

**UNIVERSITI TEKNOLOGI MARA**

**A FORMULATION OF CRITICAL  
THINKING FRAMEWORK IN  
UNDERGRADUATE INTERIOR  
DESIGN PROGRAM: A CASE  
STUDY OF UNIVERSITI  
TEKNOLOGI MARA**

**NORHAYATI BINTI KASSIM**

**PhD**

**April 2026**

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**NORHAYATI BINTI KASSIM**

Thesis submitted in fulfilment  
of the requirements for the degree of  
**Doctor of Philosophy**  
**(Built Environment)**

**Faculty of Built Environment**

**April 2026**

## CONFIRMATION BY PANEL OF EXAMINERS

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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## ABSTRACT

Critical thinking is a crucial skill in the higher education system. Despite MOHE highlighting critical thinking as one of the soft skills in Malaysian higher education, there are many complaints from employers about the deficiency of this skill among higher education graduates. As this skill is an essential competency in architecture, it is also important in interior design education, as it enables students to address complex design problems, make informed decisions, and justify design outcomes. Since RMK-12 highlighted that MARA education institutes will be leveraged to equip Bumiputera human capital with future skills, including critical thinking, to boost creativity and competency. This study aims to formulate a framework for critical thinking by investigating how it is perceived, practiced, and fostered in the interior design program at Universiti Teknologi MARA (UiTM). Guided by an interpretivist research paradigm, the study adopts a qualitative exploratory case study approach. Data were collected through a multi-method qualitative approach that includes semi-structured interviews with interior design educators and final-year students, as well as document analysis of instructional materials and students' design portfolios. The data were analyzed using thematic analysis (Braun, V., & Clarke, V., 2006) to identify patterns related to perceptions, practices, challenges, and opportunities for improvement. The results show that the interior design program includes critical thinking in a way that isn't obvious. The phenomenon is due to critical thinking naturally articulated in the studio-based pedagogy in the interior design program. Its integration is often unstructured and dependent on individual educators' interpretations. This study exposed challenges, including student and educator barriers, instructional design alignment barriers, and institutional support barriers. The outcome of this study is the formulation of a conceptual framework to increase the development of critical thinking in the interior design program. This study contributes to the body of knowledge by providing empirical data on how critical thinking is perceived, practiced, and fostered in interior design programs. It also offers practical implications for educators, curriculum designers, and higher education institutions seeking to strengthen critical thinking development in interior design programs.

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## TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xiii</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xv</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Background of Study	3
1.3 Statement of the Problem	4
1.4 Research Objectives	6
1.5 Research Questions	7
1.6 Significance of Study	7
1.7 Delimitation of Study	8
1.8 Limitation of the Study	8
1.9 Ethical Committee	9
1.10 Operational Definition	10
1.11 Thesis Scope	12
1.12 Summary	13
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>14</b>
2.1 Introduction	14
2.2 Conceptual Foundation of Critical Thinking	14
2.2.1 Critical Thinking Definition	15
2.2.2 Critical Thinking Skills	18

2.2.3	Critical Thinking Disposition	20
2.2.4	Critical Thinking Assessment	22
2.2.5	Benefit of Critical Thinking in Higher Education	28
2.2.6	Critical Thinking in Malaysian Higher Education	30
2.2.7	Teaching Critical Thinking in Higher Education	32
2.2.8	Critical Thinking Strategies Fostering Critical Thinking	37
2.3	Perception of Critical Thinking	41
2.3.1	Educator's Perception of Critical Thinking	42
2.3.2	Student's Perception of Critical Thinking	43
2.4	Integration and Pedagogical Practices	45
2.4.1	Integration of Critical Thinking in Design Thinking	45
2.4.2	Pedagogical Approach That Foster Critical Thinking in Architecture and Interior Design Education	50
2.5	Barriers and Challenges of Critical Thinking Development	57
2.5.1	Educator's Barriers	57
2.5.2	Student's Barriers	61
2.5.3	Institutional Support	62
2.6	Theoretical Framework	63
2.6.1	Constructivism Theory (Jean Piaget ,1896)	64
2.6.2	3P Biggs Learning Model (1987)	66
2.6.3	Critical Thinking Model (Facione, P. A, 1990)	69
2.6.4	Vygotsky's Sociocultural Theory (1978)	71
2.6.5	Reflective Practice Model (Schon, 1983)	72
2.6.6	David Kolb's Theory: Experiential Learning Theory	73
2.7	Summary	80
<b>CHAPTER 3 RESEARCH METHODOLOGY</b>		<b>82</b>
3.1	Introduction	82
3.2	Philosophical Paradigm	82
3.3	Research Design	86
3.3.1	Exploratory Case Study	88
3.3.2	Study Site and Case Selection	89
3.4	Research Participants	91
3.4.1	Educators'Participant	92

3.4.2	Students' Participants	94
3.5	Pilot Study	95
3.6	Data Collection Procedures	96
3.6.1	Semi-structured Interviews	97
3.6.2	Documents Analysis	100
3.7	Research Instruments	103
3.7.1	Interview Protocol	103
3.7.2	Audio Recording	106
3.7.3	Written and Visual Documents	107
3.8	Data Analysis Procedure	108
3.8.1	Thematic Analysis	108
3.9	Trustworthiness	114
3.9.1	Credibility	116
3.9.2	Transferability	118
3.9.3	Dependability	119
3.9.4	Confirmability	119
3.10	Summary	120
 <b>CHAPTER 4 FINDINGS AND ANALYSIS</b>		<b>121</b>
4.1	Introduction	121
4.2	Research Question 1: How educators perceive critical thinking and its integration in the undergraduate interior design program?	121
4.2.1	Theme 1: Superficial Understanding of Critical Thinking	123
4.2.2	Theme 2: Tacit Understanding of Critical Thinking in Studio Practice	125
4.2.3	Theme 3: Improve Creative Thinking Process	126
4.3	Research Question 2: How students perceive critical thinking and its integration in the undergraduate interior design program?	128
4.3.1	Theme 1: Lack of Critical Thinking Understanding	130
4.3.2	Theme 2: Enhance Design Quality	131
4.4	Research Question 3: How is critical thinking fostered in undergraduate's interior design program?	132
4.4.1	Theme 1: Instructional Design	133
4.4.2	Theme 2: Teaching Strategies in Studio Learning	142

4.4.3	Theme 3: Implementation of Critical Thinking in Design Project	149
4.5	Research Question 4: What are the challenges that hinder the development of critical thinking skills in an undergraduate interior design program?	162
4.5.1	Theme 1: Student's Barriers	163
4.5.2	Theme 2: Educator's Barriers	165
4.5.3	Theme 3: Instructional Alignment Barriers	167
4.5.4	Theme 4: Institutional Support Barriers	169
4.6	Research Question 5: How is the framework to enhance critical thinking in the undergraduate interior design program?	173
4.6.1	Pillar 1: Human Factors	175
4.6.2	Pillar 2: Instructional Design Alignment	176
4.6.3	Pillar 3: Pedagogical Approach	177
4.6.4	Pillar 4: Institutional Support	178
4.7	Summary	179
<b>CHAPTER 5 DISCUSSION, CONCLUSION AND RECOMMENDATION</b>		<b>181</b>
5.1	Introduction	181
5.2	Discussion of Research Findings	181
5.2.1	Research Question 1: How educators perceive critical thinking and its integration in the undergraduate interior design program?	181
5.2.2	Research Question 2: How students perceive critical thinking and its integration in the undergraduate interior design program?	183
5.2.3	Research Question 3: How is critical thinking fostered in an undergraduate's interior design program?	184
5.2.4	Research Question 4: What are the challenges that hinder the development of critical thinking skills in an undergraduate interior design program?	186
5.2.5	Research Question 5: How is the framework to enhance critical thinking in undergraduate interior design program?	188
5.3	Research Implication	190
5.4	Contribution of knowledge	192

5.5	Areas for Further Research	193
5.6	Recommendation	194
	<b>REFERENCES</b>	<b>195</b>
	<b>APPENDICES</b>	<b>227</b>
	<b>AUTHOR'S PROFILE</b>	<b>243</b>

## LIST OF TABLES

<b>Tables</b>	<b>Title</b>	<b>Page</b>
Table 1.1	Previous Studies on Malaysia Higher Education Student's Critical Thinking Skills	2
Table 2.1	Definition of Critical Thinking Term by Critical Thinking Scholars	16
Table 2.2	The Critical Thinking Skills and Abilities by Scholars	19
Table 2.3	Critical Thinking Disposition by Critical Thinking Scholars	21
Table 2.4	The Existing Assessment Tools of Critical Thinking	24
Table 2.5	Previous Studies Related to Critical Thinking in Malaysian Higher Education	31
Table 2.6	The Teaching Strategies and Teaching Methods Foster the Critical Thinking Skills	38
Table 2.7	Design Process Phase	49
Table 2.8	NCIDQ Work Process	55
Table 2.9	Previous Studies on Barriers Hindering the Acquisition of Critical Thinking Skills	59
Table 2.10	The Facione, P. A. (1990) Critical Thinking Skills Elements	70
Table 3.1	The Philosophical Assumption of Research	83
Table 3.2	List of Educators Participants	93
Table 3.3	List of Students'Participants.	94
Table 3.4	Types of Interviews Method	99
Table 3.5	The list of documents analysed	101
Table 3.6	Interview Protocol for Educators'Participants.	104
Table 3.7	Interview Protocol for Students'Participants	105
Table 3.8	Phases of Thematic Analysis	108
Table 3.9	Sample of open coding	111
Table 3.10	Information of Experts	115
Table 4.1	Demographic of Educator's Participants	121
Table 4.2	List of Educator's Participants	122

Table 4.3	Themes and Sub-theme of Research Question 1	123
Table 4.4	Gender of Student's Participants	128
Table 4.5	List of students'participants	129
Table 4.6	Themes and Sub-theme of Research Question 1	129
Table 4.7	Themes and Sub-theme of Research Question 3	132
Table 4.8	List of Critical Thinking Skills Implicitly Stated in Syllabus	134
Table 4.9	Sample of Description of Critical Thinking Skills Implicitly Stated in Syllabus based on Critical Thinking Skills (Facione,P.A,1990)	134
Table 4 10	Themes and Sub-theme of Research Question 3	162

## LISTOF FIGURES

<b>Figures</b>	<b>Title</b>	<b>Page</b>
Figure 2.1	Step Model to Move Students toward Critical Thinking	23
Figure 2.2	The Critical Thinking Teaching Approach	34
Figure 2.3	Difference Between Critical Thinking and Creative Thinking	48
Figure 2.4	3P Biggs Learning Model	68
Figure 2.5	Kolb Experiential Learning Theory Learning Style and Classroom Activities	75
Figure 2.6	Educator Roles and Learning Cycle	77
Figure 2.7	Summary of Literature Review	80
Figure 3.1	Research Onion	85
Figure 3.2	Research Plan Process	87
Figure 3.3	Case Study Design	90
Figure 3.4	Multiple Sources of Data Collection	97
Figure 3.5	Interview Data Collection Process	98
Figure 3.6	Transcribed Data Inserted into ATLAS.ti software	110
Figure 3.7	The Process of Coding to Theory	111
Figure 3.8	Coding Process of this study using ATLAS.ti software	112
Figure 3.9	Codes generated in ATLAS.ti software	112
Figure 3.10	Sample of Network Diagram generated by ATLAS.ti Software to show the relationship among themes and sub-themes.	113
Figure 3.11	Evidence of Data Triangulation from Different Sources Analysed in ATLAS.ti software	117
Figure 4.1	Network of Sub-theme of Assessment Design Generated from ATLAS.ti software Version 23	140
Figure 4.2	Network of Sub-theme of Interpretation Skill Generated from ATLAS.ti software Version 23	151
Figure 4.3	Network of Sub-theme of Analysis Skill Generated from ATLAS.ti software Version 23	154
Figure 4.4	Network of Sub-theme of Evaluation Skill Generated from ATLAS.ti software Version 23	155

Figure 4.5	Network of Sub-theme of Inference Skill Generated from ATLAS.ti software Version 23	157
Figure 4.6	Network of Sub-theme of Explanation Skill Generated from ATLAS.ti software Version 23	159
Figure 4.7	Network of Sub-theme of Self-regulation Skill Generated from ATLAS.ti software Version 23	161
Figure 4.8	Sample of Rubric uses in Interior Design Studio	168
Figure 4.9	Network of Sub-theme of Institutional's Support Barriers Generated from ATLAS.ti software Version 23	170
Figure 4.10	A Framework to Foster Critical Thinking in Undergraduate Interior Design Program	174

## LISTOF ABBREVIATIONS

### Abbreviations

3D	3 Dimensional
3P	Presage, Process, Product
APA	American Philosophical Association
CAAEM	Council of Architectural and Education Malaysia
CAD	Computer Aided Design
CCTDI	California Critical Thinking Disposition Inventory
CCTST	California Critical Thinking Skills Test.
CIDA	Council for Interior Design Accreditation
IDr	Malaysia Registered Interior Designer
KBSR	Kurikulum Bersepadu Sekolah Rendah
LAM	Lemabaga Arkitek Malaysia
MAPS	Majlis Akreditasi Pendidikan Senibina Malaysia
MARA	Majlis Amanah Rakyat
MIID	Malaysian Institute of Interior Designers
MOE	Ministry of Education
MOHE	Ministry of Higher Education
MQA	Malaysian Qualification Agency
MQF	Malaysian Qualifications Framework
MQR	Malaysian Qualifications Register
NCIDQ	National Council for Interior Design Qualification
RMK	Rancangan Malaysi Ke-
STEM	Science, Technology, Engineering, and Mathematics
SDG	Sustainable Development Goal
UMK	Universiti Malaysia Kelantan
WGTC	Watson-Glaser Critical Thinking Appraisal

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Critical thinking has become a central educational objective in higher education worldwide. This skill becomes a key component of quality education, aligning with the goals of Sustainable Development Goal (SDG) 4. It is a fundamental talent that improves academic performance and helps individuals to make informed decisions and make important contributions to society (RMKe-12, 2021). A survey in the United States reported that 92% of the 400 companies rated critical thinking skills as the vital skill required for new recruits in the industry after communication skills. Consequently, this skill has been highlighted as one of the employability skills required by employers (Indrasiene, V., Jegeleviciene, V., Merfeldaitė, O., Penkauskiene, D., Pivoriene, J., Railiene, A., Sadauskas, J., & Valaviciene, N. (2020); Eldeen, A. I. G., Rabab, A. A., George, R. P., & Aldossary, D. A., 2018). According to Indrasiene, V., et al., the 2020 study shows the empirical data highlights the expectations of employers regarding critical thinking skills in employees, particularly in their ability to navigate emerging situations and make reasoned decisions. Employers prioritize workers who exhibit critical thinking, as they can offer innovative suggestions, thus providing significant value to the organization.

In the Malaysian context, there are multiple respondents in surveys and interviews from the sector who reaffirmed the importance of critical thinking skills in employees (MyCOL, 2023). Similarly, a survey by Talentcorp (2014) scoring 56% stands as the second-highest, after communication skills (81%), among recent graduates from local universities. Thus, this skill is vitally developed during the formal education process at the university level before they enter the real workforce. As a result, the Malaysian Education Blueprint points out the importance of developing an education that goes beyond rote memorization and encourages students to think critically. It includes ten shifts to improve conventional teaching, including globalized online learning and reshaping higher education delivery (MOE, 2015)..

Table 1.1  
 Previous Studies on Malaysia Higher Education Student's Critical Thinking Skills

Author, year	Field	Instrument	Findings
Yahya, A., Sidek, S., & Jano,Z. (2011)	Malaysian Technical Universities	California Critical Thinking Skill Test (CCTST)	Students exhibited some proficiency in critical thinking; however, they are way <b>behind the global standard.</b>
Ghadi, I. N., Bakar, K. A., Alwi, N. H., & Talib, O. (2013)	Undergraduate with a different major (Science and Art-Based)	Critical thinking ability instrument	The study revealed a strong correlation between CTD and CTS, with CTD elements being average and CTS elements being <b>high.</b>
Puteh, M. S., & Hamid, F. A. (2014)	Accounting	Thinking rubric	<b>Low to moderate</b> level.
Rusdi, S. H., & Umar, I.N. (2015)	Technology course	Online forum	Their levels of critical thinking were still mainly at the <b>lower</b> levels.
Noor, H. M, & Samsudin,Z. (2016)	Art aesthetics, art history, art production, and art criticism	Qualitative evaluation	<b>Less than 30%</b> of students are able to analyze works of art critically.
Rabu, S. N. A., Mahdzir, A. M, Aris, B.,&Tasir,Z. (2017)	Faculty Education	Malaysian Critical Thinking Instrument - Version 4 (MaCTIv4)	<b>Mediocre</b> level.
Fadhullah, A., & Ahmad, N. (2017)	Business Management	Qualitative analysis	<b>Low to moderate</b> level.
Lee, M, Sohod, S., & Rahman, A. (2019)	Engineering	Adopted from Watson-Glaser Critical Thinking Skill Appraisal (WGTCAs)	<b>Moderate</b> level.
Noni, N. S., & Abdullah, A. H. (2019)	Engineering students	The Malaysian Critical Thinking Skills Instrument-My CT	<b>Moderate level</b> but weak in analytical, logical, and disposition skills.
Sharif, M.,etal. (2021)	Undergraduate vocational education	Custom achievement test	Students tend to exhibit <b>low to moderate</b> levels for all seven elements in critical thinking and problem-solving.

Consequently, the Ministry of Higher Education (MOHE) Malaysia has taken a serious initiative to incorporate these skills into the higher education curriculum. MOHE has identified critical thinking as one of the seven crucial soft skills that students should acquire, alongside communication skills, problem-solving, teamwork, lifelong learning, information management, entrepreneurial skills, ethics and professionalism,

and leadership skills. Thus, curricula should incorporate the development of critical thinking skills to assist educators and students in problem-solving, as learners must not only identify and comprehend issues but also possess the requisite skills, confidence, knowledge, and interpersonal/management abilities to address challenges as they emerge (El-Daghar, K., 2020).

However, evidence from previous studies conducted within Malaysian higher education institutions, as summarized in Table 1.1, indicates that the level of critical thinking among graduates remains minimal to low. Although these studies offer important perspectives on the state of critical thinking in higher education, they are predominantly situated within non-studio-based disciplines and largely rely on general or classroom-based learning contexts. Consequently, there is limited empirical evidence that examines how critical thinking is developed, experienced, or assessed within studio-based courses, where learning is characterized by iterative design processes, problem-solving, and reflective practice. This gap highlights the lack of discipline-specific understanding of critical thinking in studio-based education, particularly within interior design programs. Therefore, this study is warranted to extend the existing body of knowledge by exploring the integration of critical thinking within a studio-based learning environment, thereby offering a more contextually grounded and pedagogically relevant contribution to critical thinking research in design education.

## **1.2 Background of Study**

In architectural education and practice, critical thinking is essential in fostering development in design thinking and supporting students in both the design process and broader architectural knowledge (Schoch, M., & Lawanyawatna, S., 2018; Khaled, W., & Hamza, A. A., 2019). Critical thinking is essential in architectural education programs, as it enables architects to address complicated challenges within the subject of architecture (Tarasova, I. V., 2018; Schoch, M., and Lawanyawatna, S., 2018). Developing these skills enables architects to manage their thinking effectively, enhancing their overall creativity (Tarasova, I. V., 2018). Ibrahim, N. L. N., & Utaberta, N. (2012) asserted that the learning objectives of architectural education include cultivating architectural students proficient in various thinking skills, including critical thinking. The core subject, fundamental to architectural education, includes

architectural design, urban design, landscape design, and interior design (Yasser, W. K., 2019).

Since interior design falls under the domain of architectural education, the interior design curriculum necessitates critical thinking in the learning process. According to Albadi, N., & Zollinger, S. W. (2021), interior design necessitates a varied array of creative, technical, and analytical talents, appealing to individuals who thrive in numerous learning modes. According to Piotrowski, C. M. (2011), interior design professionals cultivate critical thinking skills while navigating the problem-solving process, exerting influence over the entire scope of interior design projects. In addition, for effective interior design education, students should cultivate cognitive and affective skills to become critical problem solvers. Students must also learn to evaluate design ideas, express concepts visually, and translate meaningful ideas into visual and sensual solutions (Vaikla-Poldma, T., 2003).

Due to the importance of this skill to interior design, critical thinking is identified as a fundamental competency for interior design, as articulated by MAP (2013), which interior design students are expected to develop according to the Lembaga Arkitek Malaysia (LAM) Policy and Procedure for Accreditation of Interior Design Program PPAID. Therefore, further research is needed in the area of thinking abilities within interior design pedagogy (Shaheen, R. Z., 2018).

### **1.3 Statement of the Problem**

In the context of Malaysian higher education, the inadequate emphasis on critical thinking skills in universities may be regarded as a primary factor contributing to the deficiency in awareness and development of these skills (Ahrari, S., Abu Samah, B., Bin Hassan, S. H., Wahat, N. W. A., & Zaremohzzabieh, Z. ,2016). Although policy recognizes critical thinking as a vital graduate competency, its application at the program and instructional levels is disjointed and inconsistent. However, many graduates now lack the competencies necessary to meet the demands of the 21st-century job, mostly owing to deficiencies in critical thinking, problem-solving, and communication skills (Yoke, S., Ahmad, S., Yunos, R., Amin, J., Sulaiman, N., & Majid, F. ,2020). Similarly, the literature review in Chapter 2.4.2 indicates that Malaysian higher education students possess poor to moderate critical thinking abilities.

The development of critical thinking is influenced by various elements, including the individual features of each student and the educator's interpretation of critical thinking and its application in the courses taught (Bezanilla, M. Jet.al., 2019). Previous studies revealed that most teacher educators and science teachers lack knowledge and understanding of critical thinking, which hinders their ability to develop students' critical thinking skills and competencies, including deficiency in educators' background and experience in the field (Bibi, S., & Hanif, S., 2023; Franklin, E. I., Iwu, C. G., & Dubihlela, J., 2022; Essalih, S., Ourahay, M., & Khzami, S. E., 2022; Hamzah, M. I., Zhaffar, N. M., & Razak, K. A., 2018; Ramis, A. Al., 2018). While several studies revealed that students' attitudes and their own disinterest and unfamiliarity with the concepts hinder them in developing critical thinking in the classroom (Franklin, E. I., et al., 2022; Amin, A. M., & Adiansyah, R., 2018; Ramis, A. AL, 2018). McAdam (2020) indicated that student perspectives and experiences are essential for understanding how critical thinking influences their ability to transform. Additionally, Ramis, A. Al. (2018) suggested that it would be beneficial to investigate students' perceptions and experiences and to compare their insights with those of their educators.

In the Malaysian context, literature research reveals that the majority of studies on critical thinking conducted in higher education mostly pertain to engineering (Endut et al., 2014; Zaid, N. M., & Hamizan, N. I., 2014; Darby, N. M., & Rashid, A. M., 2017; Rabu, S. N. A., et al., 2017; Noni, N. S., & Abdullah, A. H., 2018; Lee, M., Sohod, S., & Rahman, A., 2019), vocational education (Sulaiman, N. L., 2012; Sharif, M., et al., 2021), and language (Hamdan, S. I., et al., 2012; Dwee, C. Y., Anthony, E. M., Salleh, B. M., Kamarulzaman, R., & Kadir, Z. A., 2016; Ismail, F., Ibrahim, N., & Samat, N., 2017; Ya'acob, et al., 2020).

Despite the importance of these skills, there remains a paucity of research, especially on this talent within the architectural field (Tarasova, I. V., 2018). Evidence from architectural education indicates issues that require a thorough investigation in interior design education. The gap contributing to the aforementioned issue, particularly in the field of interior design, may stem from an absence of a framework for integrating critical thinking abilities. It is important to remember, as emphasized by Duncan, E. (2012), that without a critical thinking framework outlining the processes and features of critical thinking, a designer's creativity lacks direction and meaning. The absence of a well-structured plan for incorporating critical thinking into the interior design program, especially in studio practice, remains a significant challenge. According to El-

Daghar, K. (2020), critical thinking skills should be integrated into the curriculum to support educators and students in resolving problems, as learners need problem anticipation, identification, confidence, knowledge, and interpersonal/management skills to effectively address emerging challenges.

Therefore, this study explores the current practice of fostering critical thinking within the context of an undergraduate interior design program. It employs an exploratory case study methodology to investigate how critical thinking is understood, fostered, and experienced in the educational practices of the program. The findings aim to provide insights into the effective incorporation of critical thinking skills in design education with the formulation of a framework that integrates critical thinking into the interior design program. In this study, the framework does not establish a pedagogical model, checklist, or prescriptive guideline. This study aims to provide a conceptual and interpretative framework to integrate critical thinking in interior design learning. The framework will serve as a conceptual structure that organizes and elucidates the significant factors influencing the integration and enhancement of critical thinking within an undergraduate interior design curriculum. It functions as an analytical framework that integrates theoretical principles, empirical evidence, and contextual elements into a unified system.

#### **1.4 Research Objectives**

This study aims to propose a framework to foster critical thinking in undergraduate interior design programs. The following research objectives will be carried out to fulfill the above aim

- i) To describe educators' perceptions of critical thinking and its integration in the undergraduate interior design program,
- ii) To comprehend students' perceptions of critical thinking and its integration in the undergraduate interior design program,
- iii) To investigate the way critical thinking is fostered in an undergraduate's interior design program,
- iv) To distinguish challenges that hinder the successful implementation of critical thinking integration into undergraduate interior design programs,
- v) To formulate a framework of critical thinking in the undergraduate interior design program.

## **1.5 Research Questions**

This study was conducted in response to the following research questions, which are presented below:

- a) How do educators perceive critical thinking and its integration in the undergraduate interior design program?
- b) How do students perceive critical thinking and its integration in the undergraduate interior design program?
- c) How is critical thinking fostered in an undergraduate's interior design program?
- d) What are the barriers that hinder the development of critical thinking skills in an undergraduate interior design program?
- e) How is the framework for enhancing critical thinking in the undergraduate interior design program?

