElKhodary, 2020, Kavenuke et al.,2020; Janssen et al., 2021; Ramis, 2018). Therefore, many scholars suggested the teachers should attend the training on CT in order for them to be ready to teach this skill to students. Other than the teacher's role, the teaching method used by the teacher in teaching the CT in the classroom is one of the factors to the process of CT development. (Terblanche et al., 2020). Even though the aim of the institution is to bear a generation who can think critically, however many educators still practice the old method of teaching (Khaled and Hamza, 2019; Dwee et al., 2016). This gap should be explored in detail in enhancing the development of CT among students.

Third theme is the personal factors related to the demographic profile, family background, and personal attitude. Among those three main themes, students are the dominant factors to contribute to the acquisition of CT skill discussed in this review. These findings are quite similar to the study done by Chan (2013) where the factors influencing the development of CT in nursing education are students, educator, education system, and atmosphere/environment.

CONCLUSION AND RECOMMENDATIONS

This review presented contributing factors that influence the acquisition of CT skills among higher education students. The most popular themes are discussing the students' factors which regard the benefit of the research in CT development. Though not many scholars discussed each factor, it can be referenced by the institutional organisations in solving the related issues. The factors influencing the development of CT is crucial to be explored as it is one of a key competency in supporting sustainable development. The practice of thinking critically during campus life would prepare students with high quality of decision making. Multiple factors impact learning, including each student's characteristics as well as the instructor's understanding of critical thinking and how he or she applies this skill in the areas taught. (Bezanilla et al., 2019). In conclusion, the institutional organization needs to prepare future graduates to work in a complex environment. Thus, the students, teachers and pedagogical factors should be taken into detailed consideration in any education field. Future studies could be conducted to investigate the factors focused on the built environment education. The factors that affect the utilisation of teaching strategies should be explored. In addition the evidence that direct and indirect impacts of research in fostering the CT skill have not been well studied. Future in depth research is urgently needed to investigate the impact of different learning styles in built environment education on the acquisition of CT among students.

LIMITATIONS

This review is focused on the factors that influenced the acquisition of CT skill among higher education graduates. This review only focuses on the factors that contribute to the acquisition of CT in higher education levels. Some of the factors in the findings do not elaborated in detail for especially personal factors such as age, gender and attitudes. Though factors found can not be generalised to other fields of education in acquiring the CT skills but it can be as reference in taking initiative to improve the students' CT skill.

REFERENCES

Abdellatif, W. & ElKhodary, E. (2020). A Critical Review on the Differences Between an Art Student and a Design Student in Their Critical Thinking and Learning Style. Journal of Design Sciences and Applied Arts, 1(2), 88-97.

Ardian, P., Hariyati, R. T. S., & Afifah, E. (2019). Correlation between implementation case reflection discussion based on the Graham Gibbs Cycle and nurses' critical thinking skills. Enfermeria Clinica, 29, 588-593.

Ayçiçek, B. (2021). Integration of critical thinking into curriculum: Perspectives of prospective teachers. Thinking Skills and Creativity, 41, 100895.

Bell, R., & Loon, M. (2015). Reprint: The impact of critical thinking disposition on learning using business simulations. The International Journal of Management Education, 13(3), 362-370.

Bezanilla, M. J., Fernández-nogueira, D., Poblete, M., & Galindo-domínguez, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher' s view. 33(June).

Brečka, P., Valentová, M., & Lančarič, D. (2022). The implementation of CT development strategies into technology education: The evidence from Slovakia. Teaching and Teacher Education, 109, 103555.

Bouanani, N. (2013). Critical Thinking and Learners' Conception of Knowledge-A Meeting Point. Arab World English Journal, 4(3).

Chan, Z. C. (2013). A systematic review of critical thinking in nursing education. Nurse education today, 33(3), 236-240

DeWaelsche, S. A. (2015). Critical thinking, questioning and student engagement in Korean university English courses. Linguistics and Education, 32, 131-147.

Dewi, N. A., Yetti, K., & Nuraini, T. (2021). Nurses' critical thinking and clinical decision-making abilities are correlated with the quality of nursing handover. Enfermería Clínica, 31, S271-S275.

Dwee, C. Y., Anthony, E. M., Salleh, B. M., Kamarulzaman, R., & Kadir, Z. A. (2016). Creating Thinking Classrooms: Perceptions and Teaching Practices of ESP Practitioners. Procedia - Social and Behavioral Sciences, 232(April), 631–639. https://doi.org/10.1016/j.sbspro.2016.10.087

Faramarzi, M., & Khafri, S. (2019). A causal model of critical thinking in a sample of Iranian medical students: associations with self-esteem, hardiness, and positive affect. GMS Journal For Medical Education, 36(4).

Ekamilasari, E., & Pursitasari, I. D. (2021). Students' critical thinking skills and sustainability awareness in science learning for implementation education for sustainable development. Indonesian Journal of Multidiciplinary Research, 1(1), 121-124.

Gloudemans, H. A., Schalk, R. M., & Reynaert, W. (2013). The relationship between critical thinking skills and self-efficacy beliefs in mental health nurses. Nurse Education Today, 33(3), 275-280.

Gunawardena, M., & Wilson, K. (2021). Scaffolding students' critical thinking: A process not an end game. Thinking Skills and Creativity, 41, 100848.