## **1.6 Significance of Study**

This study enhances educators' and students' understanding of how critical thinking can be systematically integrated into interior design education. The findings offer guidance for refining teaching strategies, curriculum design, and assessment practices that promote critical thinking. The study aids students in cultivating critical thinking skills essential for proficient problem-solving, decision-making, and reflective design practice. The study contributes to professional practice by supporting the preparation of interior design graduates who are better equipped with critical thinking skills required in complex and real-world design contexts. The suggested framework provides a basis for improving graduates' critical thinking in the undergraduate interior design program at the university level. This study contributes to the body of knowledge by addressing the limited empirical research on critical thinking integration within undergraduate interior design programs, particularly in the Malaysian context. By examining educators' and students' perceptions and current instructional practices and by proposing a structured framework for enhancement, the study extends existing literature on critical thinking, design education, and curriculum development.

## **1.7 Delimitation of Study**

The study is confined to a single case study of the Interior Design program at Universiti Teknologi MARA (UiTM) in Malaysia to provide extensive and contextual knowledge of the integration of critical thinking within a particular educational environment. The study focuses on interior design educators and undergraduate bachelor's degree students as primary stakeholders engaged in curriculum development and educational experiences. An exploratory case study approach with multiple methods of data collection, including semi-structured interviews and document analysis, was employed to explore perception and experience of critical thinking rather than measure its outcome quantitatively. Additionally, this study focused on critical thinking conceptualized as defined by the Critical Thinking Skills (Facione, P. A., 1990) and did not seek to compare various critical thinking models.

## **1.8 Limitation of the Study**

This study utilized a single case study approach; hence, the conclusions are not meant to be statistically generalizable to all interior design programs. The objective of qualitative case study research is analytical rather than statistical generalization, enabling discoveries to contribute to theory and practice in analogous contexts (Yin, 2018). The study is only concentrated on the interior design program and does not encompass other design-related fields such as architecture, graphic design, or landscape architecture. Consequently, the insights obtained may not comprehensively reflect the integration of critical thinking in alternative studio-based or design education settings.

Data were gathered from a designated cohort of participants, including final-year interior design students and interior design educators. Nevertheless, the exclusion of viewpoints from other stakeholders (such as curriculum developers, external examiners, and industry professionals) may have limited a more comprehensive understanding. Data were predominantly gathered via interviews, which depend on participants' self-reported perceptions. This data may be influenced by social desirability bias or selective recall, despite attempts to promote candid reflection through open-ended inquiries and guarantees of secrecy. The researcher, being an interior design educator, may introduce a potential risk of bias in data interpretation. To

address this constraint, reflexive practices, audit logs, peer debriefing, and systematic coding processes utilizing ATLAS.ti were implemented.

This study did not involve the observation method. This is supported by Idrus, H. (2013), who states that the observation method does not necessarily need to be involved in the data collection process. Classroom observation was excluded since the research focused on examining the opinions and experiences of educators and students about the incorporation of critical thinking. Interviews and document analysis were more effective in elucidating these meanings and offered enough triangulation within an exploratory case study design.

The findings indicate perceived and documented practices instead of actual observation of teaching behaviors. Data were gathered at a singular moment, representing participants' experiences during a defined academic interval. Consequently, alterations in curriculum or pedagogical methods over time were not documented. The absence of standardized or validated tools for assessing critical thinking skills makes it difficult to determine the extent to which it is integrated into the curriculum or whether the suggested approaches effectively enhance student outcomes. This constraint may limit the study's ability to present definitive evidence of its effectiveness in promoting critical thinking among interior design students.

## **1.9 Ethical Committee**

This study adhered to the ethical guidelines and standards established by Universiti Teknologi MARA (UiTM) for research involving human participants. Ethical approval for the study was obtained on 12 August 2022 from the UiTM Research Ethics Committee prior to the commencement of data collection (Reference No: REC/08/2022 (PG/MR/180)). Ethical concerns around participant protection are important in any qualitative investigation (Merriam, S. B. ,2009). This study is under minimal-risk research as approved by UiTM REC.

Participation in this study was entirely voluntary. All participants were provided with a clear explanation of the research purpose, procedures, and their rights through an informed consent form. Participants were assured of the confidentiality and anonymity of their responses. Subsequently, they were informed that they could withdraw from the study at any stage without any consequences. Participants were also informed about the project and its procedures. As suggested by Merriam, S. B. (2009), since the participants

were above eighteen years of age, all participants signed a consent form confirming their willingness to participate. They were informed and allowed to withdraw from the study without penalty.

Data collected during interviews, focus groups, and document analysis were securely stored and used solely for academic purposes. No identifiable information was disclosed, and all data were anonymized during transcription and analysis to protect the privacy of the participants. Following the completion of all procedures, the original audio cassettes will be destroyed. The educator participant was selected based on the criterion and their willingness to participate. Respect was given to the participants' privacy as employed in the study by Patchamuthu, S. (2018), where i) confidentiality of participants was upheld through the non-disclosure of information, ii) secure storage and coding of data, and iii) to safeguard the participants' identity, codes were employed. In this study, no participants requested access to the data obtained to validate the findings.

## **1.10 Operational Definition**

Throughout this dissertation, numerous phrases, terms, and acronyms are employed to delve into the importance of critical thinking research. The definitions of key terms are provided in the subsequent section:

### **Critical Thinking Concept**

Educators' and students' understanding of critical thinking as a cognitive construct

### **Critical Thinking Skills**

Critical thinking skills in this study refer to the critical thinking skills or abilities stated in the Delphi Report of American Philosophical Association (APA) by Facione, P.A., (1990) included interpretation, analysis, synthesis, inference, explanation, and self-regulation.

### **Critical Thinking Disposition**

Critical thinking in these studies refer to the attitudes and willingness to engage in critical thinking.

### **Educators**

Academic staff at Centre of Studies Interior Architecture at UiTM Puncak Alam who are actively engage in teaching, curriculum planning, and assessment for the undergraduate interior design program.

### **Students**

Final-year of Bachelor Degree undergraduate interior design students at UiTM Puncak Alam that significant exposure to studio projects, assessments, and curricular experiences that demonstrate the integration of critical thinking in their program.

### **Perception**

Perception involves the interpretations, understanding, beliefs, and experiences of educators and students concerning critical thinking within the undergraduate interior design program, explored through narratives from semi-structured interviews.

### **Interior design program**

Refer to the undergraduate interior design program offered at UiTM Puncak Alam utilizing accredited by LAM.

### **Barriers**

Barriers are defined as limits relating to students or educators that directly impede the cultivation of critical thinking skills.

### **Challenges**

There are various challenges that hinder of the critical thinking development, However, in this study refer to a range of individual, pedagogical, and institutional factors that constrain the effective integration of critical thinking within the undergraduate interior design program.

### **Integration of critical thinking**

The integration of critical thinking skills (Facione.P.A, 1990) such as interpretation, analysis, evaluation, inference, explanation, and self-regulation into the curriculum design, pedagogical strategies, learning activities, assessments, and students' design processes in the undergraduate interior design program.

### **Teaching Approach**

Hasanova, Abduazizov, and Khujakulov (2021) defined a teaching approach as a set of principles, beliefs, or ideas that guide the learning process. This study explores the teaching approach used by interior design educators to effectively deliver content, engage students in learning activities, and foster critical thinking skills.

### **Course Information**

At UiTM, course information in the curriculum pertains to the fundamental data on each subject or course available within a program. This information is often included in the Course Information Summary or Course Outline, adhering to the criteria set by UiTM and the MQA. In this study, the course information involved is the core subjects in the interior design programme.

### **Project Brief**

A project brief is a document provided to students, usually in interior design studio classes, that describes the objectives, scope, expectations, and deliverables for a particular design project or assignment. It operates as a genuine client brief and directs students throughout their design process.

## **1.11 Thesis Scope**

This thesis comprises five chapters, with a brief overview provided for each chapter:

Chapter 1 outlines the scope of this investigation. This chapter provides an overview of the research background on the study's scope. It examines the issues and research questions rooted in the identified research gaps outlined in the problem statement. Additionally, this section highlights the significance of the study for various stakeholders, outlines the research limitations, and presents the organization of the thesis.

Chapter 2 explained the basics of interior design, including interior design professions and education. Subsequently, this chapter also describes an exploration of current literature, encompassing an overview, theories, critical thinking concepts, and teaching strategies related to critical thinking skills in general and in the program context. Emphasis is placed on educators' perceptions and their teaching techniques used within these chapters, along with the challenges and barriers, which were also identified in existing literature. Following this, the importance of critical thinking in interior design programs and its impact was also deliberated.

Chapter 3 delineates the methodology utilized to address the research questions. It details the suitable research paradigm and research design encompassing the research process for collecting and analyzing data. This chapter also discusses the validity and reliability of data. The analysis of findings from semi-structured interviews with educators and students, along with document analysis, takes place in this chapter

Chapter 4. The chapter also discusses the development of the framework and expert validation, concluding with a comprehensive exploration of the findings.

Chapter 5 discussed research questions based on findings gathered in Chapter 4. This chapter also brings the research to a conclusion by addressing the research questions and detailing the contributions and implications of the research. The chapter also acknowledges certain limitations of the study and presents potential recommendations for future research.

## **1.12 Summary**

This chapter presented the groundwork for investigating the integration of critical thinking into undergraduate interior design education. Initially, the background section described how critical thinking is crucial for preparing students for the intricate and ever-changing problems of the interior design profession. It is evident from comprehending the nature and importance of critical thinking that there is a growing need for its inclusion in interior design education. The problem statement emphasized the discrepancy between the demands of the interior design industry and the current state of education, emphasizing that although critical thinking abilities are highly regarded, they are frequently not included in the curriculum or treated inconsistently. To address this gap, this study investigates the best practices for including critical thinking skills in undergraduate interior design education.

Furthermore, to fill this gap, the study developed research questions and objectives, concentrating on the viewpoints of educators and students, how critical thinking abilities are currently taught in the classroom, and the possibility of creating a theoretical framework to direct curriculum improvement. Subsequently, Chapter 2 will deal with pertinent literature related to the research topics. This chapter will encompass five subtopics, offering insights into critical thinking, the associated theoretical framework, interior design education, the intersection of critical thinking and education, and challenges and barriers impacting critical thinking skills in education.

## CHAPTER 2

### LITERATURE REVIEW

#### **2.1 Introduction**

This chapter presents a comprehensive review of literature relevant to the integration of critical thinking in interior design education within the context of higher education. It aims to establish a conceptual foundation and identify existing research gaps that justify the need for this study. The chapter begins by exploring various dimensions of critical thinking, including its definitions, core skills, dispositions, and assessment methods. Emphasis is also placed on the relationship between critical and creative thinking, highlighting their complementary roles in the design education process. The subsequent section delves into the field of interior design, outlining the nature of the profession and the current state of interior design education. This provides contextual grounding for examining how critical thinking is situated within the discipline. Following this, the chapter discusses the role of critical thinking in higher education, both globally and in the Malaysian context. It further narrows down to examine how critical thinking is integrated into interior design education, exploring existing pedagogical approaches, educator roles, and factors influencing the teaching of critical thinking. Finally, the chapter concludes with a discussion of the theoretical framework that underpins the study. This includes the 3P Biggs Learning Model (1987), critical thinking models, Constructivism Theory, and Vygotsky's Sociocultural Theory (1978), all of which provide foundational perspectives to guide the research. By critically analyzing prior literature, this chapter synthesizes key concepts and empirical studies, identifying significant gaps that support the formulation of a theoretical framework. This is aimed at enhancing the integration of critical thinking in undergraduate interior design programs.

#### **2.2 Conceptual Foundation of Critical Thinking**

This section develops a conceptual foundation for critical thinking by synthesising established definitions, key cognitive skills, and critical dispositions from the literature. It clarifies the meaning and scope of critical thinking and situates the

concept within the educational context of higher education, providing a shared understanding to guide subsequent analysis and framework development.

### **2.2.1 Critical Thinking Definition**

The definition of critical thinking varies, as reported by critical thinking scholars. The lack of a commonly accepted definition of critical thinking presents difficulties for scholars studying this subject. Research in this field generally begins with a review of various definitions of critical thinking, with a focus on areas of agreement (Feulner, M., 2020). A common belief observed in critical thinking literature is that there is no single, widely accepted definition (Ortiz, C. M. A., 2007). A study by Abasaid, M., and Ferreira, M. (2022) similarly noted that there is no single definition of critical thinking that educators agree upon in the education literature. Most of them defined critical thinking primarily in relation to students' academic success, rather than considering its more general applicability in everyday life. However, the concept and understanding of critical thinking have evolved due to differing perspectives from various thinkers, critics, and educators in the field (Allamnakhrah, A. Y., 2013).

Table 2.1 summarizes the definition of critical thinking as presented by expert scholars in this field. It indicates that Ennis, R.H. (1985) defined critical thinking as reflective thinking, which is aligned with Dewey, J.'s (1909) definition. While Lipman (1987) characterized it as self-corrective thinking, thinking with criteria, and sensitivity to context, his definition is in the same direction as Paul, R., and Elder, L. (1992). The researchers also defined critical thinking as self-directed thinking or disciplined thinking that exemplifies the ideals of thinking appropriate for a certain topic or manner of thought. Furthermore, Halpern, D. F. (2003) summarized that critical thinking is a goal-directed, purposeful, and reasoned approach to problem-solving, decision-making, and formulating inferences, utilizing thoughtful and effective skills tailored to the specific context. This notion is agreed upon by Yaldiz, N., and Bailey, M. (2019), who stated that critical thinking is a deliberate, rational, and goal-directed mode of thinking employed in the process of decision-making. Other experts, such as Facione, P. A. (2011), defined it as logical and rational thinking. This approach encourages active thinking rather than simply repeating information (Snyder, L. G., & Snyder, M. J., 2008).

Table 2.1  
Definition of Critical Thinking Term by Critical Thinking Scholars

Authors	Definition	Main characteristics
Ennis, R. H. (1985).	Critical thinking as defined by the expert is reflective and reasonable thinking that is focused on deciding what to believe or do	Reasonable thinking Reflective <u>thinking</u>
Lipman, M. (1987).	Critical thinking to be defined by three characteristic (1) it is self-corrective thinking, (2) it is thinking with criteria (3) it is thinking that is sensitive to context	Self-corrective thinking Thinking with criteria Sensitive <b>to</b> context
Dewey, J. (1909)	Active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends.	Reflective thinking
Paul, R., & Elder, L. (1990).	Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking. It requires rigorous standards of excellence and mindful command of their use. It entails effective communication and problem-solving abilities and a commitment to overcoming our native egocentrism and sociocentrism.	Self-directed thinking
Halpern, D. F. (2003).	Critical thinking involves the application of cognitive skills or strategies that enhance the likelihood of achieving a favourable outcome. It describes purposeful, reasoned, and goal-directed thinking—specifically the type of thinking employed in problem-solving, formulating inferences, calculating probabilities, and decision-making. This occurs when the thinker utilises thoughtful and effective skills tailored to the specific context and type of thinking task	Goal—directed thinking
Facione, P. A. (2011).	Critical thinking means good thinking, almost the opposite of illogical, irrational, thinking.	Logical thinking Rational thinking

There are also other scholars in the field of critical thinking who propose various definitions. Some scholars have distinguished it as a cognitive, mental, or thought process (Sternberg, R. J. ,1986; Kurfiss, J. G. ,1988; Huitt, W. ,1998; Mulnix, J. W. ,2010; Loh, W. L.,2020a). The cognitive process involves strategies and presentation (Sternberg, R. J. ,1986), appraising arguments or propositions and forming judgments (Huitt, W. ,1998), and a dedication to employing reason (Mulnix, J. W. ,2010). This includes accurate and thoughtful reasoning in the quest (Schafersman, S. D. ,1991), as well as considering different types of factors (Loh, W. L.,2020a) in forming the decision-making process. Dwyer, C. P., et al. (2014) characterized critical thinking as a metacognitive procedure encompassing various sub-skills (such as analysis, evaluation, and inference). Meanwhile, Goldsmith, R. E. (2013) determined critical thinking as follows:

- i. Accurately articulate a decision problem.
- ii. Identify the pertinent information required for decision-making,
- iii. Assess the quality of the information available,
- iv. Appropriately apply the gathered information to resolve the problem or reach a decision.
- v. Critically evaluate the decision-making process and make improvements as needed.

The critical thinking involves various processes. McPeck, J. E. (1981) asserted that in the past, thinking consistently involved contemplating something, whether it was a problem, an activity, or a subject matter. Apart from its critical thinking, it also distinguishes itself as a systematic mental process of appraising arguments or propositions and forming judgments that can guide the formation of beliefs and the decision-making process (Huitt, W. ,1998). In addition, it involves uncovering and addressing personal preconceptions and biases, articulating compelling reasons to support conclusions, and making rational, informed decisions regarding beliefs and actions (Bassham, G., Irwin, W., Nardone, H., & Wallace, J. M.,2010). Building on this, critical thinking helps people analyze, appraise, justify, and rearrange their ideas, reducing the likelihood that they will accept, act upon, or respond with an incorrect opinion (Raj, T., Chauhan, P., Mehrotra, R., & Sharma, M. ,2022).

Notably, critical thinking aims to improve the quality of decision-making, which is comparable to the goals of most researchers (Sternberg, R. J. ,1986; Huitt, W. ,1998; Halpern, D. F. ,2003; Loh, W. L.,2020a). This subtopic, however, asserted that experts' differing opinions have prevented an agreement on the concept of critical thinking. This study employed the definition of critical thinking by Facione, P. A. (1990). The author stated that critical thinking is a deliberate and controlled process where individuals monitor and adjust their thought processes to ensure logical and reasoned decision-making. Its process involves interpretation skills that require understanding and explaining information, analysis skills that break down complex ideas, evaluation skills that assess the credibility of arguments, and inferences are logical conclusions based on available evidence. Meanwhile, explanation refers to the ability of students to justify their judgments by considering various factors. This study adopted the definition of critical thinking from Dohr, J., and Portillo, M. (2011). The study also asserted that critical thinking involves analytical reasoning, and design requires logical decisions for

problem-solving. It consists of analyzing components and sharing reasoning using mental, computer, or physical models.

### **2.2.2 Critical Thinking Skills**

The term critical thinking skills refers to a set of mental habits and cognitive processes that involve specific necessary skills and abilities to produce problem-solving, reasoned decision-making, and critical reasoning. Moreover, critical thinking extends beyond merely evaluating statements. It encompasses the cognitive processes utilized in problem-solving and actively participating in specific activities (McPeck, J. E.,1981). Critical thinking skills are used in the critical thinking process in the formulation of decision-making. Consequently, it entails the cognitive procedures, approaches, and mental structures that individuals use to address problems, make decisions, and absorb new ideas (Sternberg, R. J.,1986).

An individual proficient in critical thinking possesses the ability to pose relevant questions, collect appropriate information, creatively and effectively analyze this information, apply logical reasoning, and draw dependable conclusions about the world. These conclusions empower individuals to lead a successful and purposeful life (Schafersman, S. D. ,1991). Accordingly, critical thinking comprises the elemental skills of scrutinizing arguments, drawing inferences through inductive or deductive reasoning, assessing or evaluating, and making decisions or solving problems (Lai, E. R. ,2011).

In contrast to creativity assessments, which involve tasks with heuristic qualities, evaluations of critical thinking require participants to employ logical reasoning (Loes, C., Pascarella, E., & Umbach, P. ,2012). As such, critical thinking is defined as the intellectual skills encompassing certain skills such as analysis, reasoning, problem-solving, creative thinking, judgment, and effective decision-making (Hussin, W. N. T. W., Harun, J., & Shukor, N. A. ,2018). It also involves the capacity to critically analyze phenomena and arguments using existing scientific knowledge and facts. Additionally, it entails determining the most suitable explanation among various models and explanations (Azizah, U., & Ibrahim, M. ,2019).

Table 2.2  
The Critical Thinking Skills and Abilities by Scholars

1	McPeck, J. E. (1981)		x										
2	Ennis, R. H. (1985)											x	
3	Schafersman, S. D. (1991)	x										x	
4	Watson, G., & Glaser, E. (2002)		x	x	x							x	x
5	Facione, P.A (2011)	x	x	x	x					x	x		
6	Lai, E. R. (2011)	x	x		x								
7	Thomas, T. (2011)	x	x										
8	Dwyer, C. P., et.al (2014)	x	x		x					x			
9	Hussin, W. N. T. W et.al (2018)	x								x	x		
10	Azizah, U., & Ibrahim, M. (2019)	x											
11	Fisher, A. (2019)	x	x	x								x	
12	Loh, W. L. (2020a)	x	x	x									
13	Bellaera, L., et.al (2021)	x	x	x	5	2	2	2	1	1	1		
		10	9	5									

Table 2.2 summarizes the critical thinking elements as illustrated by several critical thinking scholars. The majority of scholars agreed that analysis is the most essential skill required in the critical thinking process, followed by evaluation, interpretation, and inference. This aligns with the research by Loh, W. L. (2020b), which has revealed that educators in university settings within the humanities and social sciences regard analysis, evaluation, and interpretation as the most crucial critical thinking skills. The same applies to university disciplines such as the humanities and social sciences, which also regard analysis, evaluation, and interpretation as the critical thinking skills of utmost importance (Bellaera, L., Weinstein-jones, Y., Ilie, S., & Baker, S. T., 2021). Furthermore, the essential components of critical thinking skills encompass the capacity to reason independently, employ logical thinking, analyze information in light of personal experiences, validate assertions through evidence, and articulate compelling arguments for acceptance or rejection. Consistent with this, critical thinking comprises evaluating received information, mitigating the risks associated with acting on a single false assumption, actively seeking evidence and reasons to make informed judgments and conclusions. This involves considering

various probabilities and consulting with experienced and knowledgeable individuals (Asefi, M., & Imani, E.,2018).

Scholars have described numerous skills and abilities that are involved in the process of critical thinking. Among all skills constantly highlighted by most scholars and contributing to the consensus, these could be used to assess the critical thinking skills of students. In response, students should grasp these skills to become good critical thinkers.

### **2.2.3 Critical Thinking Disposition**

Dispositions, often referred to as attitudes or intellectual qualities, have been observed in several contexts: as an independent yet related term, or as an intrinsic part of critical thinking (Reed, J. H., 1998). Notably, the disposition of critical thinking is shaped by an individual's internal motivations when solving problems, evaluating ideas, and making decisions. It is crucial for educators to keep in mind that having a critical thinking disposition is not the same as possessing the appropriate critical thinking skills (Treado, C. ,2018). In addition to the skills and abilities that students should be equipped with, a disposition is also necessary to be a great critical thinker. Thus, the consensus among experts is that critical thinking comprises two components: cognitive skills and affective dispositions. Both aspects require cultivation to foster the development of individuals into critical thinkers (Fisher, A. ,2019).

According to Ennis, R.H. (1996), disposition refers to a willingness to act in a particular way under specific circumstances. Meanwhile, Fisher, A. (2011) described dispositions as patterns of behavior. A predisposition to act in a specific manner is a form of habit. On a similar note, critical thinking disposition, as stated by Schick Jr, T., and Vaughn, L. (2014), is a certain mental state (such as seeking, believing, fearing, and so forth). It is characterized by the tendency to feel or act in a certain situation. In addition, the natural dispositions of the human mind, resulting from the pathology of the natural mind, can be identified and corrected through critical thinking processes to enhance our thinking significantly. This is primarily attributed to the fact that they are interrelated and occur in daily life (Paul, R., Paul, R. W., & Elder, L. ,2002).

Developing a critical thinking attitude and disposition is just as crucial as honing critical thinking abilities. Table 2.3 demonstrates the critical thinking disposition mentioned by scholars. Open-mindedness is the widely agreed-upon attribute among

scholars to be one of the critical thinking disposition elements, followed by truth-seeking. It is fundamental to foster and appreciate the mindset of a critical thinker (Halpern, D. F. ,2003). Although most academics argue that a dispositional component is essential to critical thinking, the evaluation feature may outweigh this assertion. Note that dispositions are often not evaluable since critical thinking dispositions are a hidden quality (Ennis, R. H. ,1996). However, the author suggested a few methods could be used to assess critical thinking disposition. There are three types of evaluation: i) multiple-choice testing, such as the California Critical Thinking Disposition Inventory (CCTDI), ii) performance-based assessment, and iii) guided open-ended.

Table 2.3  
Critical Thinking Disposition by Critical Thinking Scholars

Open-mindedness	x	x	x	x	x	x	6
Truth seeking		x	x	x		x	4
Cognitive self-confidence				x	x		2
Analyticity		x		x			2
Systematicity		x		x			2
Integrity				x	x		2
Inquisitiveness		x		x			2
Maturity of judgments		x					1
Cognitive maturity				x		x	1
Self-confidence		x					1
willingness			x				1
Empathy					x		1
Perseverance					x		1
Humility					x		1
Autonomy					x		1
Courage					x		1

At the same time, open-mindedness is widely highlighted by critical thinking scholars. This attribute is valuable to individuals in the critical thinking process, as it enables them to make informed decisions by evaluating information fairly, considering diverse perspectives, and considering diverse viewpoints. Siegel, H. (2020) asserted that open-mindedness entails a propensity to pursue explanations and facts, and to form beliefs based on their appropriate assessment, rendering it fundamental to critical thinking. Simultaneously, Facione, P. A. (1990) stressed that educators must consider both skills and dispositions when instructing and evaluating critical thinking. Suppose they focus solely on the skill-based components of critical thinking, such as analysis, evaluation, or reasoning. In that case, they may overlook significant pedagogical and

assessment ramifications stemming from the dispositional portion of critical thinking. In addition, focusing solely on skills can lead to assessments that overlook students' motivation to engage in critical thinking. Furthermore, educators often teach critical thinking as a technical process, neglecting strategies that promote lifelong critical inquiry.

#### **2.2.4 Critical Thinking Assessment**

Critical thinking is widely recognized as an essential goal of higher education (Facione,P.A, 1990; Paul, R. & Elder, L. , 2006). To effectively teach critical thinking skills, it is crucial to conduct assessments to determine students' current proficiency in this skill (Al-Mazroa, S., 2017). Critical thinking assessment is challenging yet achievable, with various challenges and traps depending on the purpose and format, and numerous unwary pitfalls for the unwary (Ennis, R.H.,1993). He emphasized several purposes of critical thinking assessment, which include:

- i) Diagnosing the levels of students' critical thinking,
- ii) Providing students with feedback on their critical thinking prowess,
- iii) Motivating students to be better at critical thinking,
- iv) Informing educators about the success of their efforts to teach students to think critically,
- v) Researching critical thinking instructional questions and issues,
- vi) Providing help in deciding whether a student should enter an educational program,
- vii) Providing information for holding schools accountable for the critical thinking prowess of their students.

Figure 2.1 displays the framework created by Duron, R., et al. (2006), which consists of a comprehensive approach that can be effectively applied in any educational or training setting to enhance students' critical thinking abilities. The implementation of this framework necessitates a commitment to active, student-centered learning, which may initially be unfamiliar and uncomfortable for both students and educators (Duron, R., et.al., 2006).

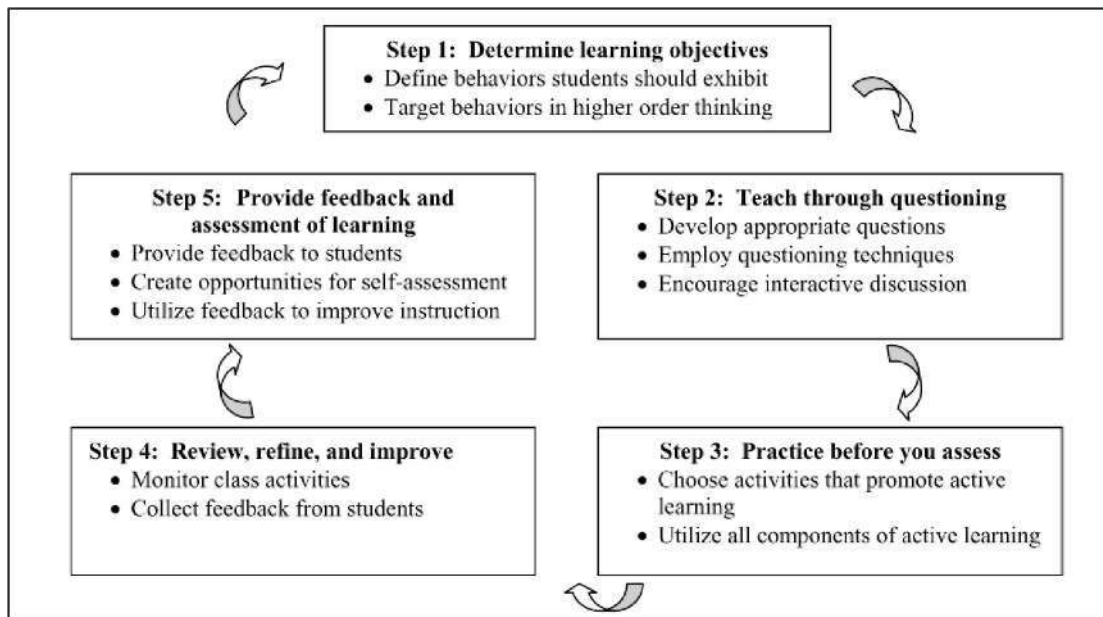


Figure 2.1 Step Model to Move Students toward Critical Thinking  
Sources: Adopted from Duron, R., Limbach, B., & Waugh, W. (2006)

The authors added that educators should offer students regular practice opportunities and provide ample time to help them understand the criteria and standards. Other than that, they should also encourage peer feedback and evaluation, assisting students to distinguish between satisfactory and unsatisfactory performance. These techniques help students learn to differentiate between satisfactory and unsatisfactory outcomes. In line with this, feedback and self-assessment opportunities enable students to reflect on their cognitive processes, identify areas for improvement, and cultivate autonomy as essential objectives in critical thinking education. In essence, assessment within this framework enhances teaching as a dynamic and responsive process, thereby fostering critical thinkers in any field.

There are many standard tools created by critical thinking philosophers. Table 2.4 outlines a standard assessment of critical thinking. For example, Ennis, R.H. (1993) highlighted the standard test that addresses multiple and single dimensions of critical thinking. The critical thinking assessment tools presented in Table 2.4 encompass multiple dimensions. In addition, most assessments use selected-response items like multiple-choice or Likert-type items, while ETS Proficiency Profile (EPP) and Halpern Critical Thinking Assessment (HCTA) combine multiple-choice and constructed-response items. In particular, the Ennis-Weir test is an essay test, and due to the limited testing time, only a small number of constructed-response items can be used in each assessment (Liu, O. L., Frankel, L., & Roohr, K. C. ,2014).

Table 2.4

The Existing Assessment Tools of Critical Thinking

Test	Vendor	Format	Delivery	Length	Form and items	Themes/topics
<b>California Critical Thinking Disposition Inventory (CCTDD)</b>	Insight Assessment (California Academic Press)	Selected-response (Likert scale— extent to which students agree or disagree)	Online or paper/pencil	30 min	75 items (seven scales: 9-12 items per scale)	This test contains seven scales of critical thinking: (a) truth-seeking, (b) open-mindedness, (c) analyticity, (d) systematicity, (e) confidence in reasoning, (f) inquisitiveness, and (g) maturity of judgment (Facione, & Sanchez, <b>1994</b> ).
<b>California Critical Thinking Skills Test (CCTST)</b>	Insight Assessment (California Academic Press)	Multiple-choice (MC)	Online or paper/pencil	45 min	34 items (vignette-based)	The CCTST returns scores on the following scales: (a) analysis, (b) evaluation, (c) inference, (d) deduction, (e) induction, and (f) overall reasoning skills (FacionePA, <b>1990a</b> ).
<b>California Measure of Mental Motivation (CM3)</b>	Insight Assessment (California Academic Press)	Selected-response (4-point Likert scale: strongly disagree to <u>strongly agree</u> )	Online or paper/pencil	20 min	72 items	This assessment measures and reports scores on the following areas: (a) learning orientation, (b) creative problem solving, (c) cognitive integrity, (d) scholarly rigor, and (e) technological orientation (Insight Assessment, <b>2013</b> ).
<b>Collegiate Assessment of Academic Proficiency (CAAP) Critical Thinking</b>	ACT	MC	Paper/pencil	40 min	32 items (includes four passages representative of issues commonly encountered in a postsecondary curriculum)	The CAAP Critical Thinking measures students' skills in analyzing elements of an argument, evaluating an argument, and extending arguments (CAAP Program Management, <b>2012</b> ).
<b>Cornell Critical Thinking Test (CCTT)</b>	The Critical Thinking Co.	MC	Computer-based (using the software) or paper/pencil	50 min (can also be administered untimed)	Level X: 71 items  Level Z: 52 items	Level X is intended for students in Grades 5-12+ and measures the following skills: (a) induction, (b) deduction, (c) credibility, and (d) identification of <u>assumptions</u> (The Critical Thinking Co., 2014).  Level Z is intended for students in Grades 11-12+ and measures the following skills: (a) induction, (b) deduction, (c) credibility, (d) identification of <u>assumptions</u> , (e) semantics, (f) definition, and (g)

<b>Ennis-Weir Critical Thinking Essay Test</b>	Midwest Publications	Essay	Paper/pencil	40 min	Nine-paragraph essay/letter	prediction in planning experiments (The Critical Thinking Co., <b>2014</b> ).  This assessment measures the following areas of the critical thinking competence: (a) getting the point, (b) seeing reasons and assumptions, (c) stating one's point, (d) offering good reasons, (e) seeing other possibilities, and (f) responding appropriately to and/or avoiding argument weaknesses (Ennis & Weir, <b>1985</b> ).
<b>ETS Proficiency Profile (EPP) Critical Thinking</b>	ETS	MC	Online and paper/pencil	About 40 min (full test is 2 h)	27 items (standard form)	The critical thinking component of this test measures a students' ability to: (a) distinguish between rhetoric and argumentation in a piece of nonfiction prose, (b) recognize assumptions and the best hypothesis to account for information presented, (c) infer and interpret a relationship between variables, and (d) draw valid conclusions based on information presented (ETS, <b>2010</b> ).
<b>Halpern Critical Thinking Assessment (HCTA)</b>	Schuhfried Publishing, Inc.	Forced choice (MC, ranking, or rating of alternatives) and open-ended	Computer based	60-80 min, but the test is untimed (Form S1) 20 min, but the test is untimed (Form S2)	25 scenarios of everyday events (five per subcategory) 20 min, but the test is untimed (Form S2) S2: All forced-choice items	This test measures five critical thinking subskills: (a) verbal reasoning skills, (b) argument and analysis skills, (c) skills in thinking as hypothesis testing, (d) using likelihood and uncertainty, and (e) decision-making and problem-solving skills (Halpern, <b>2010</b> ).
<b>Watson-Glaser Critical Thinking Appraisal tool (WGCTA)</b>	Pearson	MC	Online and paper/pencil	Standard: 40-60 min (Forms A and B) if timed Standard: 40-60 min (Forms A and B) if timed Watson-Glaser II: 40 min if timed	80 items 80 items 40 items	The WGCTA is composed of five tests: (a) inference, (b) recognition of assumptions, (c) deduction, (d) interpretation, and (e) evaluation of arguments. Each test contains both neutral and controversial reading passages and scenarios encountered in the workplace, the classroom, and the media. Although there are five tests, only the total score is reported (Watson & Glaser, <b>2008a, 2008b</b> ).

Source: Adopted from Liu, O. L., et.al, (2014)

Examples of tests that involve a single dimension, as stated in Ennis, R. H. (1993), are the Cornell Class Reasoning Test (1964) by R.H. Ennis, the Cornell Conditional Reasoning Test (1964), Logical Reasoning (1955), and Test on Appraising Observations (1983) by S.P. Norris and R. King. Notably, the California Critical Thinking Skill Test (CCTST) (1990) and the Cornell Critical Thinking Tests (Levels X and Z) are commonly employed to assess critical thinking skills in high school and college students. This includes skills such as induction, deduction, assumption identification, and credibility evaluation. Conversely, the Ennis-Weir Critical Thinking Essay Test (1985) focused on students' ability to construct and evaluate arguments using written responses. Meanwhile, the New Jersey Test of Reasoning Skills (1983) evaluated syllogisms, assumptions, and reasoning types for students in Grade 4 through college. In terms of single-dimension assessments, tests such as the Cornell Class Reasoning Test and Cornell Conditional Reasoning Test (both 1964) are designed to assess deductive reasoning in younger students. Other tools, such as Logical Reasoning (1955) and Appraising Observations (1983), focused on classifying and justifying observations. These tools provide a structured means to measure specific critical thinking components.

Ennis, R.H. (1993) stressed that educators should be aware of potential pitfalls when using critical thinking tests, as they can lead to misleading results and a lack of critical thinking skills. These include comparing test results with norms, using pre- and post-test without comparing the class to a control group, using the same test for both, and using different forms of the same test for pre- and post-test comparisons. Comparability is suspected, as much depends on the specific context of the test. Most critical thinking tests are not comprehensive, especially multiple-choice tests, which often miss crucial aspects of critical thinking. Furthermore, differences in background beliefs and assumptions between test makers and test takers can lead to varying interpretations of test questions. Significant results may be expected in a relatively short period, as learning to think critically takes time and requires reflective practice with numerous examples in various situations. Similarly, Rear, D. (2018) warned that institutions should be cautious when using standardized tests to assess critical thinking, as they are based on well-known taxonomies, and should not be used to measure educational outcomes. This is due to the fact that these critical thinking tests are flawed due to their lack of consideration for contested issues, inadequate validity and reliability, and limited assessment of real-life academic tasks. In addition, Ennis, R. H.

(1993) criticized the limitations of most current critical thinking tests, noting their lack of comprehensiveness, which often fails to assess open-mindedness and source credibility. Without a strong understanding of critical thinking, judgments about tests are likely to be erratic or worse. Therefore, a more comprehensive approach is required. Hence, a more effective approach would be implemented at the faculty level, involving assessments of coursework integral to specific academic disciplines that evaluate critical thinking. Subject-specific critical thinking assessments provide personalized feedback, focusing on the practical application of skills within a discipline while ensuring that formative feedback is tailored to the student's needs (Feulner, M., 2020).

In design education, critical thinking assessment evaluates students' ability to analyze, synthesize, and solve complex problems using various task types, with performance-based and process-oriented tasks being the most effective and widely recommended approaches. One method for assessing critical thinking in design education is performance assessment. Braun, H., Shavelson, R., Zlatkin-Troitschanskaia, O., and Borowiec, K. (2020) asserted that performance-based assessment is the most accurate and reliable method for evaluating critical thinking. Their performance assessment framework for critical thinking encompasses the identification, evaluation, analysis, interpretation of information, synthesis of evidence, and reporting of conclusions in complex, real-world scenarios. Consistent with this, a study by Adri, J., Refdinal, Ambiyar, and Abdullah, A. S. (2022) aimed to develop a performance-based assessment instrument for welding quality testing courses, focusing on critical thinking skills. The process involves identifying the problem, creating an assessment context, determining a rubric, conducting a performance assessment, and formulating results. The outcome is a report that contains observations and recommendations for decision-making. Similarly, the study by Shively, K., Stith, K. M., and Rubenstein, L. D. V. (2018) used the performance-based assessment to assess critical thinking in design education. They highlighted the need for assessment tools to evaluate students' process skill growth and the final products, presenting multiple approaches for measuring cognitive process skills. Additionally, they created rubrics and frameworks to evaluate the outcome and the whole design process, encompassing students' problem-solving approaches, idea generation, and solution iteration.

This methodology underscores the need to combine creative and analytical thought during the design process (Shively, K., et.al,2018; Shanta, S., & Wells, J., 2020). Furthermore, Facione, P.A. (2000) developed a rubric approach for assessing

critical thinking skills, asking two key questions: the context of knowledge development and the specific cognitive action (critical thinking skill). In addition, Utami, B., Saputro, S., Ashadi, A., Masykuri, M., and Widoretno, S. (2019) sought to evaluate critical thinking abilities in interpretation using a rubric, concentrating on five indicators: interpretation derived from experience, facts, events, processes, and judgment, while highlighting their significance in improving interpretation skills. Meanwhile, Adri, J., Refdinal, Ambiyar, and Abdullah, A. S. (2022) created a performance-based assessment tool designed to encourage students' critical thinking in welding quality evaluation courses. Their tools include five stages: identifying the core problem, establishing the assessment context, developing a scoring rubric, conducting the performance assessment, analyzing the results, and responding to the evaluation outcomes. Accordingly, the rubric applied is a scoring-type rubric, and the assessment instrument is designed to align with the task of inspecting welding outcomes. Moreover, Loh, L. (2023) proposed an evaluation method for assessing students' critical thinking quality in design journals, utilizing Paul, R. and Elder, L.'s model, which employs a self-study approach.

### **2.2.5 Benefit of Critical Thinking in Higher Education**

The ability to think critically serves various benefits from daily life to educational life and the workplace. One of the benefits of the ability to use critical thinking skills in daily life or working could enhance the quality of problem-solving skills and decision-making (El-Daghar, K. ,2020; Şenturk, N. ,2018; Dwyer C.P, et.al ,2014; Schafersman, S. D. ,1991). This is attributed to the fact that, occasionally, problems that emerge are unknown (Thomas, T. ,2011), and they come in various forms of circumstances (Azizah, U., & Ibrahim, M. 2019). Umrzokova, G. and Paradaeva, S. (2020) described several advantages of using critical thinking skills in decision-making. This includes drawing correct conclusions, gathering necessary information, justifying decisions, clearly understanding the problem, utilizing ideas, interacting with people, and using alternative thinking. Notably, the ability to anticipate unforeseen issues in everyday life could help to prevent mistakes, personal, professional, and social failures, increase understanding, and address issues in everyday life caused by a lack of education and readiness for current decision-making (Azizah, U., & Ibrahim, M., 2019; Goldsmith, R. E. ,2013). Thus, critical thinking helps enhance the quality of life

(Sentiirk, N. ,2018; Snyder, L., & Snyder, M. ,2008) and succeed in the world (Schafersman, S. D. ,1991; Goldsmith, R. E.,2013).

Critical thinking skills are essential, as many critical circumstances arise in everyday life. In an age of technology, the internet and remote services put a wealth of knowledge at our fingertips. However, it must be carefully selected, interpreted, digested, evaluated, learned, and used to ensure its usefulness. The material is no longer relevant on a computer screen or a faraway library shelf. Employees in various job categories need to receive individualized critical thinking instruction to address the challenges posed by the substantial amount of information and rapidly changing information in the workplace (Halpern, D. F., 2003). According to Paul, R. and Elder, L. (2006), critical thinking is gaining importance due to four trends: accelerating change, intensifying complexity, escalating interdependence, and increasing danger. Due to the rapidly evolving world, information is readily available to us, which forces us to be attentive and courageous enough to think critically (Dwyer, C.P, et.al ,2014).

Other than that, in the new era of technology, we are given the abundance of data accessible, critical thinking abilities are necessary for performing exhaustive information searches and efficiently utilizing concepts or information (Hidayah, R., et.al,2017). As a result, it could help obtain more complicated information (Halpern, D. F., 2003) and improve people's comprehension of the information acquired (Azizah, U., & Ibrahim, M., 2019) by increasing complexity (Paul, R., & Elder, L.,2006). Therefore, to effectively address these challenges, it is crucial to incorporate critical thinking skills into the curriculum, which requires problem anticipation and identification, confidence, knowledge, and interpersonal/management skills (El-Daghar, K. ,2020; Halpern, D. F., 2003).

Furthermore, preparing higher education students with critical thinking abilities will benefit their workplace experiences. In other words, critical thinking skills are vital to be implemented to ensure that graduates of higher education possess the information and abilities needed to make informed judgments in the modern world (Goldsmith, R. E.,2013). Additionally, it helps develop a person's knowledge, confidence, and interpersonal and management skills (El-Daghar, K., 2020). It could also have a significant impact on their profession post-study. For example, students need to possess knowledge and critical thinking skills, as failure in their field can hinder businesses from maximizing their potential, ultimately impacting their output (Franklin, E. I., et.al ,2022). This is supported by Indrasiene, et.al (2018), who stated that individual

development indirectly contributes to the ability to develop critical thinking skills, which in turn contributes to being a better employee. This is largely since it enhances the analytical abilities and encourages self-reflection (Hidayah, R., Salimi, M., & Susiani, T.,2017).

In addition, many scholars agree that critical thinking is beneficial for developing successful leadership in the workplace (Flores, K., Matkin, G., Burbach, M., Quinn, C, & Harding, H. ,2012). They have the potential to develop into competent workers, as they may be able to oversee unforeseen problems that arise at work (Halpern, D.,2003). Therefore, it is necessary for all grade levels' curricula to include critical thinking instruction for it to be taught effectively (Paul, R., & Elder, L. ,2006). These skills are beneficial in the learning process and can be more easily applied in their future careers.

#### **2.2.6 Critical Thinking in Malaysian Higher Education**

Critical thinking is a crucial skill for students to be empowered by higher education. Students should develop this talent in addition to other essential skills, such as practical knowledge, effective communication, teamwork, and lifelong learning. Critical thinking was introduced by Dewey in the early 20th century and has garnered international recognition as an essential component of an education program. Other than that, it aims to better prepare students for the workforce through integration into the curriculum, objectives, educators, and classrooms (Allamnakhrah, A. Y. ,2013). It involves logical, reflective, and systematic thinking, aiding in information analysis, decision-making, creativity, effective use of ideas, thorough information searches, and self-reflection, thereby enhancing analytical abilities and fostering creativity (Hidayah, R., Salimi, M., & Susiani, T.,2017). Building on this, critical thinking skill ability is required in solving the problem and decision-making process (§entiirk, N.,2018; Indrasiene, et.al, 2018; Dwyer, C. P., et.al ,2014), in either personal or workplace issue (Halpern,D. ,2003;Snyder, L., & Snyder, M. ,2008). It extends beyond assessing claims; it also entails active engagement in targeted actions and cognitive processes for addressing problems (McPeck, J. E.,1981).

Critical thinking is beneficial to the development of students' soft skills in higher education. Quality education demands the incorporation of critical thinking skills, an essential skill that enhances academic performance, decision-making, and

societal contributions. This approach goes beyond mere information transmission, preparing students to tackle global issues and solve global concerns. Critical thinking improves academic performance while fostering informed decision-making and societal impact (RMKe-12, 2021).

Table 2.5  
Previous Studies Related to Critical Thinking in Malaysian Higher Education

	60	t/2 H U	in		
	2 H CS O	O o a	o ^ a	• ^ 2	H 5 ^
	S	Q			
Ahrarietal. (2016)	X				
Ali El sayed Ibrahim et al. (2020)			X		
Ashaari & Che Mohd Adli (2019)				X	
Bazid, N. I., & Umar, I. N. (2014)	X				
Daud, N. S. M., et.al (2013)	X				
Dweeetal. (2016)	X	X		X	
Darby, N. M., & Rashid, A. M. (2017)	X		X		
Endutetal. (2014)		X			
Endutetal. (2018)	X				
Fadhulllah, A., & Ahmad, N. (2017)	X				
Ghadi, I. N., Bakar, K. A., Alwi, N. H., & Talib, O. (2013)	X				
Ghadi, I. N., Bakar, K. A., & Njie, B. (2015)				X	
Hamdan, S. I., et.al., (2012)	X				
Ismail, F., Ibrahim, N., & Samat, N. (2017)		X			
Johari, F., Alias, M. H., Rahman, A. A., & Ibrahim, M. F. (2015)	X				
June, S., et.al, (2014)	X				
Lee, M, Sohod, S., & Rahman, A. (2019)	X	X			
Murugan, A., & bt Razali, W. N. (2013)	X				
Noni, N. S., & Abdullah, A. H. (2018)	X	X			
Noor, H. M., & Samsudin, Z. (2016)		X			
Puteh, M. S., & Hamid, F. A. (2014)		X			
Rabu, S.N. A., etal (2013)	X				
Rabu, S. N. A., et.al. (2017)		X		X	
Rodzalan, S. A., & Saat, M. M. (2015)			X		
Rusdi, S. H., & Umar, I. N. (2015)	X	X			
Salleh, S. M, etal (2012)	X				
Setambah, M. A. B, et.al (2019)	X				
Sharif, M, etal. (2021)		X			
Sulaiman, N. L. (2012)	X		X		
Ya'acob, etal (2020)	X				
Yahya, A., Sidek, S., & Jano, Z. (2011)		X			
Zabit, M. N. M, Karagiannidou, E., & Zachariah, T. Z. (2016)	X				
Zaid, N. M., & Hamizan, N. I. (2014)	X				
Total	20	11	5	3	3

Considering the significance of these skills for graduate quality and their effect on employability skills, the MOHE took the initiative to incorporate them as one of the seven soft skills integrated into the higher education curriculum design. Prior to the

introduction of soft skills, Malaysian students had already been exposed to teaching methods that emphasized problem-solving, creative thinking, and critical thinking. This was achieved through the Kurikulum Bersepadu Sekolah Rendah, (KBSR) known in English as the Integrated Curriculum for Primary School and Kurikulum Bersepadu Sekolah Menengah (KBSM) known in English as the Integrated Curriculum for Secondary School.

However, a previous study revealed that the education system in Malaysia has traditionally been exam-oriented (Zabit, M. N. M., Hadi, Z. A., Ismail, Z., & Zachariah, T. Z. ,2018). Since these skills are crucial in preparing graduates to be more flexible individuals in solving university problems prior to entering the workforce, it is vital to understand the actual capabilities of students at universities with regard to these critical skills. Thus, many Malaysian scholars conducted studies related to critical thinking in the higher education system. As can be observed in Table 2.5, the table summarizes previous studies in Malaysian higher education institutions. Table 2.5 indicates that most of the research conducted in Malaysia on critical thinking is related to the teaching method that improves critical thinking skills. Meanwhile, the second-highest rate pertains to research assessing students' critical thinking abilities. However, very few studies have been conducted to examine the factors and challenges in critical thinking development. This support underscores the necessity of this study.

### **2.2.7 Teaching Critical Thinking in Higher Education**

The question of how to teach critical thinking abilities in a way that is both specialized and generalized has been discussed in the critical thinking literature. Specifically, critical thinking is a debated attribute between generalists and specialists. Generalists believe it is non-discipline-specific, applicable to all disciplines. At the same time, specialists argue that it is a discipline-specific skill that can only be taught from a disciplinary perspective and using the language of that discipline. Both perspectives suggest critical thinking is generic in nature (Davies, M. ,2013). Technically, teaching critical thinking is divided into two beliefs. The first method is critical thinking, taught separately from the discipline domain. Conversely, another one is the integration of these skills into subject-specific areas.

Ennis, R.H. (1989) believed that these skills can be taught independently in any discipline and later transferred to another. However, McPeck asserted that critical thinking skills are unique and cannot be transferred across different disciplines. The researcher emphasized the need for knowledge and understanding of the content and epistemology of each discipline to utilize these skills effectively. Contrary to McPeck (1990), who affirmed that critical thinking is specific to a particular discipline, stated that critical thinking is influenced by an individual's knowledge and understanding of the subject they study. Similarly, Facione, P. A (1990) and Hyytinen, H., Toom, A., and Shavelson, R. (2019) also agreed that critical thinking can be integrated into various daily life subjects or topics, rather than being a standalone field with its own knowledge corpus.

The inclusion of critical thinking in course materials is one of several efforts to teach people how to think critically (Bag, H. K., & Giirsoy, E.,2021). Facione,P.A (1990) underlined that critical thinking instruction can be integrated into programs that encompass various disciplines or everyday life content, rather than being a separate discipline with a specific knowledge base. Al Ghamdi, A. K. H., and Deraney, P. M. (2013) also noted that critical thinking should ideally be included in all a student's academic experiences rather than being limited to a single, stand-alone program, to help them develop as critical thinkers. In addition, Schafersman, S. D. (1991) mentioned that the first method is the simplest, least time-consuming, and least expensive; it is also the one that this guidebook supports. This approach involves making slight adjustments to one's teaching and assessment strategies to foster critical thinking in students. In comparison, another method is more challenging, costly, and time-consuming. This approach utilizes programs, resources, and structured critical thinking tasks developed by experts.

Several studies have revealed that the second method of teaching critical thinking has had a positive impact, rather than a stand-alone critical thinking course. A quantitative study by Sughra, U., and Usmani, A. (2022) in the twin cities Rawalpindi-Islamabad at a medical college discovered that students who followed an integrated curriculum demonstrated stronger critical thinking skills. This is compared to those who followed a standard curriculum. Thus, teaching and learning should incorporate diverse approaches, questions, cognitive levels, and activities to foster high knowledge and attitudes among students (Ab Halim, A. S., Osman, K., Aziz, M. M., Ibrahim, M. F., & Ahmad, A. A. K. ,2021). Likewise, the Caceres, M., Nussbaum, M., and Ortiz, J. (2020)

indicated that rather than teaching critical thinking skills alone, educators prefer to integrate them into their disciplines to help students develop their critical thinking abilities. They foster critical thinking by choosing lessons that deepen students' comprehension of the world through subject-specific instruction. Collectively, these findings suggest a discrepancy between research and educational practice, with the latter favoring the explicit and targeted teaching of critical thinking as a stand-alone topic or as part of a cross-curricular approach.

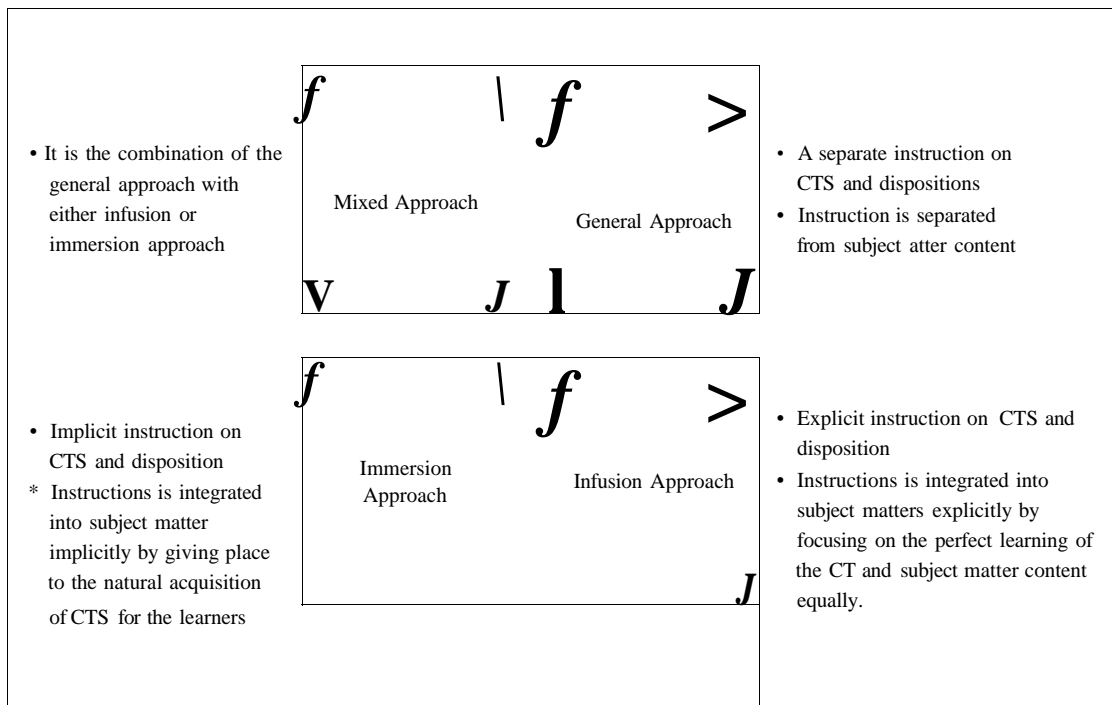


Figure 2.2 The Critical Thinking Teaching Approach  
Source: Adopted from Ennis, R.H. (1989)

. The integration of critical thinking skills in education is formulated through several alternatives. According to Ennis, R.H. (1989), there are four approaches to integrating critical thinking skills in education: the general approach, infusion approach, immersion approach, and mixed approach as shown in Figure 2.2.

General approach when it aims to teach critical thinking by teaching critical thinking skills and attitudes independently from the presentation of the content of existing subject-matter offerings. The general approach focuses on teaching critical thinking in non-school contexts, separate from existing subject matter offerings, aiming to develop critical thinking skills in students (Sternberg, 1987; Al-Ghadouni, A. M., 2021). The general approach teaches critical thinking skills and attitudes without focusing on any one subject (Behar-Horenstein, L. S., & Niu, L., 2011). Since this

approach is less prevalent, there are minimal studies on the effect of the general approach in teaching critical thinking skills in higher education.

Second is the infusion approach, which embeds critical thinking instruction within subject-specific teaching, involving a profound and thoughtful approach. It entails clear and comprehensive subject-matter instruction that encourages students to engage in critical thinking within the subject. Additionally, this approach explicitly outlines the general principles underlying critical thinking dispositions and abilities. Essentially, the infusion approach teaches critical thinking skills explicitly within subject-specific content. In contrast to the immersion technique, which leaves students unaware that they are receiving critical thinking instruction, the infusion approach clearly teaches critical thinking concepts (Behar-Horenstein, L. S., & Niu, L. ,2011).

Moreover, this approach facilitates students' transition from understanding to applying critical thinking levels using appropriate meta-cognitive processes. This is supported by Snyder, S., Edwards, L., and Sanders, A. (2019), who suggested that the proof of infusion approach could contribute to the development of critical thinking skills. Darby, N. M., and Rashid, A. M. (2017) summarized that the infusion approach incorporates problem-solving strategies and techniques. This includes questioning and discussion, which significantly enhanced the development of a critical thinking disposition. In order to enhance students' critical thinking abilities, knowledge, and attitudes, educators might create instructional methodologies that includes intentional learning tasks that foster critical thinking skills. In essence, critical thinking skills need to be taught to students, and regular and clear educators modeling of these abilities is necessary (ZivkoviL, S. ,2016).

The third approach is the immersion approach to instruction design. Immersion is a comparable and thought-provoking form of subject matter instruction where students become deeply involved in the subject. However, it does not explicitly articulate the general principles of critical thinking. Finally, there is the mixed approach. This approach combines a general approach with either the infusion or immersion approach. Beneath it, there is a distinct thread or program designed to impart the fundamental principles of critical thinking, while simultaneously engaging students in subject-specific instruction that fosters critical thinking. The immersion approach teaches critical thinking skills implicitly. The integration of critical thinking skills in a subject through the immersion approach occurs when critical thinking skills are integrated into subject matter implicitly (Ennis, R.H., 1989). Remarkably, implicit

teaching enhances explicit instruction by enabling students to apply specific critical thinking skills in new contexts and demonstrate their understanding of when to apply them (Snyder, S. J., Edwards, L. C., & Sanders, A. L. (2019). Additionally, this approach teaches critical thinking implicitly within a specific subject, assuming it is a result of interaction and learning about the subject matter, rather than explicitly taught (Bellaera, L., et.al, (2021).

Finally, the mixed approach combines the general and infusion approaches, focusing on teaching general critical thinking principles and subject-specific instruction in a separate program. This approach ensures comprehensive and effective teaching methods. A study by Apsari, N. P. A. N. (2016) revealed that, on average, participants prefer the mixed method. Educators explicitly note that critical thinking skills are incorporated into programs, as opposed to the infusion strategy, which does not state explicitly but rather implicitly for the subject matter. Al-Ghadouni, A. M. (2021) revealed that the immersion approach is the least effective and most frequently used, while the mixed approach is the most effective yet the least frequently used. This is supported by a study by Bellaera, L., et al. (2021), which discovered that educators reported employing dialogue-based activities to foster critical thinking and that they were more likely to teach critical thinking implicitly than explicitly.

In conclusion, the best teaching approach promotes both content-specific and general critical thinking, enabling students to reason effectively across various subjects and domains, despite the possibility of developing critical thinking skills within specific content areas (Paul, R., & Elder, L. ,2006). For instance, Ab Halim, A.S. et al. (2021) underscored that teaching and learning should incorporate diverse methods, cognitively varied questions, and challenging activities to foster high levels of knowledge and attitudes. Regardless, when teaching critical thinking, it is essential to also emphasize its value (Schafersman, S. D. ,1991). Flores, K., et al. (2012) added that successful critical thinking pedagogy is shifting from content-based, deep knowledge-based learning to teaching students to think complexly.

The meta-analysis study conducted by Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., and Zhang, D. (2008) stated that the most effective approach to critical thinking training, is to view the critical thinking abilities as distinct components that need to be improved upon and explicitly included into classroom practice. They also discovered that learners require explicit instruction linked to the core subject training. Note that implicit training without a clear focus on

critical thinking is ineffective for improving skills and dispositions. This approach unsuccessful is attributed mainly to the main issue with the integration of critical thinking skill is that educators only paid attention to the material, while failing to emphasize critical thinking skills (Dwee, C. Y., et.al, 2016; Ozelci, S. Y., & Cahşkan, G.,2019; Amin, A. M., & Adiansyah, R. ,2018). This is supported by Adeyemi, S. B. (2012), who revealed that the least successful approach was the immersion technique. Notably, the most successful approach was a mixed one, with the infusion strategy coming in second. Accordingly, it promotes both content-specific and general critical thinking, enabling students to reason effectively across various subjects and domains, despite the possibility of developing critical thinking skills within specific content areas (Paul, R., & Elder, L. ,2006). There is ample evidence that critical thinking can be taught. Hence, there is hope that teaching critical thinking skills may prevent the occurrence of negative life events (Butler, H. A., Pentoney, C, & Bong, M. P. ,2017).

Nonetheless, the literature analysis indicated that incorporating critical thinking into subject-specific courses is currently facing challenges. Many studies discovered that educators solely focus on the subject matter instead of critical thinking skills when integrating these skills into subject matter-specific fields (Ozelci, S. Y., & Cahsjtan, G.,2019; Amin, A. M., & Adiansyah, R., 2018; Dwee, C. Y., et.al, 2016). Similarly, students in formal education are expected to develop two critical thinking skills: using evidence to justify their positions and considering objections or contrary opinions in their reasoning. However, this has not been adequately addressed in higher education research (Rapanta, C, & Macagno, F. ,2019).

### **2.2.8 Critical Thinking Strategies Fostering Critical Thinking**

The way critical thinking is taught influenced the acquisition of these skills among students. According to Fadhlullah, A. and Ahmad, N. (2017), students' capacity to exercise critical thinking may be significantly impacted by the way knowledge is conveyed to them. Terblanche, E. A. J., and De Clercq, B. (2020) stated that the teaching method is the main factor influencing students' critical thinking abilities. However, the terms "teaching approach," "teaching strategies," and "teaching methods" often become confusing among educators. According to Hasanova, N, Abduazizov, B., and Khujakulov, R. (2021), a teaching approach is a set of principles, beliefs, or ideas that guide the teaching process, providing a philosophy to the learning process. Building on

this, the critical thinking teaching approach in education should be supported by appropriate teaching strategies, in addition to identifying the general idea for teaching critical thinking skills. It should be included in the curriculum to assist educators and students in problem resolution, as learners require problem anticipation as well as identification, and confidence, knowledge, and interpersonal management skills to effectively address emerging challenges (El-Daghar, K. ,2020).

Table 2.6

The Teaching Strategies and Teaching Methods Foster the Critical Thinking Skills

<u>Teaching Strategies</u>	<u>Teaching Method</u>
Problem-based learning Prapulla, S. B., et.al, (2023); Saputro, A. P., et.al (2020)	Puzzle solving (Prapulla, S. B., et.al, (2023) Case study (Campo, L. et.al,2023; Afify, H. M. N., et.al (2021)
Experiential learning Prapulla, S. B., et.al, (2023)	Visual notetaking (Alsabban, H., & Farouq, R. (2021) Modeling (Janse van Rensburg, J., & Rauscher, W. ,2021; Afify, H. M. N., et.al ,2021) Real-world exposure (Campo, L. et.al,2023; Putra, P. D. A., Sulaeman, N. F., Supeno, & Wahyuni, S. ,2021)
Collaborative learning (Prapulla, S. B., et.al, (2023)	Critique (Yaman, S., & Koca, D. (2023) Discussions (Afify, H. M. N., et.al (2021) Dialogue-based (Bellaera, L., etal ,2021; Liu, S. H. ,2020; Reciprocal Peer Tutoring (Zulkifli, N., Halim, N., Yahaya, N., Meijden, H., Zaid, N., Rashid, A., & Hashim, S., 2021). Debate (Campo, L. et.al,2023) Cooperative learning (Campo, L. et.al,2023; Akbar, T., & Akhtar, M. ,2021)
Inquiry-based learning	Questioning (Janse van Rensburg, J., & Rauscher, W. ,2021) Doing research (Campo, L. et.al,2023) Project-based learning (Campo, L.,et.al,2023)
Reflective learning	Feedback (Janse van Rensburg, J., & Rauscher, W. ,2021)
Technology-based	Using facebook (Zulkifli, N., et.al ,2021)
Student-centered learning	Flip Classroom (Yulian, R. ,2021)

While teaching strategies involve a meticulous plan of activities aimed at ensuring effective teaching and learning, they are aimed at achieving specific goals or a series of goals (Hasanova, N., et.al ,2021). According to Yasser, W. K. (2019), the teaching strategy is more comprehensive and general, utilizing multiple methods to achieve objectives. In addition, teaching methods are organized, systematic, and well-planned procedures designed to enhance students' learning. They are employed to achieve specific instructional goals and should be presented efficiently and clearly to ensure their effectiveness (Hasanova, N., et.al ,2021). Furthermore, Brecka, P., Valentova, M., and Lancaric, D. (2022) highlighted that the implementation of specific teaching strategies is influenced by personal educators characteristics such as age and gender, and professional characteristics. This includes qualifications, teaching

experience, position, and school characteristics like type, stage of education, and location.

Critical thinking scholars employ various instructional techniques to help students develop these abilities, as summarized in Table 2.6. Table 2.6 outlines the teaching strategies and methods employed by educators in studio-based education, which are believed to enhance students' critical thinking skills. In particular, commonly adopted strategies include experiential learning, problem-based learning, collaborative learning, and inquiry-based learning. Educators have discovered that the listed teaching methods effectively improve students' critical thinking skills.

Many teaching strategies observed in the literatures could foster the critical thinking skills including through the completion of practical training (Rodzalan, S. A., & Saat, M. M. (2018), group work (Dwee et al., 2016; Sulaiman, N.L., 2012; Zaid & Hamizan, 2014), peer evaluation (Daud, N. S. M., et.al (2013), and questioning method (Dwee et al., 2016; Sulaiman, N.L., 2012). Other than that, online learning is also believed to enhance critical thinking skills. The most effective strategies noted to foster the critical thinking skill are via various kinds of online learning, namely "blended learning" including "web-learning" (Haghparast et al., 2014; Salleh et al., 2012; Talib, C. A., Aliyu, H., Ali, M., Abdul Malik, A. M., & Kang, H.-S. ,2018), and online forums (Bazid & Umar, 2014). The table displays that there are a few studies related to factors influencing the acquisition of critical thinking skills.

Problem-based learning is a student-centered approach that has been popularized by the medical field (Sulaiman, N. L. ,2012). Saputro, A. D., Atun, S., Wilujeng, I., Ariyanto, A., and Arifin, S. (2020) stressed that Problem-based Learning (PBL) is more effective than traditional methods in promoting student performance, indicating its potential as a valuable tool in teaching science in the 21st century. Specifically, PBL in learning occurs when students construct their own knowledge by solving authentic problems and reflecting on their own experiences (Zabit, M. N. B. M., et.al ,2018). However, problem-based learning is slightly different from project-based learning, where it entails applying knowledge, whereas project-based learning entails acquiring information (Lavi, R., & Marti, D. ,2023).

Collaborative learning is one of the most effective methods identified in numerous studies that could foster critical thinking skills. It also allows individuals in various settings, including classrooms, companies, and organizations, to contribute diverse perspectives and angles to the collaborative thinking process (Shaheen, R. Z.

,2018). In addition, Zivkovic, S. (2016) highlighted that classroom discussions offer students the opportunity to work in a collaborative and cooperative group setting. In collaborative learning, students conduct tasks in groups or pairs that develop their critical thinking abilities, strengthening their problem-solving, creative, and decision-making skills. It encourages students to collaborate to complete academic tasks, enhances critical thinking, problem-solving, creative thinking, and decision-making skills (Doheim, R. M., & Yusof, N. (2020). At the same time, MQA (2017) stated that collaborative learning involves collaborating ethically and professionally with diverse individuals in learning and working communities, as well as with other groups and networks to achieve shared goals. Alternatively, collaborative learning can also be conducted online, allowing students and educators to connect and promoting a student-centered learning experience (Ismail, N. M., 2023).

Furthermore, experiential learning also has a positive impact on the development of critical thinking in education. Experiential learning was introduced by Kolb, D. A. (1984), who later developed Kolb's "Experiential Learning Model." This model emphasizes individual learning experience theory, which consists of four steps: Experience, Reflection, Conceptualizing, and Experimentation. In particular, experience involves concrete experiences. Meanwhile, reflection consists of observing and reviewing, conceptualizing involves theorizing about experiences, and experimentation involves testing and exploring alternatives. In addition, Kolb's model demonstrates that individuals acquire new knowledge and information through these four stages, demonstrating the significance of individual learning experiences. Among the teaching methods employed under experiential learning are researching, project-based learning, case study, and practices in the real context, which could benefit the development of students' critical thinking skills (Campo, L., Galindo-Dominguez, H., Bezanilla, M. J., Fernandez-Nogueira, D., & Poblete, M. ,2023). Moreover, Abrami, P., Bernard, R., Borokhovski, E., Waddington, D., Wade, C, and Persson, T. (2015) added that mentoring, exposure to real-world situations, and discussion are all effective ways to develop critical thinking abilities and dispositions that have a favorable influence on student accomplishment at all educational levels and across disciplines.

Other than that, the questioning method is also noted by many scholars to foster critical thinking skills (Janse van Rensburg, J., & Rauscher, W. ,2021; Bezanilla, M. J, 2016; Fadhlullah, A., & Ahmad, N. ,2017; Dwee, C. Y.,et.al ,2016). Questioning enables students to express their existing comprehension of a subject, establish

connections with other concepts, and identify their knowledge gaps (Rahman, Z. A. ,2014). It also helps both debate sides identify contradictions and amendments, allowing for a gradual deepening of their understanding (Qian, H. ,2020). Furthermore, the educator's probing questions prompted the students to participate fully in class discussions. They provided honest answers to the questions while also challenging one another's arguments (Rashid, S., & Qaisar, S. ,2016). According to (Yurtsever, B. ,2017), activities that emphasize the value of asking questions will be the first step towards developing critical thinking skills.

There are various student-centered teaching approaches that have been reported to benefit and improve students' ability to think critically. However, this is contradicted by Koreshnikova, J. N., and Froumin, I. D. (2020), who argued that traditional education could enhance critical thinking development if educators possess subject-logical and organizational competence. The instructional strategies were considered conventional when educators were perceived as information providers rather than facilitators (Franklin, E. I., et.al, 2022). Essentially, the conventional method leans towards an exam-oriented teaching method. It focuses on memorizing facts and familiarizing students with exam questions and their conventional solutions, which was observed to hinder the development of positive critical thinking dispositions among the control group. This, in turn, results in a lack of motivation (Darby, N. M., & Rashid, A. M. ,2017). Snyder, L. G., and Snyder, M. J. (2008) also claimed that conventional teaching approaches emphasize memorization over critical thinking and an excessive amount of data over conceptualization. For this reason, teaching and rote learning do not foster critical thinking. Teaching methods should align with field objectives, such as interior education, where educators should focus on methods rather than solutions (Alkhalidi, A. S. ,2015).

### **2.3 Perception of Critical Thinking**

Perception of critical thinking plays a crucial role in shaping how the skill is taught, learned, and assessed in higher education. Investigating the perception of educators and students about critical thinking is essential for understanding how instructors implement it in practice and how students comprehend it (Ismail, N. M., 2023). This is aligned with constructivist research, which aims to focus on participants' perception of the situation and issue being studied. Muhammad, S. (2019) asserted that

educators should receive exposure to a diverse range of knowledge, perceptions, and skills related to the application of critical thinking skills. This exposure is essential to enhance their understanding, perception, and readiness to implement effective teaching concepts that incorporate critical thinking skill practices. The next section will further discuss the previous studies related to both educators' and students' perceptions towards critical thinking in formal higher education.

### **2.3.1 Educator's Perception of Critical Thinking**

Educators play an important role in teaching critical thinking to students. Numerous studies have emphasized the critical role that educators play in encouraging critical thinking skills among students (Khalid, L., Bucheerei, J., & Issah, M.,2021; Kilicaslan, H.,2018). The way information is communicated to students can significantly impact their ability to engage in critical thinking (Fadhlullah, A., & Ahmad, N. ,2017). As such, the effectiveness of the critical thinking acquisition depends critically on their comprehension of critical thinking skills and the instructional techniques applied in the classroom. In a nutshell, educators' main duty is to provide clear knowledge and involve the class in stimulating activities that will profoundly affect their way of thinking (Rodzalan, S. A., & Saat, M. M. (2015). Concurrently, they must possess a thorough understanding of the subject matter and adeptly structure their instructional approaches prior to transferring them to students (Fadhlullah, A., & Ahmad, N. ,2017).

Previous studies shows that educators have limited understanding of critical thinking concept. A study by Lynda, D. Y. (2023) involved 15 educators who were interviewed, and it was observed that most educators demonstrate a solid understanding of what critical thinking is. Nonetheless, they faced various challenges in implementing it into their lesson. While, the study by Yasir, A. H. (2020) employed a quantitative research approach, utilizing a questionnaire to collect the data. Accordingly, the 17 respondents were involved to provide their opinions on critical thinking. Notably, the study revealed that most educators assumed that critical thinking is a mode of thinking that helps students understand the learning process. Despite this, educators did not appear to understand what was required to help students develop critical thinking skills.

Gunawardena, M., & Wilson, K. (2021) argue that educators' perceptions influence the method used to teach critical thinking. The findings of his study describe

that educators perceive critical thinking as 'a product' rather than a developmental process, and that this perception impacts their approaches to teaching critical thinking. To overcome this, his study suggested educators can address this issue by fostering a culture of thinking in the classroom and explicitly scaffolding students' development of critical thinking, making the process more visible for them. Furthermore, a study by Al Kafri, B. (2021) analyzed the perceptions of college educators and students regarding critical thinking, exploring the similarities and differences in these perspectives. The study asserted that college educators view critical thinking as a set of skills, with a high emphasis on reflection, yet less on reasoning. They were positive with regard to seven definitions of critical thinking. However, they were less likely to view it as a single skill. Most educators also disagree with focusing on explicitly teaching critical thinking in specific classes. In addition, a study by Tuzlukova, V., Al Busaidi, S., Burns, S., and Bugon, G. (2018) aims to understand stakeholders in the job market in higher education institutions throughout Oman. The findings suggested that educators perceive the importance of employing critical thinking skills in their teaching, yet they lack support in their implementation.

In summary, educators lack a clear definition of critical thinking. Despite having a better understanding, they struggle to teach students to think critically in the classroom. As the role of educators is vital in fostering students' critical thinking skills, further research is necessary to improve their ability to transfer trained skills to other critical thinking tasks, explain reasoning, and foster attitudes towards teaching critical thinking (Janssen, E.M. et.al, 2019). Therefore, this study will investigate educators' knowledge and perceptions of critical thinking applications in interior design education.

### **2.3.2 Student's Perception of Critical Thinking**

Understanding students' perceptions and lived experiences is essential for assessing the efficacy of educational practices designed to cultivate higher-order thinking skills, particularly critical thinking. The ways in which learners interpret the introduction and application of critical thinking yield significant insights into its effective incorporation into teaching and learning settings. McAdam, J. (2020) asserted that students' perceptions and experiences of critical thinking are valued to support educators in understanding how critical thinking impacts their ability to effect change

or make significant contributions. The review of literature explained earlier shows that there is still lacking on the research.

A study by Bowen, R. S. (2022) examined students' perceptions of critical thinking in organic chemistry education, involving freshmen and returning students. The 14 interview participants were informed of their rights as research participants in the study. The result of the study suggested that students viewed critical thinking as a method that involved applying knowledge. This contrasts with passive learning methods, such as rote memorization, which are derived from prior experiences and are motivated by various intrinsic and extrinsic forces. The study also asserted that students' perceptions of critical thinking align with previous study and scientific practices in 3D learning. This, ultimately, provides clarity on the concept and guides students in defining what they should learn and how to apply their knowledge.

While, a study by Franklin, E. I., et al. (2022) examined students' opinions about what prevents critical thinking from flourishing in the classroom. The participants in this study are students from the internal auditing department at a South African university, and data analysis was conducted using the interpretative phenomenological analysis techniques. The study demonstrated that the educators often lack knowledge in the field of critical thinking. Simultaneously, the students claimed that immediate intervention in the form of educator training and re-curriculation is necessary due to their lack of critical thinking expertise, as well as the educators' apparent lack of critical thinking knowledge. In addition, students' varying perspectives on critical thinking are a result of their varied academic experiences in South Africa.

Furthermore, A study by Aboyan, L. E. (2021) aims to investigate students' perceptions and experiences of critical thinking within an undergraduate business curriculum, exploring whether these aspects are influenced by gender and academic discipline. The study employed utilized focus groups and individual interviews with 22 participants. All participants engaged in focus group discussions, while seven also participated in individual interviews. In essence, three key themes emerged from the collected data: critical thinking is viewed as a process, it is enhanced by an interest in the subject matter, and the use of technology has an impact on critical thinking. Overall, the results suggest that interest in the subject matter plays a more substantial role in influencing critical thinking than academic discipline.

In summary, the evidence indicates that students' comprehension, beliefs, and learning dispositions impact the engagement, development, or limitation of critical

thinking in higher education. Thus, this study aims to examine the student's perception of critical thinking in the context of interior design education. Their perception is considered a crucial feature that can contribute to understanding the real practice of critical thinking skills integration in interior design education.

## **2.4 Integration and Pedagogical Practices**

### **2.4.1 Integration of Critical Thinking in Design Thinking**

Design thinking is sometimes characterized as 'outside the box thinking,' since designers strive to cultivate innovative approaches that diverge from conventional problem-solving techniques, akin to the practices of artists (Savchenko, O. ,2018). Design thinking, originally grounded in architecture and engineering, has expanded to various disciplines where it holds significant importance (Suligoj, V., Zavbi, R., & Avsec, S. ,2020). According to Savchenko, O. (2018) design thinking is a versatile approach suited for a wide range of individuals, including designers, creative employees, freelancers, business leaders, and students. It aims to foster innovation in a powerful and effective manner, making it applicable across all organizational levels and sectors to generate new alternatives for businesses and society. Study by Suligoj, V., Zavbi, R., & Avsec, S. (2020) exposed that the most creative designers tend to be mechanical engineering students, noted for their originality and usefulness in design. Savchenko, O. (2018) asserted that the design thinking approach emphasizes the value of designers and their processes in applying human-centered techniques to creatively and innovatively solve problems across various domains. An invention is recognized as an innovation only when it is integrated into social practices.

Building on this, the integration of both skill sets is involved in generating and evaluating ideas within a foundation of knowledge, and they are connected to students' cognitive abilities, which enable them to engage in thought processes (Hamid, A.,2017). These skills complement each other in shaping the decision-making and problem-solving process (Halpern, D. F.,2003). Therefore, it is crucial to comprehend the distinctions in meaning and the capabilities of both skills. Since these skills are consistently discussed together, it is essential to determine whether they are distinct or overlapping abilities when applied to problem-solving.

### ***2.4.1.1 Relationship Creative and Critical Thinking***

The concepts of "critical" and "creative thinking" are common in design education. According to Montana-Hoyos, C, & Lemaitre, F. (2011) creativity is enhanced by critical thinking, which serves as a key evaluative and decision-making tool in today's complex post-industrial, digital, and sustainability-focused society. Critical and creative thinking is a skill that involves generating and evaluating ideas based on a core of knowledge (Baum-Combs, L., Cennamo, K. S., Newbill, P., & Wagner, T. (2012). Both are complementary, resulting in a balance that leads to a novel and effective solution (Choueiri, L. S., & Mhanna, S. (2013). Deutsch, R. (2020), in his book, highlighted the significance of combining critical and creative thinking in one person, such as an architect, to create sound and unexpected solutions. At the same time, Asefi, M., and Imani, E. (2018) asserted that contemporary architects encounter intricate issues in architectural design and related processes, necessitating critical and creative thinking for effective problem-solving. Furthermore, critical and creative thinking enhance students' decision-making abilities in recognizing design demands and selecting ideal solutions. This makes them crucial dimensions of professional operation in architecture and design education, especially in the field of design. Hence, both are crucial in the learning process (Fatmawati, A., Zubaidah, S., Mahanal, S., & Sutopo, 2019). Achieving good critical thinking abilities requires creative thinking, imaginative approaches, and the ability to think 'out of the box' (Fisher, A., 2011).

A study by Loes, C, et al. (2012) stated that critical and creative thinking have strong relationships. However, this contradicts the study by Khoshhal, Y. and Hosseini, F. (2017), which revealed a minimal positive association between the two dimensions of creativity and critical thinking. As both skills involve different processes, it is imperative to understand the distinctions between them to ensure that it can be employed appropriately. Regarding the term, critical thinking is generally defined as convergent thinking, while creative thinking always refers to divergent thinking.

Convergent thinking is perceived as logical, objective, judicious, and controlled, while the divergent thinking is often characterized as intuitive, subjective, imaginative, and unstructured (Duncan, E. (2012). Nonetheless, divergent thinking stands as the predominant measure employed to evaluate creative thinking (Wechsler, S. M., Saiz, C, Rivas, S. F., Vendramini, C. M. M., Almeida, L. S., Mundim, M. C, & Amanda Franco. (2018). Both aim to equip individuals with the necessary tools for an

effective evaluation process, ensuring compatibility with solutions and approaches developed during the creative process (Abdellatif, W., & ElKhodary, E.,2020).

Critical thinking, as defined by convergent thinking, is a cognitive process of evaluating or judging things or ideas (Faux, B. J.,1992; Paul, R., & Elder, L. ,2004; Abdellatif, W., & ElKhodary, E.,2020). It is more on robust thinking and formal logical way of thinking and reasoning (Loes, C., et.al, 2012; Duncan, E,2012; Wechsler, S.M., et.al, 2018; Asefi, M., & Imani, E.,2018). It is also involved in the process of searching and validating evidence (Asefi, M., & Imani, E.,2018), assessing information and enhancing ideas (Khoshhal, Y., & Hosseini, F., 2017; Asefi, M., & Imani, E.,2018). Additionally, the critical thinking process includes deductive and inductive reasoning as well as analytical thinking skills (Faux, B. J. ,1992). It is used to assess the value or validity of existing ideas (Fatmawati,A., et.al, 2019). Furthermore, critical thinking empowers individuals to identify various subjective interpretations of ostensibly objective data and assess how well each analysis aligns with our needs (Coughlan, A. ,2007). Critical thinking demands robust thinking and reasoning skills, placing less emphasis on abstract reasoning or formal logic. Other than that, when considering the latent variable that arises in creativity dimensions, higher loadings are observed for fluency and originality. In comparison, lower loadings are noted for elaboration and flexibility (Wechsler, S.M., et.al, 2018).

Conversely, creative thinking known as divergent thinking, is a cognitive process that enhances the capacity for creativity in thought, offering a broad spectrum of ideas and possibilities. This enables students to select the most suitable and viable solution (Abdellatif, W., & ElKhodary, E.,2020). This skill is typically employed to assess and enhance creativity (Faux, B. J. ,1992) and involves tasks with heuristic qualities (Loes, C., et.al, 2012). For instance, creative thinking skills is used to contribute to something new on idea generation, deviate from established solutions and consist of novelty in the creative outcome and output (Ibrahim, N. L. N., & Utaberta, N.,2012; Faux, B. J.,1992; Halpern, D. F.,2003; Fatmawati, A., et.al, 2019).

Figure 2.3 illustrates the various terms related to critical thinking and creative thinking skills as defined by different scholars. The diagram summarizes the other terms used by previous scholars to distinguish between the two skills. The terms used represent the characteristics of each thinking skill. Specifically, divergent thinking skills represent creative thinking, which is related to the right brain, while convergent thinking is associated with the left-brain process.

Both are involved in the cognitive process of thinking. In essence, critical and creative thinking are complementary cognitive processes that improve innovative thinking, problem-solving, and successful communication. Both creative and critical thinking are complementary cognitive processes that interact and assist one another in different ways. Hence, both skills are necessary in the design process, and they are always used in conjunction to produce the product. Although both are related, this study focuses solely on critical thinking skills.

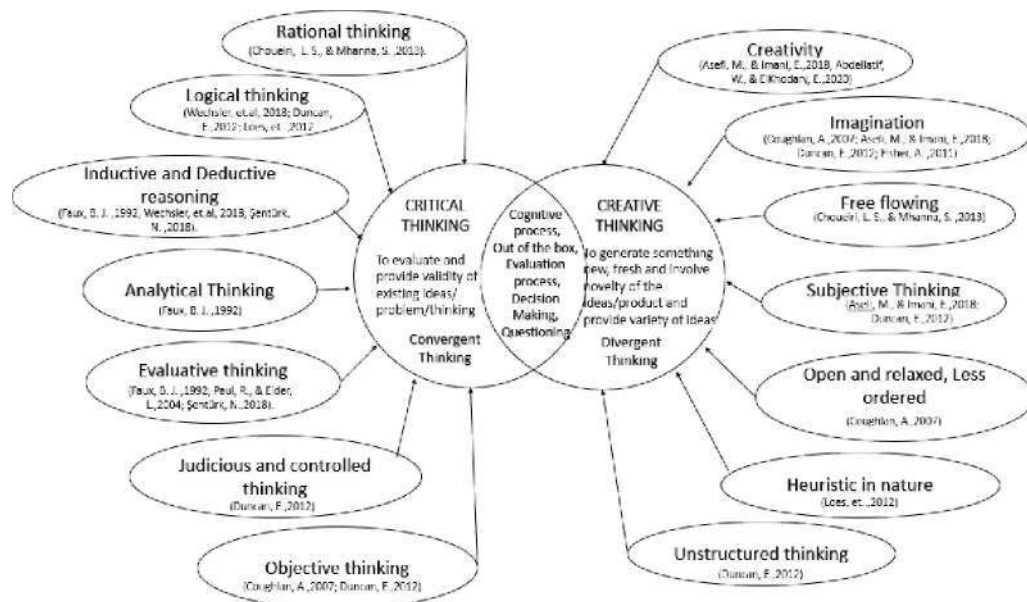


Figure 2.3 Difference Between Critical Thinking and Creative Thinking  
Source: (Researcher, 2025)

#### 2.4.1.2 Critical Thinking in Design Process

The design process is the heart of the design phase in creating a design, product, or innovation. The phrase "design process" refers to a series of actions that, when properly conducted by the designer, produce a totally well-crafted design solution that satisfies the client's requirements. Essentially, large-scale, intricate problem-solving is what interior design entails, but also incorporate humanizing details and aesthetic touches that make spaces both aesthetically pleasing and functional (Dodsworth, S., 2009). Furthermore, design represents a creative journey that involves making decisions aimed at achieving specific objectives. This process necessitates ongoing learning and thinking to identify and address challenges. The knowledge acquired during this journey reshapes our existing "prior" knowledge, resulting in the formation

of new insights. Through this synthesis, it becomes feasible to address problems from various perspectives and enrich the understanding of physical and intellectual relationships by diversifying our perspectives (Ucar, O., & Kandemir, O., 2018).

Table 2.7 illustrates the design process defined by different scholars. It can be concluded that most scholars identify the design process as encompassing the steps from defining the problem, searching for information to generate ideas, to developing the product. Only Soliman, A. M. (2017) highlighted that the design process is equal to the interior design phase. Some scholars used different terms that convey a similar meaning.

Table 2.7  
Design Process Phase

<b>Author</b>	<b>Design process</b>
Deutsch, R. (2020)	Define the design problem Collect information about the project Allow information to digest Come up with a scheme based on the absorbed data <u>Creating a solution or design direction</u>
Askin, G. D. (2019)	Defining a problem Producing solutions Developing the product
Soliman, A. M. (2017)	Pre-design phase Schematic design phase Design development phase Developing construction documents
Dodsworth, S., & Anderson, S. (2015)	Analysis Development Implementation Evaluation
Coles, J. (2015)	The brief and design analysis Information gathering and design concept Design implementation Project management and the building process
Pressman, A. (2012)	Define the problem Collect information Brainstorm and analyze ideas Develop solutions/built and tested a model Present ideas to others for feedback <u>Improve on the design</u>

The design process is a creative process that involves making informed decisions to accomplish certain goals. Within the design process, critical knowledge emerges in tandem with critical thinking and a critical approach during phases such as problem-based research, analysis, evaluation, the generation of innovative solutions, and final product development (Ucar, O., & Kandemir, O., 2018). Although interior design is (or may be) free of the weight of architecture, both as a discipline and in its result, interior design and design share the same procedural sequence and core

disciplinary language (Hildebrandt, H. ,2004). According to a study by Hazim, Z. (2017), discovered that the design process involves analysis, synthesis, and evaluation, which represent the critical thinking skills process.

#### **2.4.2 Pedagogical Approach That Foster Critical Thinking in Architecture and Interior Design Education**

Interior design education is a systematic approach to teaching and learning the principles, theories, and practices involved in designing interior spaces. Interior design education, rooted in architectural pedagogy, shares similar approaches, particularly the studio-based model that emphasizes design projects and critique sessions that enhances experiential learning and the development of competencies. Thus, pedagogical approaches in interior design education are mostly influenced by architectural traditions that emphasize practical learning, design thinking, and the cultivation of creative and technical skills. According to Vaikla-Poldma, T. (2003) as the aim of interior design education is to produce effective design problem solvers, it requires students to develop cognitive and affective skills. This includes critical thinking, understanding design processes, openness to possibilities, and the ability to evaluate and visually express ideas quickly, ultimately leading to the creation of meaningful visual and sensory solutions.

The problem-solving module in interior design education offers a unique perspective that considers aesthetics, practicality, and future living paradigms within diverse socio-cultural contexts. This approach beautifies the space and contributes to the overall aesthetic appeal and functionality of the space (Rahman, S., Aris, N. N., Yaman, R., & Mustapha, A. A., 2022). Nonetheless, the interior design educator faces challenges in teaching interior design. The future of interior design will be influenced by a changing population, social structure, cultural values, economics, technology, and resources. It should continue to be technical, complex, and specialized while maintaining its unique identity through a humanistic approach (Fowles, D. L. ,1991).

Critical thinking in interior design involves evaluating space, function, aesthetics, sustainability, and user needs with a reflective mindset, questioning assumptions, evaluating options, and generating innovative, client-centered solutions. According to Albadi, N. and Zollinger, S. W. (2021), in interior design education, critical thinking is essential as it enables students to successfully analyze, assess, and

synthesize ideas, information, and design concepts. In particular, interior design requires a diverse range of creative, technical, and critical thinking skills, making it an appealing field to students who enjoy various learning modalities. Lee, W., and Nah, K. (2022) stressed that critical thinking in design research can serve as a theoretical foundation for future development of the design process. Similarly, Schoch, M., and Lawanyawatna, S. (2018) stated that critical thinking involves observation, interpretation, analysis, inference, evaluation, explanation, and meta-cognition. It involves identifying design problems, organizing information, prioritizing, constructing arguments, recognizing logical relationships, sketching solutions, testing conclusions, reconstructing beliefs, and making accurate judgments about everyday life qualities. This makes it crucial in the architectural design process.

#### ***2.4.2.1 Studio-based Learning Context***

The word 'studio' is synonymous with architectural education, which includes architecture, interior design, and landscape design education. The modern studio model has been in existence for over a century and is utilized worldwide. It originated from a combination of the German Bauhaus (1919-1933) and the French Ecole de Beaux Arts (1671-1968) (Robinson, L. B. (2013). The center of the curriculum is the design studio, where students use design concepts in real-world projects. Iterative learning, critical feedback, and the synthesis of information from other courses are all made possible in this area. In later years, studios usually transition from simple spatial exercises to intricate institutional and commercial projects (Guerin, D.A, & Martin, C.S. 2010; CIDA, 2022). However, the design studio differs from a standard classroom in terms of pedagogy, socialization, and education (Demirbaş, O. O. ,2001).

The studio is a student-centered educational pedagogy that uses project-based problems for design learning. It involves activities such as input lectures, precedent studies, talks, discussions, desk critique sessions, portfolio reviews, exhibitions, off-studio activities, presentations, and assessments. According to Ahmad, L., Sosa, M., and Musfy, K. (2020), design studio education is a unique approach that combines one-on-one teaching activities between faculty and students, focusing on architecture and interior design, encompassing both the implemented pedagogy and the physical environment. A dedicated studio, also known as a dedicated space, accommodates these activities, including dedicated workspaces for students and Studio Masters. If

necessary, the studio's operating hours might be extended to 24 hours. This methodology cultivates a cooperative educational setting that promotes problem-solving (MAPS,2013).

The design studio technique is commonly associated with the fields of design and interior design education. Both the implemented and recognized as associated with the design studio method are referred to by the term "design studio." The physical space and the applied pedagogy are both referred to as the "design studio" (Ahmad, L., et.al ,2020). The design studio functions as a problem-solving lab with an emphasis on social interaction, negotiation, and spatial design. It promotes creative problem-solving and critical thinking in both aesthetically pleasing and useful ways. Essentially, the studio serves as the center of teaching, fostering innovative thought processes and generating fresh perspectives on the internal environment of the human body. Additionally, it refines research questions that emphasize how crucial the user and their demands are to the process (Vaikla-Poldma, T.,2003). According to Ibrahim, N. L. N. and Utaberta, N. (2012), design studio students display critical thinking by learning prior building kinds and design solutions, which leads to the production of new designs.

The design studio classroom environment should reflect the complexity of interior design practice. Correspondingly, engaging students in philosophical and pragmatic questions about the interior design problem in the face of rapidly changing design methods can help clarify the interior design profession (Vaikla-Poldma, T.,2003). At the same time, the studio setting encourages cooperation, critical thinking, and creativity by allowing students to experiment with various design concepts and approaches while receiving feedback and advice from their educators. It also serves as a forum for students to communicate with their classmates, discuss ideas, and learn from one another's experiences, all of which contribute to a rich and dynamic learning environment.

Furthermore, the interior design program aims to equip students with professional competencies, technical knowledge, and knowledge at various learning levels, typically lasting three to four years, depending on the degree or diploma. Core courses, supplementary theoretical subjects, general studies, and a final capstone project or thesis typically comprise the curriculum. MAPS (2013) stated that the core course of the interior design program is the design studio that focuses on the intellectual and practical skills of interior designers. Simultaneously, the Board mandates that most coursework at all levels of the program be integrated into design studio projects,

demonstrating students' ability to integrate their acquired knowledge into design projects.

#### *2.4.2.2 Critical Thinking in Interior Design Process*

Critical thinking skills can be fostered in the design studio, alongside creative and pragmatic thinking skills in students, by enabling them to master previous building types and design solutions. This leads to the creation of new solutions (Ibrahim, N. L. N., & Utaberta, N. ,2012). Additionally, these skills can be developed through the design process. Deutsch, R. (2020) believed that critical thinking occurs in a design process when it involves conceptualizing, analyzing, synthesizing, and evaluating ideas to create a final product or service. It involves careful consideration, observation, and scrutiny to ensure its effectiveness. According to Ucar, O. and Kandemir, O. (2018), the design process involves critical thinking and attitude during problem-based research, analysis, assessment, and production of creative solutions and end products. Consistent with this, Asefi, M., and Imani, E. (2018) emphasized that critical thinking abilities should be applied by the students at every level of the design process. Accordingly, students should constantly apply critical thinking techniques during education research, drawings, design development, assessment, and conclusion (Khaled, W., & Hamza, A. A. ,2019; Ucar, O., & Kandemir, O. ,2018; Asefi, M., & Imani, E. ,2018; Piotrowski, C. M. ,2011). Note that the design process heavily relies on evaluation techniques and qualities. This indicates that creativity extends beyond imagination. It also depends on critical thinking methodologies and qualities to provide meaningful substance and direction (Duncan, E.,2012). Moreover, critical thinking skills appear to provide a theoretical foundation for the future development of the design process (Lee, W., & Nah, K. ,2022).

Furthermore, to encourage students to use critical thinking effectively, conducting research related to the subject is valuable. This is supported by Loh, W. L. (2020a), who noted that students researched to understand a problem, categorizing it into environment-related, users-related, product-related, and additional information. After identifying the findings, they considered the design implications and constraints for the solutions. After completing each research project, students concluded with a conclusion on the problem and formulated potential design solutions. A study by Landa-Blanco, M. and Cortes-Ramos, A. (2021) reported that students' attitudes towards

research can be enhanced by enhancing research methods courses. It promotes empirical epistemic values and fosters critical openness, despite not affecting their completion rate.

In today's increasingly complex and rapidly evolving design landscape, interior designers must create visually appealing spaces, solve spatial challenges, and address user needs. This skill is crucial for enhancing human experience in interior design. Correspondingly, Piotrowski, C. M. (2011) addressed the fact that students who possess critical thinking abilities are more equipped to address problems analytically, recognize underlying issues, and devise original solutions that meet the demands and objectives of users or clients. These skills are essential to ensure that interior designers are highly sought after for their creative skills, which require critical thinking, problem-solving, and decision-making, as well as their ability to create unique and appealing designs for clients. The study asserted that when a designer responds to customer complaints, critical thinking becomes essential. Notably, the designer can display the best options and reduce the influence of emotional decision-making by investigating and assessing different strategies. As such, critical thinking skills are vital in design education since students often misuse the internet to reinforce their preconceived ideas, rather than seeking alternative perspectives and ideas that challenge their existing beliefs.

Critical thinking is beneficial in the interior design field, as it involves the problem-solving process, enhancing problem-solving and decision-making skills (Deutsch, R. ,2020; Dubriea, V. R., & Punb, K. F. ,2013; Dunlap, D. R, 2011; Vaikla-Poldma, T. ,2003). Meanwhile, Tarasova, I. V. (2018) stressed that critical thinking skills also enable students to effectively manage their creativity and internalize their architectural thinking. Notably, it may influence the critical thinking abilities that it has on raising students' performance.

In conclusion, critical thinking skills are essential for interior design students to develop the ability to think critically in formal education. Moreover, educators support in fostering students' critical thinking skills is crucial, and further research is required to improve their ability to transfer trained skills to other critical thinking tasks, explain reasoning, and foster attitudes towards teaching critical thinking (Janssen, E. M., Mainhard, T., Buisman, R. S., Verkoeijen, P. P., Heijltjes, A. E., van Peppen, L. M., & van Gog, T. ,2019). Note that assessment and evaluation are mechanistic, quantifying outcomes without understanding their meaning or validity. Consistent with this, Ramis,

A. Al. (2018) emphasized that critical thinking is a crucial aspect of the curriculum and should be integrated into the interior design program.

Table 2.8  
NCIDQ Work Process

1. Programming
  - a. Determine specific client needs, goals, and project objectives.
  - b. Check existing site conditions.
  - c. Review existing or in-development floor plans.
  - d. Review the needs for consultants. e. Research and review code issues.
  - e. Evaluate existing furniture, furnishings, and equipment.
  - f. Finalize the project program using graphics and/or written methods.
2. Schematic Design
  - a. Begin initial space planning and furniture planning.
  - b. Develop other conceptual sketches as needed.
  - c. Develop preliminary materials and product specifications.
  - d. Update Programming information as needed.
  - e. Prepare preliminary budgets.
  - f. Ensure proposed design solutions comply with code and regulations.
  - g. Meet with any needed consultants, such as the architect, contractor, and engineers.
  - h. Present preliminary concepts to the client.
3. Design Development
  - a. Refine the space plan and furniture plan.
  - b. Refine materials and product specifications.
  - c. Refine budgets.
  - d. Verify all code issues as related to refined plans.
  - e. Prepare other design documents needed to clarify design concepts, such as lighting plans, elevations, perspectives, and sample boards.
  - f. Provide a presentation of the concept to the client.
4. Contract Documents
  - a. Prepare working drawings and specifications of approved plans and concepts.
  - b. Obtain required permits and/or approvals.
  - c. Consult as needed with architect, contractor, engineer, etc.
  - d. Prepare and distribute bid documents.
  - e. Communicate with project stakeholders.
  - f. Review contractor schedules.
5. Contract Administration
  - a. Issues necessary addenda.
  - b. Collects bids and makes recommendations to the client.
  - c. Provide for client review and acceptance of work in progress.
  - d. Issue purchase orders, invoices, and payments as the client agent.
  - e. Conduct periodic site inspections.
  - f. Review submitted shop drawings and samples.
  - g. Track orders of FF&E.
  - h. Conduct final walkthrough.

Adopted from Noorhani, N. M. A. (2016)

According to Ambrose, G., and Harris, P. (2010), design is a process that transforms a brief into a final product or solution. It comprises seven stages: define, research, ideate, prototype, select, implement, and learn. While the design process involves high creativity, it is controlled and directed to produce a practical solution to

the design problem, meeting or exceeding the briefs aims. It aims to generate multiple possible solutions and uses techniques to encourage creative thinking. The process ensures a design that meets all considerations and exceeds the briefs stated aims.

At the same time, NCIDQ stated the interior design work process as provided in Table 2.8. The table indicates that the phases involved in the interior design scope of work include the programming phase, schematic design, design development, contract documents, and the contract administration phase. Table 2.8 describes the five phases of the design process set in NCIDQ, which include the programming phase, schematic design, design development, contract documents, and contract administration by Noorhani, N. M. A. (2016).

#### *2.4.2.3 Role of Critique in Fostering Critical Thinking*

The critique session is an essential learning strategy to increase students' understanding in the interior design studio. El-latif, M. A., Al-hagla, K. S., and Hasan, A. (2020) described various types of critique methods, including individual critique, peer critique, group critique, interim critique, final critique, panel discussion, and public critique. The study also highlighted that in the analytical understanding phase, individual critique, group critique, and panel discussion are the main types. According to Giirel, M. O. (2010), individual critique sessions, led by each educator and three experts in various areas of the subject matter, were held in the design studio.

Critique is a common practice that manifests in both formal and informal manners, originating from educators, peers, and visiting experts (Kuhn, S., 2001). In interior architecture education, a critique session enhances students' understanding of design processes and fosters a critical culture essential for the discipline and profession (Yaman, S., & Koca, D., 2023). Particularly, it helps students assess their designs, develop critical thinking skills, and modify and refine their projects (Megayanti, T., et.al, 2019).

In addition, the study incorporated several teaching practices employed in the design studio. The first involves exploring the idea of contextual connection; the studio project focused on how the specification of a design challenge affects the idea of a solution. Second, a variety of subject matter specialists were asked to provide lectures on the social, ecological, and technical facets of sustainability. Third, students were instructed to work in groups to investigate various facets of sustainability and then report their findings to the class. Fourth is bringing students to the site visit. Finally, individual desk reviews and group project discussions were conducted.

## **2.5 Barriers and Challenges of Critical Thinking Development**

Despite the recognized significance of critical thinking in education and professional life, the development of critical thinking skills is often obstructed by several significant barriers. 2.29 also summarizes barriers hindering critical thinking skills to be developed due to student's barriers, educators lack understanding and their teaching methodologies knowledge and educational barriers.

### **2.5.1 Educator's Barriers**

Previous sections emphasized the educator-related aspects that contribute to the development of critical thinking. This section summarizes previous studies on the obstacles and problems faced by educators that hinder the cultivation of students' critical thinking skills. Many studies highlighted that most educators are less knowledgeable of critical thinking concept (Bibi, S., & Hanif, S. (2023); Franklin, E. I., Iwu, C. G., & Dubihlela, J. ,2022; Essalih, S., Ourahay, M., & Khzami, S. E. (2022); Khalid, L., Bucheerei, J., & Issah, M. (2021); Ramis, A. Al. (2018). Even though there are some studies highlighted that if even the educators are aware and understand the critical thinking skills and their significance in education, they fail to impart these skills into their teaching instruction in the classroom (Sena, H. U. O., & Etienne, I. K. ,2022; Tuzlukova, V., et.al. ,2018; Dwee, C.Y., 2016; Reynolds, S. W. ,2016). Study by Ismail, N. M. (2023) exposed that educators still rely on traditional teaching methods such as rote learning and memorization. According to Snyder, L. G., & Snyder, M. J. (2008), conventional teaching approaches emphasize excessive factual recall and little conceptual understanding, prioritizing memorization over critical thinking. Consequently, lectures and rote memorization fail to foster critical thinking.

Incorporating critical thinking into subject matter is one method to improve students' critical thinking skills (Bag, H. K., & Giirsoy, E.,2021). However, when educators lack knowledge of the critical thinking concept and pedagogical strategies, they tend to neglect emphasizing it and instead focus solely on the subject matter (Ozelci, S. Y., & Cahskan, G., 2019; Amin, A. M., & Adiansyah, R., 2018; Hamzah, M. I., et.al, 2018; Dwee, C. Y., et.al 2016). Fadhlullah, A., & Ahmad, N. (2017) stressed that educators must possess a profound mastery of the subject matter and carefully organize their instructional practices. The methodology employed in conveying information to students plays a crucial role in influencing their capacity for critical thinking. Similarly, Ab Halim, A. S., Osman, K., Aziz, M. M., Ibrahim, M. F., & Ahmad, A. A. K. ,2021) asserted that effective teaching and learning practices should exhibit high levels of knowledge and positive attitudes by incorporating diverse methods, utilizing questions that target different cognitive levels, and engaging students in thought-provoking activities.

The lack of knowledge about the concept of critical thinking among educators is primarily due to insufficient resources, including the absence of critical thinking training (Akhter, A., et.al. ,2023; Sena, H. U. O., & Etienne, I. K. ,2022; Franklin, E. I., Iwu, C. G., & Dubihlela, J. ,2022). Study by Bibi, S., & Hanif, S. (2023) emphasised that teaching experience, qualification, job status, and training attended on critical thinking are significant predictors of critical thinking knowledge. The critical thinking knowledge of prospective teachers and their students is at risk. Study by Brown, R. (2023; Franklin, E. I., Iwu, C. G., & Dubihlela, J. (2022; Noor, H., & Samsudin, Z. (2016; Sulaiman, N. L. (2012) urged that educators should undergo the training related to critical thinking. Snyder, S. J., Edwards, L. C., & Sanders, A. L. (2019) exposed that proper training and mentoring in seven specific pedagogical practices aimed at enhancing critical thinking skills led to statistically significant improvements in students' critical thinkin abilities after just one semester of instruction.

Table 2.9

Previous Studies on Barriers Hindering the Acquisition of Critical Thinking Skills

<b>Author, year</b>	<b>Student's Barriers</b>	<b>Educator's Barriers</b>	<b>Educational's Barriers</b>
Akhter, A., et.al. (2023)	Lack of cooperation among students Lose the concentration Discipline problem Diverse mental level		Lack of time Large number of students Lack of resources Unavailability of internet Instructional and physical facilities
Ismail, N. M. (2023)	Fixed mindset Focus on grades Linguistic barriers Lack of prior knowledge of critical thinkini Peer pressure	Rote learning and memorization.	Poor critical thinking assessment format
Franklin, E. I., et.al (2022)	- Not interested	- Less knowledgeable.	- Lack of prioritization of critical thinking in educational institutions.
Abasaid, M, & Ferreira, M. (2022)	- Low English language proficiency		
Essalih, S., et.al. (2022)		- Lack of understanding of critical thinking.	
Sena, H. U. O., & Etienne, I. K. (2022)	- Lack of awareness with concept of critical thinking - Poor reading and listening skills	- Inadequate training in critical thinking.	- Large class size
Gunawardena, M, & Wilson, K. (2021)	- Poor motivation - Misconception of learning goals - Lack of preparedness		
Khalid,L., et.al (2021)		- Less preparedness to assess students' critical thinking skills. - Inadequate background knowledge.	- Lack of appropriate resources
Zhong, W., & Cheng, M. (2021)	- English language proficiency	- Lack of knowledge of the criteria for assessing critical thinking in writing practices.	
Amin, A. M, & Adiansyah, R. (2018)	- Lack of interest in reading - Lack self-confidence and bravery		

Ramis, A. Al. (2018)

- Lack of interest

- Educators lack an understanding of critical thinking.

- Lack of critical thinking attention in pedagogical methods.

- Limitations of knowledge of certain topics.

Hamzah, M. I., et.al (2018)

### 2.5.2 Student's Barriers

Student barriers are another obstacle that impedes the development of critical thinking as shown in Table 2.9 Previous studies in Table 2.10 indicated that barriers related to students primarily include a lack of knowledge in critical thinking and personal attitudes, such as low interest and insufficient preparedness, which hinder the development of critical thinking. Sena, H. U. O., and Etienne, I. K. (2022) emphasized that students lack awareness of the concept of critical thinking and have poor reading and listening skills, which they suggested should be developed during the secondary level of education. Due to lack of reading contributes significantly to their limited knowledge (Amin, A. M., & Adiansyah, R. ,2018). Liu, S. H. (2020) added that students who failed to sufficiently read and understand the materials had difficulties in subject analysis, leading to a decline in critical thinking abilities. In addition, some studies also revealed that students have less interest in being involved in the process of critical thinking, which becomes a barrier to the development of this skill. (Franklin, E. I., et.al (2022; Ramis, A. Al. (2018). According to Franklin, E. I., et.al (2022) many learners have a dislike for critical thinking, often due to unfamiliarity with its concepts.

Furthermore, language proficiency among students also become a challenge in developing critical thinking (Ismail, N. M. ,2023; Abasaid, M., & Ferreira, M. ,2022; Zhong, W., & Cheng, M. ,2021). According to Fadhlullah, A., & Ahmad, N. (2017) most individuals struggled to articulate their fundamental understanding of the problem due to language limitations and insufficient knowledge of the topic at hand. Dwee, C. Y., et.al (2016) suggested that educators can equip students with common English phrases used for questioning and responding to general issues. This may help to reduce language anxiety and at the same time, aid students to express their ideas in the target language despite their limited language proficiency.

Additionally, students with diverse mental abilities can make it challenging for educators to transfer knowledge and information equally, affecting student engagement and concentration. According to Gunawardena, M., and Wilson, K. (2021), students' factors, such as low motivation, misconceptions regarding learning goals, and lack of preparedness for higher-order thinking, are significant contributors to their academic struggles.

### 2.5.3 Institutional Support

Another reason why critical thinking is challenging to incorporate into teaching methods by educators is the lack of support from institutions. Review of literature summarizes various barriers contribute to the poor development of critical thinking. One of barriers hinders the development of critical thinking is lack of resources (Akhter, A., et.al., 2023; Khalid, L., et.al ,2021; Almulla, M. ,2018; Indar, D. ,2017). Faculty require resources and administrative support to effectively create interventions that enhance students' critical thinking skills (Goldsmith, R. E. ,2013). Study by Khalid, L., et.al (2021) revealed lack of resources, and the existing materials do not promote critical thinking. His study's participants suggested alternative resource acquisition methods, but the study highlights the necessity for the Ministry of Education (MOE) to intervene and provide appropriate resources that enhance critical thinking. Study by Akhter, A., et.al, , 2023 informed that lack of resources adversely affects educators' strategies, as they require sufficient resources and the flexibility to make decisions regarding planning and teaching methods. Additionally, educators have insufficient domain knowledge regarding the nature of students, largely due to a lack of effective training and seminars designed to enhance student skills. In addition, lack of resources is include the physical facilities provided by institutional. Study by Hamzah, M. I., Zhaffar, N. M., & Razak, K. A. (2018) insufficient access to necessary facilities and a physical classroom environment that does not foster critical thinking activities are highlighted as major issues. Expressed the physical facilities includes classroom, whiteboard, multimedia, models, charts, science laboratory, and library.

Furthermore, large size of class also become a challenges to educators impart critical thinking to students in classroom ( Akhter, A., et.al, , 2023; Sena, H. U. O., & Etienne, I. K. ,2022; Khalid, L., et.al ,2021; Hamzah, M. I., Zhaffar, N. M., & Razak, K. A. ,2018; Ismail, F., Ibrahim, N., & Samat, N. ,2017).Large class sizes hinder student engagement and attention, making it challenging to address individual needs. The congestion in such classes discourages participation, and higher-order thinking skills require more individualized attention. Additionally, diverse mental levels and educational backgrounds complicate comprehension for students (Akhter, A., et.al, 2023). Study by Hamzah, M. I, et.al (2018) reported that educators could not assess each student's critical thinking level due to the high number of students within the lesson's time constraints.

In addition, lack of prioritize or critical thinking in education also hinders the development of this skills (Ismail, N. M. (2023;Franklin, E. I., et.al , 2022; Ahrari, S., et.al. ,2016). Study by Franklin, E. I., et al. (2022) noted that students argued the educational system did not emphasize the integration of critical thinking abilities into learning. Ismail, N. M. (2023) underlined that university education necessitates students to develop knowledge construction and assume responsibility for their viewpoints, but this is contrasting with previous educational experiences when debate and critical thinking were often undervalued.

Finally, literature also highlighted time constraint contribute to the poor attainment of these skills. (Akhter, A., et.al., 2023; Hamzah, M. I, et.al, 2018; Indar, D. ,2017). According to a study by Reynolds, S. W. (2016), educators are often unable to dedicate sufficient time and training to developing critical-thinking activities. These are essential for teaching mandated curriculum and fulfilling additional duties assigned to them, according to the first theme. Study by Hamzah, M. I, et.al (2018) explained that the preparation process has become a barrier for teachers, as they must use their free periods at school to complete tasks such as recording, reporting, fulfilling class teacher responsibilities, serving as head of panel, and attending meetings.

## **2.6 Theoretical Framework**

This study is underpinned by a constructivist theoretical framework that views learning as an active process of knowledge construction shaped by experience, reflection, and social interaction. Biggs' 3P Learning Theory provides a structural lens to examine the alignment between curriculum intentions, instructional processes, and learning outcomes related to critical thinking. Vygotsky's Sociocultural Theory further informs the study by explaining the role of social interaction, scaffolding, and collaborative learning within studio-based design education. Kolb's Experiential Learning Theory and Schon's Reflective Practice Model are employed to explain how critical thinking develops through iterative design processes, experiential learning, and reflective engagement. Finally, Facione,P.A (1990) Critical Thinking Skills framework is adopted to operationalize and evaluate the specific critical thinking skills demonstrated by students. Collectively, these theories provide an integrated framework that guides the analysis and interpretation of how critical thinking is embedded, practiced, and enhanced within an undergraduate interior design program.

### **2.6.1 Constructivism Theory (Jean Piaget ,1896)**

This study is mainly guided by the constructivist learning theory introduced by Jian Piaget(1896). Constructive alignment integrates constructivist learning theory and instructional design to improve teaching approaches and student performance in higher education (Biggs, J. ,1996). Notably, constructivism empowers students by granting them ownership of their learning process, as it is built upon their questions and explorations. It also emphasizes the learner building knowledge through experiences that foster reflective thinking, filtering ideas, establishing meaning, and integrating previous knowledge, and aims to promote critical thinking and knowledge reflection (Treado, C. ,2018).The "constructivist" theory, which examines how individuals actively reshape information when they transition it into new contexts, provides a foundation for constructing educational environments centered on active learning (Ucar, O., & Kandemir, O., 2011). In addition, the constructivist learning theory is crucial in today's global societies, where economic competitiveness, technology, and information advancements drive high educational demand. Specifically, competence level is a key factor in attracting quality workers into the workforce (Yasir, A. H. ,2020). Overall, constructivism seeks to improve knowledge reflection and critical thinking by addressing common goals.

According to John W. Creswell and J. David Creswell (2018), a constructivist researcher, often addresses the processes of interaction among individuals. They also focused on the specific contexts in which people live and work in order to understand the historical and cultural settings of the participants. Building on this, researchers recognize that their own backgrounds shape their interpretation, and they position themselves in the study to acknowledge how their interpretation is influenced by their personal, cultural, and historical experiences. Within the constructivist framework, students are encouraged to actively participate in their learning journey. The educator's role transforms into that of a facilitator, guiding, mediating, prompting, and supporting students in shaping and evaluating their understanding, thereby promoting learning. In a constructivist classroom, both the educator and students view knowledge not as static facts to be memorized, but instead, as a dynamic and constantly evolving perspective on the world. Moreover, it involves the ability to flexibly stretch and explore this viewpoint (Bada, S. O., & Olusegun, S. ,2015).

This study selected this theory since it aligns with the nature of interior design education. Through the interactive use of virtual environments, instructional design should empower students to investigate on their own in student-centered design processes. According to Kurt, S. (2016), constructivist principles in design education focus on creating meaning through action, resulting in unique knowledge creation for everyone. This approach fosters a learning environment that values each student's level of learning and enables the intensive use of digital technology in the design process, resulting in unique characteristics in the final product. In the study, the author highlighted several ways in which the Constructivist Theory is applied to architectural education. This includes: i) realistic practices which exist in the real world, ii) it emphasizes on case studies which offer a great method for resolving design issues, iii) developing multi perspectives and multi context which offer diverse perspectives on a specific argument, iv) design in social context through communication with educators, fellow designers, and other students, v) addressing the challenging issue through the finding alternative for problem solving, vi) reflecting on the process through the writing, drawing and completing pre-made forms, and vii) students' involvement in accountability yields control instead of forcing them to comply.

Ucar, O., and Kandemir, O. (2011) mentioned that through adopting constructivism, the learner generates knowledge through a sequence of experiences that encourage reflective thinking, sifting through ideas, connecting experiences with prior knowledge, and establishing meaning. Therefore, a design studio that offers enhanced learning is necessary for this approach, which can only be developed in a constructivist learning environment. As previously stated, the student should not be immediately provided with the necessary information in this studio setting. Instead, they should be encouraged to learn how to use it and devise a solution to address the design challenge.

Several scholars have employed this theory in their studies. The constructivist strategies were implemented in graphic art education, where educators could transition students from lower-order thinking skills such as memorization, understanding, and application, to higher-order thinking skills such as analysis, evaluation, and creation. Notably, students can enhance the production of personal and professional knowledge using constructivism and reflective practice to take charge of their learning (Treado, C, 2018). A study by Indar, D. (2016) employed the Constructivism Theory in assessing the relationship among vocational education, critical thinking, and constructivism. In the context of vocational education, students apply their critical thinking skills to link

fresh knowledge and experiences with their existing knowledge. Several participants in the study have indicated the view that critical thinking may not be a mandatory requirement for acquiring these competences. Consequently, one could reasonably speculate that the improvement of trainees' critical thinking skills and the cultivation of an entrepreneurial mindset might not reach an optimal level during the Innovative Program (IPRO).

While Patchamuthu, S. (2020) used this theory to examine students' experience in learning and acquiring critical thinking skills during their Engineering Foundation Year. Meanwhile, Lovegreen, V. A. (2019) employed this theory in his study, which aims to examine the educator's perception towards the critical thinking definitions and their necessity for classroom success. As this study examines the students' and educators' perception of critical thinking skills, it will apply the Constructivist Theory. This allows for the development of new conceptualizations and interpretations of critical thinking skills, emerging from their experiences.

The constructivist learning theory serves as a fundamental framework for this study, since it posits that students develop critical thinking abilities through active involvement, reflection, and contextualized learning experiences. Considering that interior design education encompasses intricate problem-solving and iterative design methodologies, a constructivist framework facilitates an exploration of how students and educators collaboratively generate knowledge, make design choices, and engage in critical reflection on their practices. In essence, this idea corresponds with the educational essence of design studios and substantiates the use of qualitative approaches, including interviews and reflective analysis.

### **2.6.2 3P Biggs Learning Model (1987)**

The 3P Learning Model was designed by John Biggs. The main goal of John Biggs' 3P Model of teaching and learning is to improve the quality of instruction in higher education. To encourage students to study deeply and comprehend concepts, this approach concentrates on matching instructional techniques and evaluation methodologies with the desired learning goals. The 3P Model's three primary elements are as follows:

- 1) **Presage:** The component of teaching and learning involves the learning environment, subject matter, and student characteristics. Understanding these elements helps educators tailor lesson plans and assessment methods to meet the needs of their students, fostering successful learning and enhancing the overall learning experience.
- 2) **Process:** The process component focuses on classroom teaching and learning activities, involving student and educator's chosen methodologies like note-taking, active involvement, self-directed study, lectures, discussions, and group activities. It aims to involve students in relevant learning activities fostering critical thinking and in-depth comprehension.
- 3) **Product:** The product component of the teaching and learning process is the outputs or findings, which include the actual learning outcomes and desired learning objectives. Assessment is crucial in providing feedback on the achievement of these goals. To improve student outcomes, the product component also evaluates the effectiveness of instructional techniques and assessment processes and makes necessary improvements.

The 3P Model of teaching and learning aims to enhance the quality of higher education. Similarly, this theory assists in guiding data collection in this study. It helps structure the interviews and case studies by focusing on presage (student/educator factors), process (teaching strategies), and product (learning outcomes). Additionally, this theory sheds light on the difficulties certain students encounters in cultivating critical thinking skills and offers solutions for establishing a supportive learning environment. Moreover, addressing instructional strategies, student involvement, and learning objectives aids in the development of a framework that provides suggestions for enhancing the interior design curriculum.

Figure 2.8 display the model provides an extensive framework explaining the interaction of several components in the learning process. At the *Presage* stage, it facilitated the investigation of underlying elements influencing the instruction and acquisition of critical thinking skills. This encompassed the examination of educators' understanding and attitudes of critical thinking (utilizing Facione,P.A, 1990 Critical inkinggn Skills model), curriculum frameworks, institutional support, and students' previous educational experiences. Correspondingly, data were obtained via educator surveys, interviews, and the review of curriculum manuals.

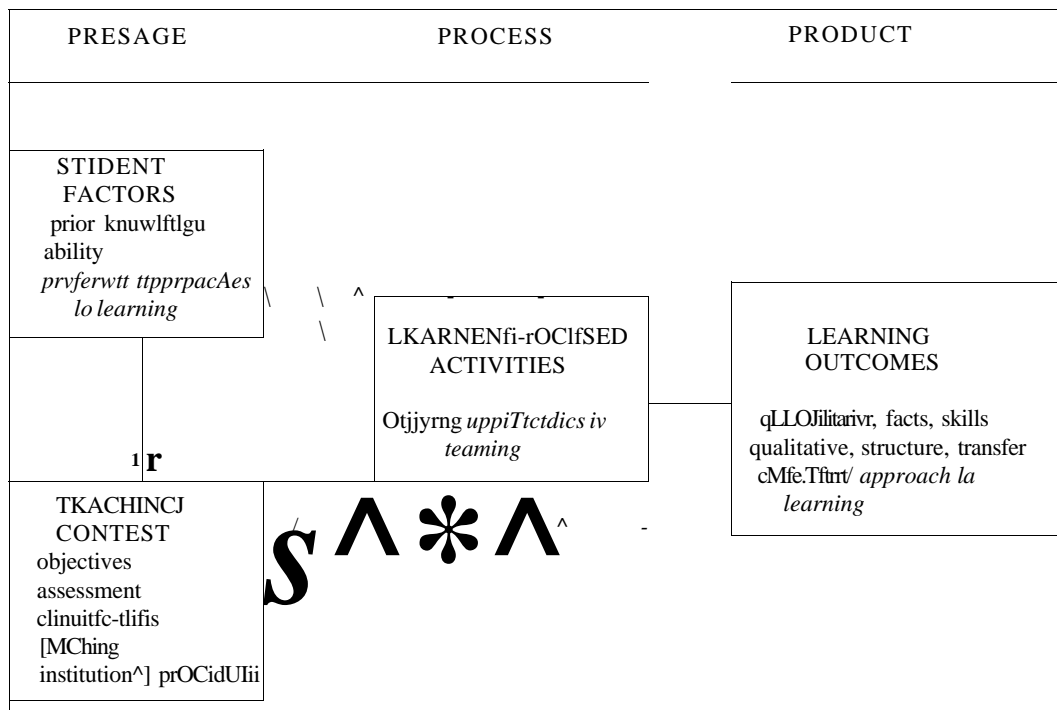


Figure 2.43P Biggs Learning Model

The *Process* part of the model guided my analysis of pedagogical approaches and learning activities employed to cultivate critical thinking. The process dimension facilitated the structuring of classroom observations and interviews with educators and students, emphasizing active learning practices that correspond with Facione's critical thinking skills. Finally, the *Product* stage facilitated the evaluation of learning outcomes, particularly the extent to which students exhibit critical thinking in their design projects, reflections, and justifications. Portfolio analysis, student reflections, and rubrics connected with critical thinking indicators were employed to assess the attainment of the specified learning objectives.

The Biggs' 3P Model organized data collection of this study and directed the interpretation of the findings. Biggs' 3P Model helps map relationships between perceptions, pedagogical implementation, and barriers/outcomes, highlighting the significance of understanding the role of educators and students in critical thinking. The approach facilitated a comprehensive assessment of the strengths and deficiencies in incorporating critical thinking within interior design education by linking key variables (such as educator comprehension) to processes (teaching methodologies) and products (student results). Overall, Biggs' 3P Model offers a coherent and adaptable framework for examining the interplay between educator views, pedagogical approaches, and curricular design in fostering critical thinking among interior design students.

### **2.6.3 Critical Thinking Model (Facione, P.A,1990)**

Critical thinking skills model by Facione, P. A (1990) is the outcome of the expert consensus through the Delphi method. An interactive expert panel was assembled to establish a consensus on the role of critical thinking in educational assessment and instruction. A total of 46 scholars, educators, and key players were involved in this Delphi method, with approximately half affiliated with philosophy departments and the remainder associated with education, social sciences, or physical sciences. The recommendations generated from the deliberations cover the cognitive skill dimension of critical thinking, the dispositional dimension of critical thinking, and specific suggestions regarding critical thinking instruction and assessment. This includes the development of a critical thinking curriculum.

The Delphi method yields six critical skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. The explanation of these skills is presented in Table 2.14 as reported by Facione,P.A (1990). This theory applied in this study to guide in analyzing the data. Note that this theory was selected as aligns with the nature of the interior design program field. It has also been applied in this study as the elements of critical thinking skills in this theory consist of interpretation elements, which have a very close relationship with the nature of the interior design process. This is supported by Sharif, H. R., Abhar, H., and Goudarzi, F. (2014), highlighting that a crucial component of critical thinking is a vital subprocess in the design process and a significant force in forming architectural design solutions, even during the transformation phase from conceptual models to design models.

Several scholars have incorporated this theory into their studies. One of them is used by Qian, H. (2020) to analyze data on perceptions of students and educators regarding the critical thinking skills of students and educators in academic writing among Chinese students. This theory of critical thinking skills has also been applied in a study by ZivkoviL, S. (2016). Furthermore, it was used to develop a model that enhances the critical thinking skills of undergraduate engineering students. In addition, this theory has also been employed by Murguia, S., Occhi, D., Ryan, J., and Verbeek, P. (2011) to assess students' perception of critical thinking skills practices in four programs offered at an English immersion liberal arts university in Japan.

Table 2.10

The Facione, P. A. (1990) Critical Thinking Skills Elements

Critical Thinking Skills	Sub-skills	Description	Example of activity
Interpretation	Categorizing	Comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, and criteria" (APA, 1990,	Summarizing an article in one's own words or identifying the main points in an article.
	Decoding Significance Clarifying meaning		
Analysis	Examining Ideas	"Identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representations intended to express beliefs, judgments, experiences, reasons, information, or opinion" (APA, 1990, p.8).	Identifying similarities and differences between two arguments or finding a way to identify the problem through sketching a graph or drawing a picture.
	Identifying Arguments Analyzing Arguments		
Evaluation	Assessing claim	To evaluate given information is to "assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situations, <u>judgments, beliefs, or opinions</u> " (APA, 1990, p.9).	The ability to determine the credibility of the source of information the author used, or the ability to judge two statements that contradict each other (APA, 1990).
	Assessing arguments		
Inference	Querying Evidence	The ability to "form conjectures and hypotheses, to consider relevant information and to reduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinion, conceptions, questions, or other forms or representations" (APA, 1990, p. 10).	The ability to make a prediction of what will happen in the future from given information (APA, 1990).
	Conjecturing Alternatives Drawing Conclusions		
Explanation	Stating Results	The ability to "give the big picture: both to state and to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one's results were based; and to present one's reasoning in the form of <u>cogent arguments</u> " (APA, 1990, p. 10).	The ability to present an argument using one's own words, seeking the best understanding, or the ability to explain to someone a problem using one's own words to reach the maximum understanding of the problem.
	Justifying procedures Presenting Arguments		
Self-regulation.	Categorizing Decoding Significance Clarifying meaning	Self-regulation means " self-consciously to monitor one's cognitive activities, the elements used in those activities and results deduced, practically by applying skills in analysis, and evaluation to ones' own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's <u>reasoning or one's results</u> " (APA, 1990, p. 10).	The ability to constantly evaluate the opinion to make sure that it does not have any bias (APA, 1990).

Source: Adapted from Facione, P. A. (1990)

This study employs this model as a foundation to investigate how educators and students conceptualize and implement critical thinking abilities in their pedagogical activities. Moreover, this study utilizes interview responses from open-ended questionnaires asking educators to explain or describe their methods of teaching critical thinking. The responses are subsequently analyzed according to Facione's six abilities to assess the depth and precision of their knowledge. Employing Facione, P.A. (1990) paradigm in this study facilitates a systematic and comprehensive examination of how educators conceptualize, interpret, and assess critical thinking. In essence, it connects theoretical clarity with practical assessment, allowing researchers to evaluate educator preparedness, identify misunderstandings, and provide specific treatments for the incorporation of critical thinking in interior design education.

#### **2.6.4 Vygotsky's Sociocultural Theory (1978)**

Vygotsky's Sociocultural Theory (1978) has profoundly impacted constructivist methodologies in education, where learning is perceived as an active and collaborative endeavor. It facilitates the creation of a curriculum that prioritizes social learning and engagement (Shabani, K., 2016). This theory underscores the crucial role of interaction with others in cognitive development. Furthermore, Lev Vygotsky posited that learning is fundamentally a social process, wherein cognitive growth occurs via interactions with more informed others, including parents, educators, and peers. The core of this theory is the notion of the Zone of Proximal Development (ZPD). It refers to the disparity between a learner's independence and their potential achievements with support and motivation (Vygotsky, L. S., 1978). Additionally, Vygotsky believed that social connection is essential for cognitive growth. He posited that learning is fundamentally a social process, wherein knowledge is generated via interactions with others (Alkhudiry, R., 2022). The ZPD concept delineates the disparity between a learner's independent capabilities and their potential accomplishments with support. It underscores the possibility of cognitive advancement through social engagement and scaffolding (Shabani, K., 2016).

In art education, Hariana, K. (2021) analyzed the use of Vygotsky's Sociocultural Theory in constructivist learning contexts. The research emphasized the significance of social contact, cultural instruments, and scaffolding in promoting creativity and critical thinking among art students. Through participation in

collaborative projects and conversations, students internalized complicated concepts and developed higher-order thinking skills, consistent with Vygotsky's focus on the social foundations of cognitive development. Similarly, Wass (2012) examined how scaffolding within the ZPD might augment critical thinking, observing that students gain from guided learning experiences that challenge their existing comprehension and promote deeper analysis. Social interaction encourages students to express their thinking, evaluate differing viewpoints, and enhance their concepts. Accordingly, students are prompted to express their design objectives, question assumptions, and explore alternate viewpoints through discussion and feedback. This approach enhances design abilities while promoting metacognitive awareness and reflective thinking. The iterative studio process, defined by critique, revision, and reflection, strongly corresponds with Vygotsky's concept that learning is a socially mediated phenomenon that enhances higher-order cognitive skills (Wass & Golding, 2014).

Vygotsky's Sociocultural Theory offers a significant theoretical framework for analyzing how social interaction, instructional scaffolding, and language facilitate the development of critical thinking in interior design education. Moreover, it emphasizes the significance of organized yet cooperative learning settings, where students transition from novices to autonomous critical thinkers through facilitated interaction with educators and peers.

### **2.6.5 Reflective Practice Model (Schon ,1983)**

Reflective practice integrates theory and activity, aligning closely with the metacognitive aspects of critical thinking. Schon established the notion of reflection-in-action, enabling students to contemplate and make judgments while engaged in a work, such as design. This framework encourages rigorous review of design choices, questions preconceived notions, and facilitates ongoing enhancement through reflective journaling, design critiques, and portfolio evaluations (Schon,D.A., 1984). This type of reflection necessitates prompt, context-aware cognition, compelling students to engage in innovative responses, reevaluate assumptions, and conduct real-time experimentation. This real-time problem-solving exemplifies critical thinking, necessitating the evaluation of options, synthesis of new knowledge, and justification of conclusions under dynamic settings. Additionally, reflection-on-action, a type of immediate reflection, entails the examination of previous acts, their justifications, and

potential enhancements for the future. This enhances metacognitive awareness, an essential component of critical thinking. As such, interior design education encompasses design diaries and post-project critiques, enabling students to critically analyze their cognitive processes, recognize biases, and investigate alternate viewpoints. These methods cultivate critical thinking and decision-making abilities.

Donald Schon's concept of the reflective practitioner is especially relevant in design education, where "thinking-in-action" and "reflection-on-action" are essential to the iterative design process. In the field of interior design education, Bahho (2008) underscored the need for reflective dialogues between educators and students. By engaging in discussions that analyze design objectives and outcomes, students are encouraged to critically evaluate their work, resulting in more informed design decisions. This method enhances critical thinking and fosters a superior understanding of the design process. Meanwhile, reflective methodologies in studio-based interior design education cultivate critical thinking by encouraging students to assess their design decisions, scrutinize assumptions, and investigate alternative solutions. Through reflection-in-action and reflection-on-action, learners develop deep insight and self-awareness, thereby enhancing their analytical and evaluative skills. This iterative feedback and self-assessment process improve their ability to make informed and logical design judgments (Schon, D.A., 1984). In essence, critical thinking is a competency cultivated via organized, reflective, and socially engaging educational settings. It arises at the meeting point of various frameworks, influenced by the learner's active participation, social environment, and reflective assessment.

### **2.6.6 David Kolb's Theory: Experiential Learning Theory**

Kolb's ELT presents a fundamentally different perspective on the learning process from that of behavioral theories of learning. It is an empirical epistemology or the more implicit theories of learning that underline traditional educational methods, which, for the most part, are based on a rational idealist epistemology. From this different perspective emerge some very different prescriptions for the conduct of education, the proper relationship among learning, work, and other life activities, and the creation of knowledge itself (Kolb, D. A. ,1984). Correspondingly, this theory guided the design of the teaching strategies and activities in the classroom, fostering critical thinking skills among students. In other words, ELT is defined as the process by

which knowledge is generated through the transformation of experiences (Pamungkas, S. F., Widiastuti, I., & Suharno. ,2019). Kolb's ELT model proposes that learning is a continuous cycle consisting of four stages: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). This cycle facilitates the transformation of experience into knowledge, particularly in design-based and studio education settings. Four cycles of Kolb's experiential learning are displayed in Figure 2.4 below.

According to this theory, adult growth occurs through experiential learning. This concept stems from viewing the experiential learning cycle as a dynamic spiral. As a CE is enhanced through reflection, imbued with significance through thoughtful analysis, and enacted upon, the resulting new experience becomes more profound, expansive, and comprehensive. Subsequent cycles of this process extend the exploration and application to different situations. Through this ongoing journey, learning becomes interconnected with existing knowledge, extending to diverse contexts, and fostering elevated levels of adult development (Kolb, D. A., & Kolb, A. Y. ,2013).

Experiential learning is emerging as a comprehensive term encompassing various ideas. It focuses on engaging and creative learning approaches that offer learners opportunities to acquire, encounter, and cultivate new knowledge and skills, whether in online or offline settings (Cohen, L., Manion, L., & Morrison, K. ,2018). It also encourages reflection on personal and others' design practices, fostering new knowledge for critically evaluating the built environment (Mulligan, K., Calder, A., Mulligan, K., Calder, A., & Mulligan, H.,2017). The purpose of ELT is to emphasize individual learning (Shaheen, R. Z.,2018) in enhancing the higher-order thinking and critical thinking skills of learners (Hamilton, J. G., & Klebba, J. M., 2011; Duncan, E., 2012).

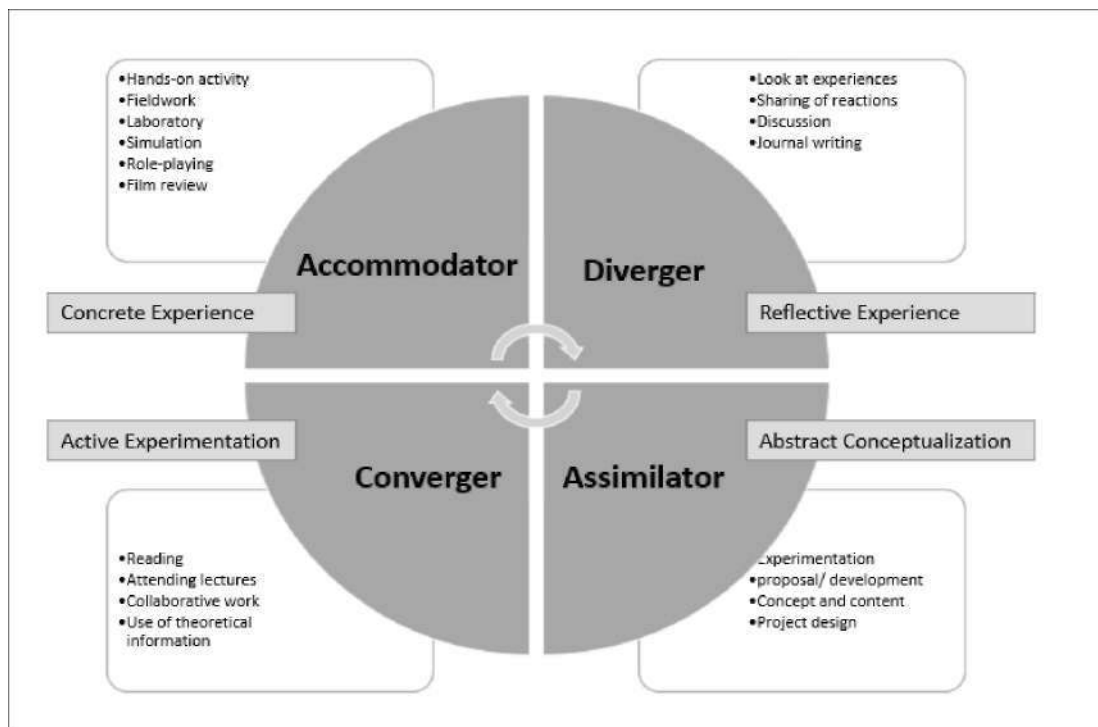


Figure 2.5 Kolb Experiential Learning Theory Learning Style and Classroom Activities

Source: Adapted from Flores, T. L. (2011)

The roles of educators extend beyond formal classroom settings. This framework is applicable to individuals in various aspects of life, including those who act as leaders, coaches, parents, friends, and others (Kolb, D. A., & Kolb, A. Y., 2013). As educators in ELT, their role is to facilitate learners' connections with their personal experiences and encourage reflection. They employ a warm and affirming style to engage learners' interests, foster intrinsic motivation, and promote self-knowledge. This is frequently achieved through guiding conversations in small groups and establishing personal connections with learners (Kolb, D. A., & Kolb, A. Y., 2013). This, ultimately, provides a comprehensive guide to being a successful educator in ELT, as illustrated in Figure 2.4. Accordingly, the researcher described four types of educator roles in education:

i) Facilitator Role:

The role of a facilitator involves educators helping learners connect with their personal experiences and engage in reflection. They employ a warm and affirming style to elicit learners' interests, intrinsic motivation, and self-knowledge.

ii) The Expert Role:

As subject experts, educators help learners structure and connect their reflections to the subject's knowledge base. They employ an authoritative and reflective style, often

teaching through example, modeling, and encouraging critical thinking. This involves systematically organizing and analyzing subject matter knowledge, commonly conveyed through lectures and texts.

iii) The Evaluator Role:

In their role as standard setters and evaluators, educators help learners apply knowledge and skills to meet performance standards. They employ an objective and results-oriented style, establishing the knowledge requirements necessary for high-quality performance. Additionally, they design performance activities that allow learners to assess their own learning.

iv) The Coaching Role:

In the coaching capacity, educators assist learners in applying knowledge to reach their objectives. They embrace a collaborative and encouraging approach, frequently engaging in one-on-one interactions to help individuals learn from their life experiences. Other than that, they contribute to the development of personal growth plans and provide mechanisms for receiving feedback on performance.

Overall, experiential learning takes various forms, including design studio, workshops, practical placements, and the design-build concept (Folic, B., et.al ,2016). Furthermore, experiential learning also involves direct engagement with the actual realities being studied, contrasting with learning methods where the learner only reads, hears, talks, or writes with regard to these realities without direct contact as part of the learning process. Additionally, several shared concepts or crucial elements are associated with experiential learning. These encompass learning from the environment, practical experience, critical thinking, the concept of the hidden curriculum, play and design games, real-life situations, action research, multidisciplinary research, and cultural diversity (Salama, A. M., & Crosbie, M. J.,2010). Figure 2.6 displays the Kolb ELT and its relationship to classroom activities. It describes the classroom activities under categories of AC, AE, CE, and RO.

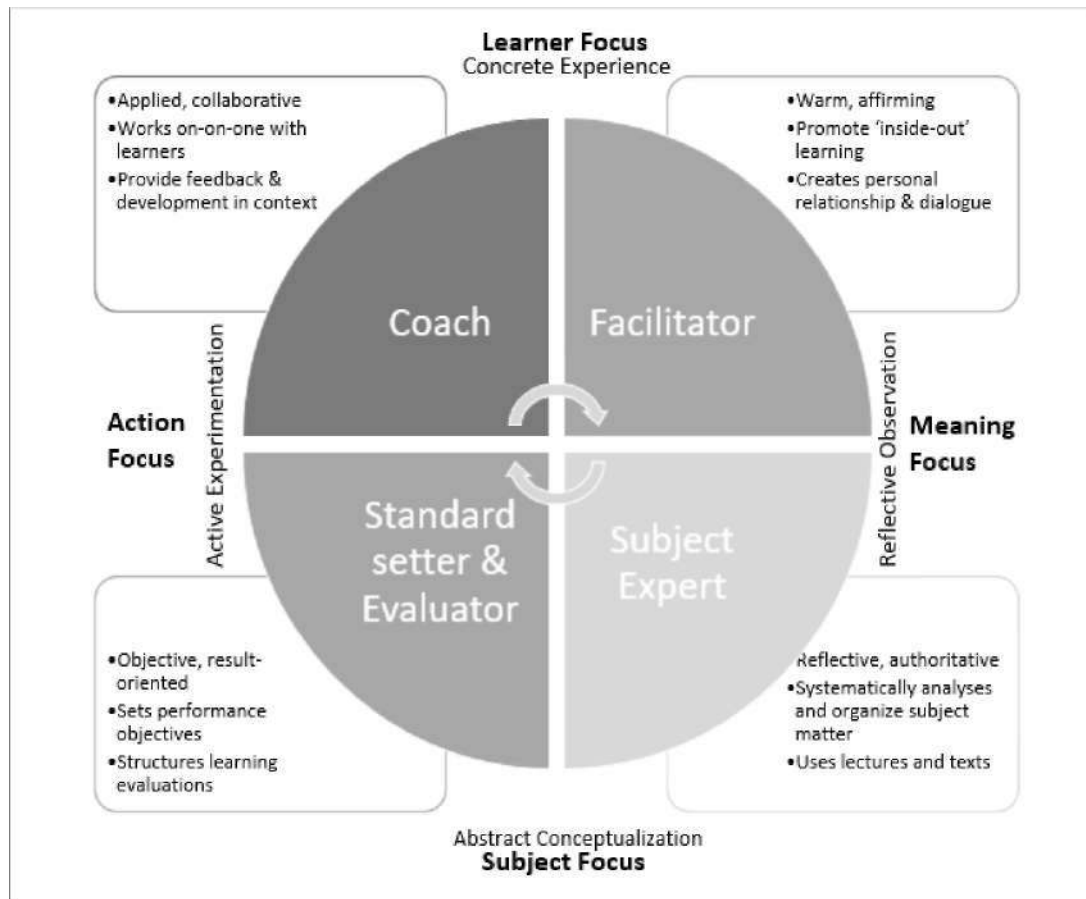


Figure 2.6 Educator Roles and Learning Cycle  
Adapted from: Kolb, D. A., & Kolb, A. Y. (2013)

Experiential learning activities are crafted to align with the principles of student-centered learning and 21st-century learning. The management of 21st-century learning, grounded in experiential learning, aims to facilitate knowledge construction for students and enhance their understanding through practical learning experiences (Pamungkas,et.al. ,2019). The study by Mulligan et al. (2017) proposed that, although not the sole learning method, experiential learning can cultivate a profound understanding and an empathetic approach to inclusive design. Hence, incorporating experiential learning into the curriculum for undergraduate architectural and design students appears advisable. Three steps may be taken, as suggested by Hamilton, J. G., and Klebba, J. M. (2011), to include experiential learning in the design process that promotes critical thinking skills. Moreover, establish the education objectives first, taking into account the necessary levels of subject-matter knowledge and cognitive process skills. Typically, the Bloom Taxonomy is applied (Krathwohl, D. R., 2002). Then, the second step involves the educator choosing approaches that best fit the educational objectives to decide the experience format. The third step covers the

instructional process, which includes the educator's role, metacognitive guidance, and evaluation activities.

This theory has been applied in several studies related to critical thinking skills. One study by Prapulla, S.B. et al. (2022) explored strategies for developing critical thinking and practical problem-solving skills through puzzle solving, problem-based learning, design thinking, picture analysis, and experiential learning. The study aimed to illustrate several methods used to enhance critical thinking skills in engineering education. The teaching technique noted in his study that fall under experiential learning are self-learning, problem-solving, societal concern, real-world problem-solving skills, literary skills, and report/article writing. A study by Dhaliwal, H.S. (2023) also supported this theory. The study examined the impact of design thinking learning on critical thinking skills among undergraduate students in Science, Technology, Engineering, and Math (STEM) fields.

The ELT was also utilized in the study by Do, C. (2021), which aimed to assess the perceptions of students, faculty, and employers regarding the efficacy of general education in imparting broad knowledge and skills for career success. The study employed the convergent mix method using Mezirow's transformative learning theory and Kolb's ELT. The study revealed that students gained numerous skills but had limited broad knowledge from general education. Although faculty recognized the value of general education, they noted that many students did not find it valuable. While employers also valued general education, they did not share the same emphasis on content and skills as universities. The findings are consistent with the theoretical framework. These findings are also aligned with Kolb's (1984) theory, which posits that students who are fully engaged in all four learning cycle phases are able to yield the greatest learning outcomes.

The ELT has also been used by Abdellatif, W., and ElKhodary, E. (2020) to distinguish the Art and Design students at the Faculty of Arts and Design, MSA University. The study involved students enrolled in four majors. The study examined how students' preferred learning styles affect their capacity to acquire knowledge and made recommendations for suitable methods that educators may use to address their requirements. The result reported that art students are predominantly active, while interior and fashion students are primarily designers, with fashion students being primarily activists and interior students being reflective.

Kolb's theory explains how students develop critical thinking skills in interior design education through hands-on learning, experience, and reflection. This study aims to enhance the integration of critical thinking into interior design education by utilizing Kolb's model. Specifically, it guides curriculum design, explains how students develop critical thinking through experiential learning cycles, and supports project-based learning. This ensures that students apply critical thinking to real-world challenges.

Interior design education follows Kolb's cycle, which involves students creating design solutions, receiving critiques and feedback, applying theoretical concepts to inform their decisions, and revising and iterating based on feedback. This process fosters critical thinking skills, such as evaluation and self-regulation. Additionally, Kolb's ELT presents a practical and pedagogically coherent framework for this study, highlighting the significance of learning via active participation, reflection, and the application of theoretical concepts to real situations. Interior design education is fundamentally rooted in an immersive framework characterized by studio-based learning, critiques, and iterative design assignments. This study employs Kolb's four-stage learning cycle to examine how each stage facilitates the development of critical thinking skills, particularly through RO and AC. This paradigm also accommodates reflective diaries and interviews as data sources that elucidate students' and educators' perceptions and engagement in experiential learning.

Interior design education, especially through studio-based instruction, inherently corresponds with this concept. Students acquire knowledge through practical engagement, reflection, conceptualization, and experimentation with innovative design methodologies, paralleling Kolb's cycle. David Kolb's ELT (1984) offers a pertinent and pragmatic framework for examining the integration of critical thinking within interior design education. The design studio model, an essential element of design education, reflects Kolb's learning cycle by providing CEs via hands-on projects, promoting RO during critiques, facilitating AC through theoretical application, and allowing AE throughout iterative design processes. This study employs Kolb's model to examine the role of each step in fostering critical thinking abilities, as outlined in Facione,PA (1990) framework. This alignment offers a systematic approach to evaluating the effectiveness of design education settings in promoting deeper thinking, problem-solving, and reflective practice.

## 2.7 Summary

Existing literature in design and higher education consistently emphasizes the importance of critical thinking; however, these discussions remain fragmented. Prior studies tend to focus on isolated components, such as pedagogical strategies, assessment methods, or student attributes, without explaining how these elements interact systematically within a studio-based interior design program.

Although established educational theories like constructivism, Biggs' 3P model, experiential learning, reflective practice, and Facione's critical thinking framework as explained in Chapter 2.8 provide valuable insights, they largely remain theoretical and generic. These theories fail to blend critical thinking within creative and design thinking learning, and they lack practical guidance for aligning learning outcomes, teaching strategies, and assessments specifically within design studio contexts.

Figure 2.7 summarize the review of literatures explains the elements such as characteristics of students and educators, instructional design and constructive alignment, pedagogical approach in design studio as well as institutional support contribute to the development of critical thinking in interior design program.

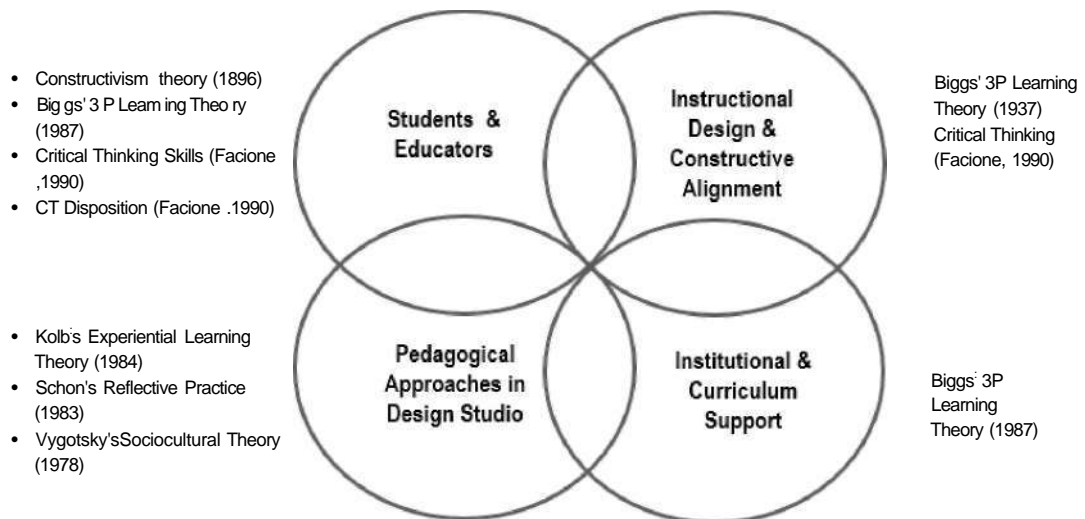


Figure 2.7 Summary of Literature Review

The literature review in chapter 2.5.2 explained the interior design education specifically, critical thinking is often implicitly embedded within design processes and learning outcomes, yet rarely articulated as an explicit, assessable construct. This approach has resulted in inconsistent interpretations and uneven implementation of critical thinking across courses and educators.

Therefore, this study aims to explore the integration of critical thinking in interior design education and to propose a conceptual framework for enhancing these skills. It examines educators' perceptions regarding their integration of critical thinking into teaching pedagogy, as well as the challenges they encounter. Furthermore, document analysis encompassing course details, project briefings, and assessment rubrics has been performed to evaluate the current integration of critical thinking within the interior design curriculum. Finally, students' design portfolios have been reviewed to determine whether they applied critical thinking skills in their project implementations. The methodology for this study will be further explained in the next chapter.

## **CHAPTER3**

### **RESEARCHMETHODOLOGY**

#### **3.1 Introduction**

This chapter will explain the research paradigm, research, methodology, data collection procedure, sampling, data analysis and data validation process of this study. The purpose of this study is to explore how critical thinking is incorporated into interior design education, considering both the experiences of interior design students and the educators' perspective. This including challenges faced by interior design educators and students in applying these skills in interior design programs. Consequently, this study suggested the framework of critical in interior design program.

#### **3.2 Philosophical Paradigm**

This chapter describes the philosophical framework supporting the study and discusses how ontological, epistemological, and methodological assumptions shape the research design. A researcher's worldview is their philosophical stance on the world and the nature of their research. It is influenced by their discipline, research communities, advisers, mentors, and prior experiences, and it shapes how they approach their studies (Creswell, J. W., & Creswell, J. D., 2018). The study employed an interpretivist paradigm as the aim of the study is to investigate the perception, interpretation, and implementation of critical thinking in undergraduate interior design program. Philosophy is a utilisation of abstract concepts and viewpoints to guide the study (Creswell, J. W., 2013). Understanding the nature of qualitative research can be achieved by examining its philosophical foundations.

The research paradigm of interpretivist or constructivism encompasses the ontology, epistemology, axiology, and methodology that guide this study process. Table 3.1 displays the ontological, epistemological, and methodological assumptions of this study.

Table 3.1  
The Philosophical Assumption of Research

Feature	Description	Interpretative- Qualitative Approach (adopted for this study)	How this study addressed it?
Purpose of this study	What is the research about?	Understanding the participants' opinions and experiences	This study aims to explore critical thinking practices by interior design educators.
Ontological Position	What is true to life? How much information is available? What is the social reality that we understand it to be? Differing perspectives or understandings of social reality.	Varying perspectives or understandings of social reality	Reality is subjective and constructed through the experiences and interactions of individuals (educators and students) within the context of interior design education.
Epistemological Position	What is knowledge, and how can I acquire it? How can we know what we know, and what is the theory of knowing capable of telling us? What proof of that reality do we accept as true?	Different viewpoints and data	Knowledge is co-constructed through dialogue and interaction between the researcher and participants. It is context-dependent and emerges from the participants' lived experiences and perceptions.
Methodological Position	Which process needs to be followed to gain knowledge? How might we approach learning the information?	Strategies are adaptable and evolve with the collection of data. The process is inductive by design.	A qualitative approach is employed, utilizing methods such as in-depth interviews, focus groups, and case studies to gather rich, descriptive data.

Sources : Adapted from Creswell, J. W., & Poth, C. N. (2018)

Ontology, within a philosophical framework, examines the nature of social reality, specifically exploring whether these realities are singular or multiple. According to Merriam, S. B., and J. Tisdell, E. (2016), ontology refers to what to believe about the nature of reality. In other words, ontology is concerned with understanding what exists and how things are categorized. In this study, reality is subjective and constructed through the experiences and interactions of individuals (educators and students) within the context of interior design education. The integration of critical thinking is not a fixed phenomenon but varies based on individual and contextual factors.

Epistemology, which expresses an individual's epistemological perspective, is the philosophical basis of researchers' views about the nature of knowledge and how it is created (Yin, R.K., 2011). In a nutshell, epistemology addresses how knowledge is acquired and understood. In this study, knowledge is constructed through dialogue and interaction between the researcher and participants. It is context-dependent and emerges from the participants lived experiences and perceptions. The study aims to

understand the meaning that participants attribute to the integration of critical thinking, emphasizing interpretation over objective measurement.

Axiology requires researchers to openly disclose their values and prejudices as well as the value-laden data they have collected from the field, and to acknowledge the value-laden character of the study (Creswell, J. W., & Poth, C. N., 2018). Moreover, axiology pertains to the role of values in research. In this study, the researcher's values, as well as those of the participants, are acknowledged as integral to the research process. The researcher values the unique insights of educators and students, ensuring their perspectives shape the framework while maintaining transparency about personal biases.

The recent study by Ismail, N. M. (2023) used this study paradigm to investigate how the teaching process at the international university fosters the learning and practice of critical thinking. The study employed a qualitative methodology to investigate how students understood and perceived critical thinking abilities considering their programme-related learning experiences. It also highlights module educators' conceptions of critical thinking, as research indicates that educators' interpretations of the term directly influence their teaching decisions, which in turn affect the development of students' skills.

As this study utilised the interpretivism paradigm, the students' and educators' perceptions and experiences are valuable to answer the research questions. It will employ the multimethod qualitative data collection with a focus on the research's applications in real-world setting.

This study is underpinned by an interpretivist-constructivist research philosophy. Constructivism also known as social constructivism believe that individuals strive to comprehend their environment, creating subjective meanings based on their experiences related to specific objects or entities (Creswell, J. W., & Creswell, J. D., 2018). Interpretivism informs the study's epistemological stance, acknowledging that critical thinking is socially constructed and interpreted differently by educators and students within a specific educational context. This philosophical positioning aligns with the study's qualitative, exploratory case study design and its focus on understanding perceptions, practices, and contextual influences rather than testing predetermined hypotheses. Furthermore, in the interpretivism paradigm, qualitative researchers tend to emphasise and value the interpretive, human aspects of knowledge about the social environment study (Ritchie, J., & Lewis, J., 2005).

Figure 3.1 display Saunders' Research Onion is a conceptual framework that helps researchers systematically design and justify a research methodology. It shows that research decisions should be made in logical layers, from broad philosophical assumptions to specific data collection techniques. As aim of this study is to explore how critical thinking is integrated and demonstrated, the suitable research paradigm is the interpretivism.

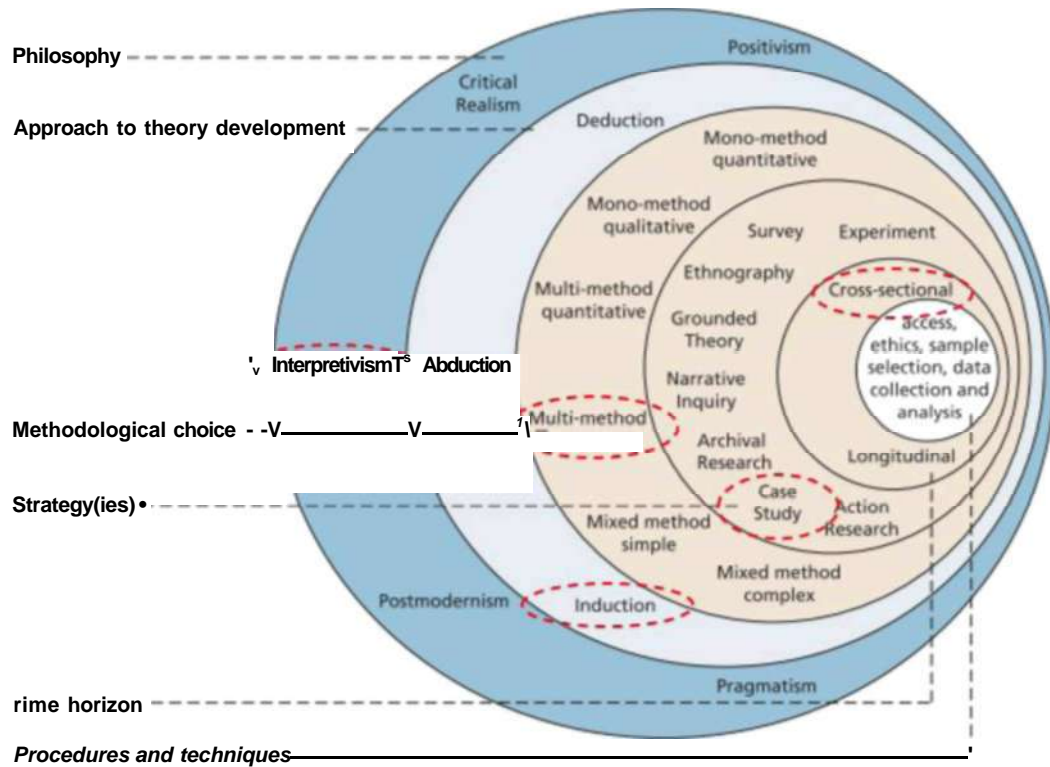


Figure 3.1 Research Onion  
Source: Saunders, M. N., Lewis, P., & Thornhill, A. (2023)

The methodological choice to explore the topic of this study is using multi method qualitative approach as shown in Figure 3.1. The data of this study were collected through semi-structured interview and documents analysis at the selected case study. The research strategy of this study is using the single case study strategy which explore the understanding of educator and students towards the topic and the analysis of related documents in the selected case study.

### **3.3 Research Design**

This study employs a qualitative, interpretivist research design using an exploratory case study technique to examine the integration of critical thinking within the undergraduate interior design curriculum at Universiti Teknologi MARA (UiTM). The case study approach was chosen for its capacity to provide a detailed analysis of a modern educational phenomena within actual setting, especially when the distinctions between the phenomenon and the context are ambiguous (Yin, 2018). Anchored on an interpretivist framework, the research aims to explain the meanings, experiences, and perceptions of interior design instructors and students about the use of critical thinking in pedagogical and evaluative activities. Various sources of qualitative data were used, including semi-structured interviews with educators and final-year students, alongside document analysis of curricular materials and student design portfolios, to facilitate data triangulation and enhance contextual depth. An exploratory approach was considered suitable owing to the paucity of empirical research about the integration of organized critical thinking in interior design education, especially within the Malaysian setting. The results of this case study guided the creation of a contextually relevant conceptual framework designed to improve the incorporation of critical thinking skills in undergraduate interior design curricula.

As this study employed the qualitative exploratory case study, Figure 3.2 present the research process to answer research questions. This study started with an examination of the research topic to identify the research gap and formulate research questions. The research design of the study was established to address the research questions and fulfill the study's objectives. The study methodology was established, including data gathering methods, sampling, instruments, and data analysis procedures. The primary data collection commenced after the acceptance of research ethics. The primary data gathering will be explained detailed in Chapter 3.5, which encompasses multi-method data collecting techniques. The study's instrument is elucidated in Chapter 3.6. The data analysis processes using thematic analysis by Braun, V., & Clarke, V., (2006) and the coding process by Saldana (2016) are detailed in Chapter 3.7. The trustworthy nature of this research was further emphasized in Chapter 3.8.

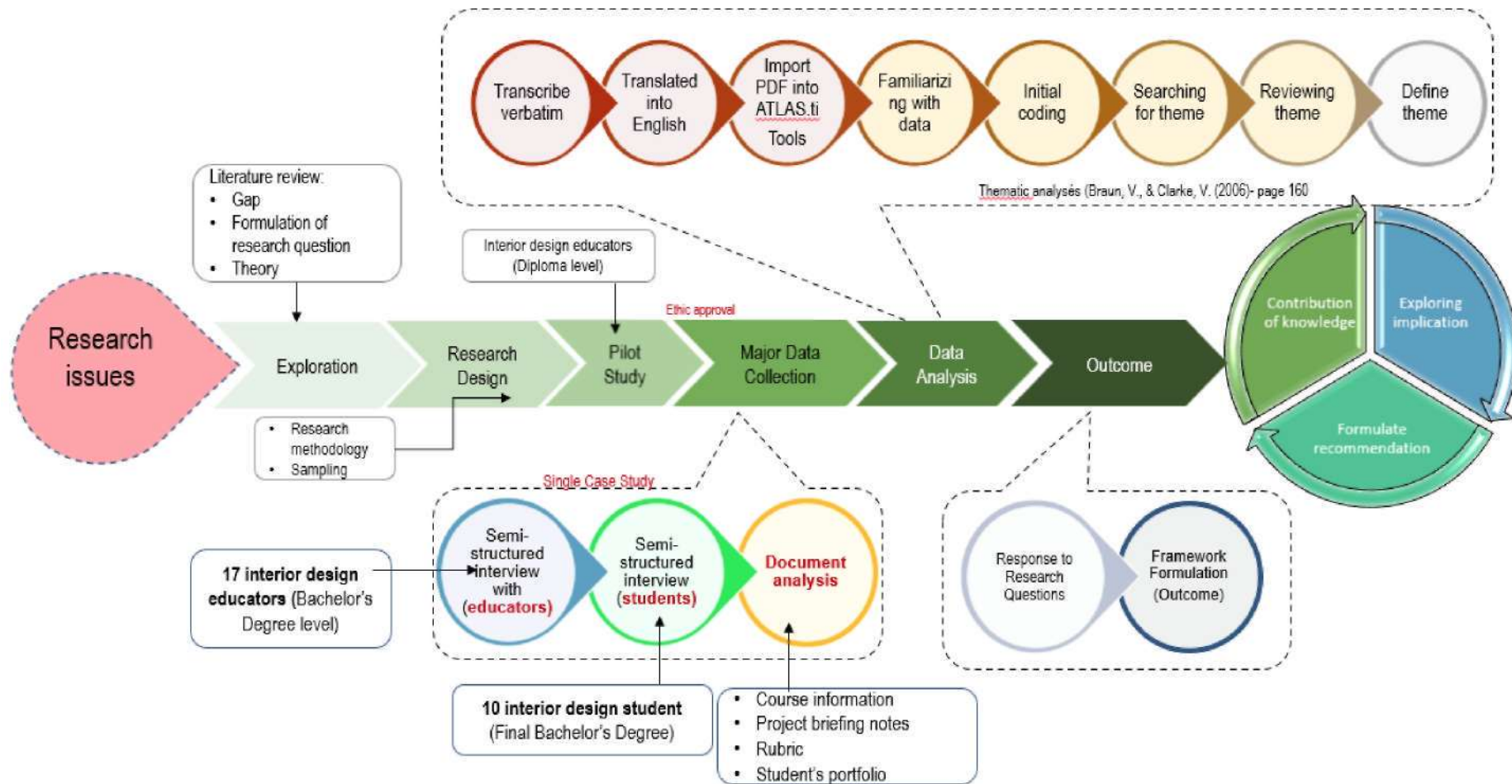


Figure 3.2 Research Plan Process  
 Source: Adapted from Hazim. Z(2017)

### **3.3.1 Exploratory Case Study**

This study adopts an exploratory single case study design to enable an in-depth understanding of how critical thinking is integrated within a specific interior design program, acknowledging the influence of institutional, curricular, and pedagogical contexts. This section provides a rationale for the exploratory case study design, outlines the definition of the case, explains the data collection methods, details the interview protocol, and elaborates on the sampling framework as well as the characteristics of the participants. Case studies are a type of inquiry used in many disciplines, particularly assessment, where the researcher analyses a case, typically a programme, event, activity, process, or one or more people in-depth (Creswell, J.W., 2014). According to Patton, M. Q. (2015), individuals, groups, neighbourhoods, programmes, organisations, cultures, regions, and nation-states are all examples of cases.

This research used an exploratory case study methodology to examine the comprehension, cultivation, and incorporation of critical thinking within an undergraduate interior design curriculum. According to K.Yin, R. (2006) addressed that and any new empirical study is likely to assume the characteristic of an "exploratory" study when the existing knowledge base may be poor, and the available literature will provide no conceptual framework or hypotheses of note. In addition, Elman, C, Gerring, J., & Mahoney, J., 2020; Leavy, P., 2017) stated that exploratory research is employed when the issue has never been studied previously, providing a preliminary analysis.

The use of an exploratory case study approach is suitable for this study, since it aims to investigate the understanding, cultivation, and limitations of critical thinking exploration within a particular educational setting specifically, an undergraduate interior design program. This is supported by K.Yin, R. (2006) claims that the exploratory case study looks at issues that don't have a lot of thorough prior investigation. Since there is a dearth of study on critical thinking in interior design in Malaysia, this kind of method fits with the investigation. The foundation of the exploratory case study methodology is Yin's contention that this design allows researchers to investigate a wide range of topics utilizing many evidence sources, which may strengthen the conclusions (Yin, 1989). Furthermore, the case study was also used

in this study because most of the research questions in this study are based on 'how' and 'why' questions. According to Yin, R. K. (2018), a case study is employed when three conditions are met, the first is the primary research questions are "how" or "why" inquiries; second is the researcher has little to no influence over behavioural occurrences; and third is the study's focus is on a contemporary phenomenon rather than one that is solely historical.

The case study method provides an in-depth understanding of the integration of critical thinking in interior design education by focusing on a specific environment and its associated challenges. This strategy facilitates the development of a theoretical framework that is empirically testable in broader contexts. The exploratory form of this study facilitates the identification of themes, trends, and challenges that may be analyzed in future research. As this study adopts a single exploratory case study design within one undergraduate interior design program at UiTM, the findings are context-specific and are not intended to be statistically generalizable to all interior design programs or higher education institutions. Instead, this study aims to provide analytical or theoretical insights that may be transferable to similar contexts (Yin, 2018; Stake, 1995)

### **3.3.2 Study Site and Case Selection**

The Bachelor's Degree of Interior Architecture at Universiti Teknologi MARA (UiTM) was selected as a case study due to it is the oldest interior design programme offered by a public university in Malaysia since 1975 (Fakulti Alam Bina, 2025; Ismail, M. A.,2025). UiTM was purposefully chosen, aligned with the aim of RMK-12, to utilize MARA institutions in achieving future-ready skills, including critical thinking. This research aims to explain the conceptualization, integration, and experience of critical thinking in the practical context of design education, therefore it guiding the creation of a contextually relevant framework applicable to similar educational environments. Universiti Teknologi MARA (UiTM) is the largest comprehensive university in Malaysia, offering innovative education supported by advanced infrastructure and technology across its 34 campuses, 24 faculties, 9 academic centres, and 2 institutes of leadership and development (Universiti Teknologi MARA , 2025).

Moreover, the advantage of the researcher as one of the faculty members of this site setting give the privilege to assess this setting. This is supported by Yin, R.K.

(2014), there is another justification for choosing just one case when the researcher has access to a current scenario that was previously unreachable for empirical investigation. This setting also allows researcher to get easy access, establishes rapport with informants, and collects data directly related to the research interests (Taylor, S. J., Bogdan, R., & DeVault, M. ,2016).

The Bachelor's Degree of Interior Architecture is one of the programs recognised by the Board of Architects Malaysia (LAM) alongside Universiti Malaysia Kelantan (UMK) and Universiti Sains Malaysia (USM), as noted on the LAM (2020) website. Additionally, UiTM produces the highest number of graduates from the interior design department annually, and many educators at private universities in Malaysia are UiTM alumni. Most of educators in the department of Interior Design at UiTM Puncak Alam have a minimum of five years of teaching experience in the interior design programme.

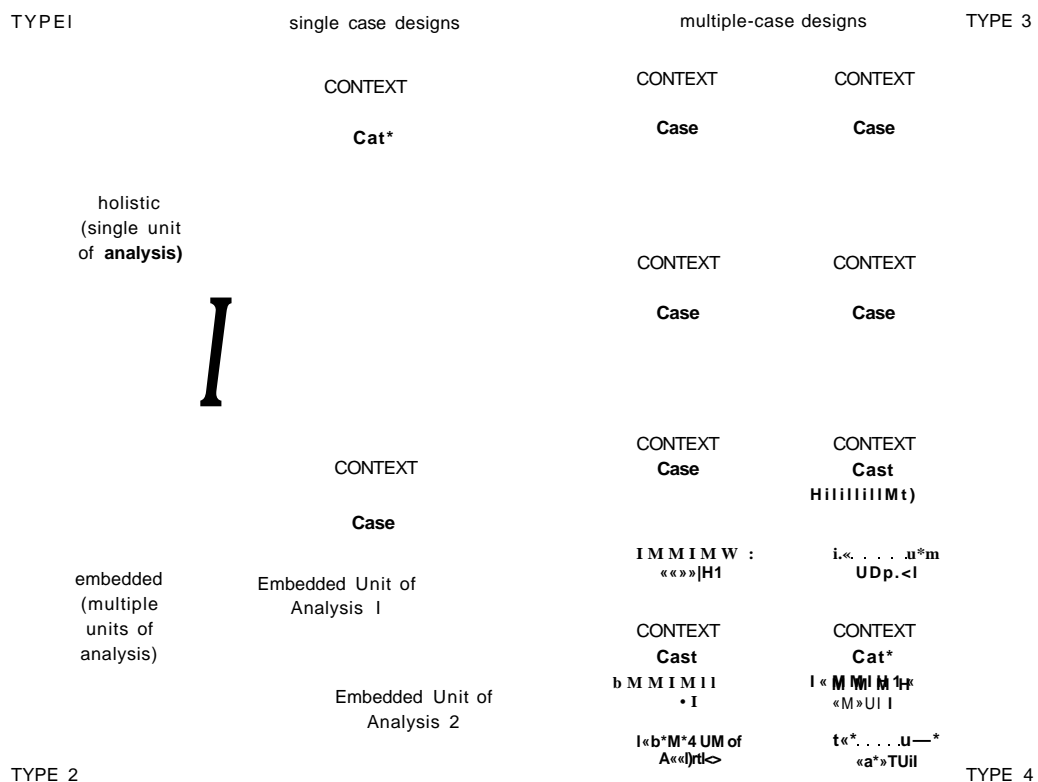


Figure 3.3 Case Study Design  
Sources : Adopted from K.Yin, R. (2018).

This study employed the embedded multiple units of analysis in a single case study, as illustrated in Figure 3.3, which is type 2. The unit of analysis of this study is

the involved individual (students and educators) and the programme documents. This method is supported by Denzin and Lincoln (2018), who asserted that a case can involve a variety of things, including people, groups, events, choices, acts, or places, such as neighbourhoods or countries, or even mixtures of these.

### **3.4 Research Participants**

The participants of this study encompassed interior design educators and final-semester interior design students. These two groups were selected as they represent key stakeholders directly involved in the teaching, learning, and application of critical thinking within the interior design program. The characteristics, roles, and selection criteria of both participant groups are explained in more detail in the following section.

The criteria for purposeful sampling directly influence the study's purpose and aid in identifying information-rich cases (Merriam, S. B., 2014). These criteria are important to ensure that the data collected can address the research questions comprehensively. The rationale behind choosing these academicians as participants was to gain a deeper comprehension of their approach to teaching critical thinking skills in the interior design classroom.

Participants were chosen using a purposive sample technique to guarantee that all individuals fulfilled the predetermined criteria.. According to Cohen, L., et al. (2018), purposive sampling is commonly used in qualitative research, as it focuses on selecting participants who can provide the most relevant insights to enhance understanding and facilitate discovery. This study specifically uses criterion sampling, which is effective when all participants have directly experienced the phenomenon under investigation (Creswell, J. W., & Poth, C.N., 2018; Cohen, L., et al., 2018).

In term of number of participants, Cohen, L., et al. (2018) stated that there are no strict rules regarding sample size in qualitative research. Baker, S. E., and Edwards, R. (2012) suggested that a sample size of around 30 participants can be sufficient, while Saldana, J. (2011) recommended a minimum of 10 to 20 participants to ensure reliable and credible results. He further noted that data collection should continue until no new information emerges, indicating data saturation. For this study, the sample size was limited to 17 educators and 13 students' participants who met the criteria and were willing to participate in the study.

### 3.4.1 Educators' Participant

Educators' participation in this research was restricted to educators who are actively teaching Interior Architecture in Interior Architecture at UiTM with at least five years of experience. There are a total of 25 educators in the Interior Architecture department at UiTM, however only 17 meet the sample requirements and have consented to participate in this research. The sample criterion of educator's participants are as follows:

- i) an interior design educator who is still active, teaching Interior Design Studio at the bachelor's degree level of the Interior Design programme
- ii) have experience in teaching the interior design programmes for more than five years
- iii) a full-time educator at the interior design department, UiTM Puncak Alam willingness to participate in the study

A total of 17 interior design educators who are volunteered to participate in this study consisted of seven males and nine females. In order to provide more reliable and believable results in the interview method, ten to twenty participants are required at a minimum for qualitative research (Saldana, J., 2011). All those participants contacted via WhatsApp were granted permission before the next step was taken. Once they agree to participate in the study, each participant receives a letter outlining the study's purpose and a brief explanation. Following that, individual appointments were made with each participant to conduct interviews. Table 3.2 display a list of educator's participants who participated in this study. The educators' interview sessions were conducted through two methods: face-to-face and online.

All participants in this study are Malay. Hence, all selected educators are Malay and speak Bahasa Melayu as their mother tongue. Therefore, the interview session was held in Malay and then translated into English during the data analysis stage. The data from participants also included their prior teaching experience for the semester from March to August 2023.

A pilot study was conducted to test the clarity and wording of interview questions to ensure they are easily understood by participants and can elicit rich, meaningful responses related to critical thinking. The pilot study involved one-on-one interviews with five interior educators at Diploma Level at UiTM Perak Kampus Serf

Iskandar. Despite the collection of data during the pilot project, the pilot data were excluded from the final data analysis. The major objective of the pilot research was methodological improvement rather than empirical addition to the study's conclusions. Pilot study aim to evaluate the duration of interviews to provide enhanced planning for the main data collection phase.

Table 3.2  
List of Educators Participants

<b>Bil</b>	<b>Code</b>	<b>Teaching Experiences (years)</b>	<b>Industry Experiences (years)</b>	<b>Areas of Expertise (years)</b>
1	IDL 01	33	13	Interior design, Architecture, Graphic Design
2	IDL 02	28	32	Interior design, Islamic Architecture
3	IDL 03	27	5	Interior design
4	IDL 04	23	15	Interior design
5	IDL 05	22	20	Interior design
6	IDL 06	19	10	Architecture, Project Management
7	IDL 07	18	3	Interior design, Construction Management, Architecture
8	IDL 08	17	6	Interior design, Construction Management
9	IDL 09	17	2	Interior design, Design, Architecture
10	IDL 10	16	8	Interior design, Facilities Management, Architecture
11	IDL 11	16	2	Interior design
12	IDL 12	15	3	Interior design, Architecture, Design
13	IDL 13	5	10	Interior design
14	IDL 14	8	2	Architecture
15	IDL 15	9	6	Interior design, Design
16	IDL 16	5	3.5	Interior design
17	IDL 17	15	6	Interior design, Construction Management, Art & Design

Subsequent to the pilot study, slight adjustments were included in the interview process, including the enhancement of phrasing and probing techniques. The departure of the final interview guide from the pilot version renders the use of pilot data in the primary analysis a threat to methodological consistency and credibility. Consequently, pilot data were omitted to uphold the study's rigor (Yin, 2018).

### 3.4.2 Students' Participants

Students' participation in this study was restricted to students from final semester of Bachelor's Degree of Interior Architecture at UiTM Puncak Alam. They were selected because of their maturity of thinking. Samples of students who are in this study are mainly those who are just finished their studies in the semester from March to August 2023. They are selected since they have gone through the full cohort of the same syllabus from the early semester. This is supported by Soliman, A. M. (2017) that the problem-seeking phase is challenging to execute at lower educational levels due to its need for critical thinking skills.

Moreover, students were selected based on a convenience purposive sampling method. There were 13 students volunteered to participate in this study, comprising five males and seven females. The participants are personally contacted to obtain their consent and permission to participate in the study. All those students volunteered to participate in this study. Since this study does not examine the relationship between Grade Point Average (GPA) and critical thinking skills, students were selected regardless of their grade in the interior design course.

Table 3.3  
List of Students' Participants.

<b>Bil</b>	<b>List of students</b>	<b>Gender</b>
<b>1</b>	<b>IDS 01</b>	Female
<b>2</b>	<b>IDS 02</b>	Female
<b>3</b>	<b>IDS 03</b>	Female
<b>4</b>	<b>IDS 04</b>	Female
<b>5</b>	<b>IDS 05</b>	Female
<b>6</b>	<b>IDS 06</b>	Females
<b>7</b>	<b>IDS 07</b>	Female
<b>8</b>	<b>IDS 08</b>	Female
<b>9</b>	<b>IDS 09</b>	Male
<b>10</b>	<b>IDS 10</b>	Male
<b>11</b>	<b>IDS 11</b>	Male
<b>12</b>	<b>IDS 12</b>	Male
<b>13</b>	<b>IDS 13</b>	Male

Furthermore, students who volunteered to participate in the study were invited into a WhatsApp group for easier communication. At first, the researcher planned to use the focus group method. However, communication with students via WhatsApp

revealed no interest in that method. Conversely, when researchers were consulted about the semi-structured interview method, they expressed strong approval. Once the method was determined, the researcher contacted the students to schedule an interview session at their convenience.

All participants were interviewed online using the Google Meet platform. Although 13 students were interviewed, only 10 data points were used for analysis due to technical issues during the interview sessions, such as poor audio quality and network connectivity issues. Table 3.3 demonstrates the students who participated in this study. Notably, their average age is twenty-one years old. The students' perception and understanding of critical thinking skills were examined, as well as their experience with educators integrating these skills into teaching instructions. Their insight is valuable for evaluating the effectiveness of the current teaching approach used to encourage critical thinking skills in the interior design classroom. This is aligned with McAdam J.'s (2020) suggestion, where it would be beneficial to do qualitative research incorporating the views and experiences of students, examining their interpretations of critical thinking and its implications.

### **3.5 Pilot Study**

The objective of the pilot research was to evaluate and enhance the interview process before the primary data collection. According to Cohen, L., Manion, L., & Morrison, K. (2018), a pilot study is deemed essential for developing and refining categories to ensure they are comprehensive and distinct. K. Yin, R. (2006) asserted that a preliminary case study is designed to establish, test, or refine the intended research topics and methodologies for the subsequent formal case study; data from the pilot case study must not be utilized in the full case study.

In this study context, the pilot study was undertaken to discover some of the problems in advance related to semi-structured interview questions. Specifically, the aim of this pilot is to make sure all questions were clear, relevant, and reliable with the research goals and questions about the use of critical thinking in interior design education. As for the context of this study, the number of actual participants is limited; there, the pilot study was carried out with three interior design educators who are teaching at the diploma level at UiTM Perak and willing to participate in the study. The purpose of the pilot study in this study is:

- i) to ensure clarity and good timing, length, and threats that possibly arise during the actual session
- ii) to enable the researcher to evaluate the clarity of terminology
- iii) to ensure that participants interpreted the questions as intended.
- iv) to assess the feasibility and flow of the interview process
- v) to ensure the interview schedule and provide training to the interviewer

Their feedback from pilot participants improves the overall structure of the interview guide, and they will be precluded from the final data collection. After the pilot study was done, the researcher adjusted the content, words, and length of the actual set of interview protocols. Most importantly, the pilot study was not intended to generate data for analysis but rather to enhance the credibility, dependability, and rigor of the main study by strengthening the data collection instrument and procedure.

### **3.6 Data Collection Procedures**

This study is employed the qualitative multi-method data collection procedures. According to (Creswell, J. W., & Poth, C. N., 2018) qualitative researchers collect various data sources like interviews, observations, and documents, rather than relying on one source, and then review and organize the data into categories or themes that span across all sources. The constructivist paradigm served as a framework for reconstructing the essential components of critical thinking and for interpreting their answers.

The data collection procedures were carried out after obtaining approval from the UiTM Research Ethics Committee with reference no REC/08/2022 (PG/MR/180) (Appendix A). Since this study employs a single case study, the data were collected holistically to answer the research questions. A multimethod qualitative of data collection was applied in this study. According to Yin, R. K. (2014), triangulation, a method of using at least three different viewpoints in a study, enhances its credibility and trustworthiness. Data was gathered through the triangulation method as shown in Figure 3.4. The data were gathered through semi-structured interviews with interior design educators and students, and a content analysis of selected documents to identify the current practices of critical thinking skills in interior design education.