Ikenna, E. (2022). Students' views regarding the barriers to learning CT. Research in Business & Social Science. 11(4), 355–364.

Janssen, E. M., Mainhard, T., Buisman, R. S., Verkoeijen, P. P., Heijltjes, A. E., van Peppen, L. M., & van Gog, T. (2019). Training higher education teachers' critical thinking and attitudes towards teaching it. Contemporary Educational Psychology, 58, 310-322.

Kavenuke, P. S., Kinyota, M., & Kayombo, J. J. (2020). The critical thinking skills of prospective teachers: Investigating their systematicity, self-confidence and scepticism. Thinking Skills and Creativity, 37, 100677.

Khaled, W. & Hamza, A. A. (2019). Teaching Strategies and Their Impact to Develop Ct Among Architecture Students.pdf.

Landa-Blanco, M., & Cortés-Ramos, A. (2021). Psychology students' attitudes towards research: the role of critical thinking, epistemic orientation, and satisfaction with research courses. Heliyon, 7(12), e08504.

Latif, N. E. A., Yusuf, F. M., Tarmezi, N. M., Rosly, S. Z., & Zainuddin, Z. N. (2019). The Application of Critical Thinking in Accounting Education: A Literature Review. International Journal of Higher Education, 8(3), 57-62.

Lee, M. F., Sohod, S. N. M., & Ab Rahman, A. (2019). Exploring the mastery level of CT and problem-solving skill among the technical undergraduate. Journal of Technical Education and Training, 11(3), 9–14. https://doi.org/10.30880/jtet.2019.11.03.002.

Liu, N. Y., Hsu, W. Y., Hung, C. A., Wu, P. L., & Pai, H. C. (2019). The effect of gender role orientation on student nurses' caring behaviour and critical thinking. International Journal of Nursing Studies, 89, 18-23.

Mahapoonyanont, N. (2012). The causal model of some factors affecting critical thinking abilities. Procedia-Social and Behavioral Sciences, 46, 146-150.

Martyn, J., Terwijn, R., Kek, M. Y., & Huijser, H. (2014). Exploring the relationships between teaching, approaches to learning and critical thinking in a problem-based learning foundation nursing course. Nurse Education Today, 34(5), 829-835.

Ministry of Education Malaysia -MOE. (2015), Executive Summary, Malaysian Education Blueprint 2015-2025 (Higher Education).

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group*. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of Internal Medicine, 151(4), 264-269.

Park, J. H., Niu, W., Cheng, L., & Allen, H. (2021). Fostering Creativity and Critical Thinking in College: A Cross-Cultural Investigation. Frontiers in Psychology, 5041.

Paul, R., Paul, R. W., & Elder, L. (2002). CT: Tools for Taking Charge of Your Professional and Personal Life. http://books.google.com/books?id=g5YX6jLnkcoC&pgis

Ramis, A. Al. (2018). Instructors' attitudes and perceptions toward critical thinking: A case study of interior design instructors in Saudi Arabia Recommended Citation. Rizco, N. J. (2014). (Translated) Investigation of the Elements of Critical Thinking in the Educational Process in the Jurisdiction of Architecture. 196–221.

Rodzalan, S. A., & Saat, M. M. (2015). The Perception of CT and Problem-Solving Skill among Malaysian Undergraduate Students. Social and Behavioral Sciences, 172(2012), 725–732. https://doi.org/10.1016/j.sbspro.2015.01.425

Rodzalan, S. A., & Saat, M. M. (2018). A mixed-method analysis on students' critical thinking and problem-solving skill development in Malaysian public universities. Journal of Physics: Conference Series, 1049(1), 272–275. https://doi.org/10.1088/1742-6596/1049/1/012015

Sasson, I., Yehuda, I., & Malkinson, N. (2018). Fostering the skills of critical thinking and question-posing in a project-based learning environment. Thinking Skills and Creativity, 29, 203-212.

Slameto (2017). CT and its affecting factors. Jurnal Penelitian Humaniora, Vol. 18(52), 1–11.

Šukolová, D., & Nedelová, M. (2017). Critical Thinking in Initial Teacher Education: Secondary Data Analysis from Ahelo GS Feasibility Study in Slovakia. The New Educational Review, 49, 19-29.

Terblanche, E. A. J., & De Clercq, B. (2020). Factors to consider for effective CT development in auditing students. South African Journal of Accounting Research, 34(2), 96-114.

Umurzakova, G., & Pardaeva, S. (2020). Developing Teacher ` Professional Competence and CT is A Key Factor of Increasing the Quality of Education. Mental Enlightenment Scientific-Methodological Journal, 2020(2), 66–75

Varenina, L., Vecherinina, E., Shchedrina, E., Valiev, I., & Islamov, A. (2021). Developing critical thinking skills in a digital educational environment. Thinking Skills and Creativity, 41, 100906.

Zhong, W., & Cheng, M. (2021). Developing CT: Experiences of Chinese International Students in a Post-1992 University in England. Chinese Education & Society, 54(3-4), 95-106.

Zairul, M. (2020). A thematic review on student-centred learning in the studio education. Journal of Critical Reviews, 7(2), 504-511.

Pejabat Perpustakaan
Librarian Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023

UNIVERSITI TEKNOLOGI MARA PERAK
TERIMA
25 JAN 2023
Tindakan
Universiti Teknologi MARA Perak
PEJABAT REKTOR

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak

Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR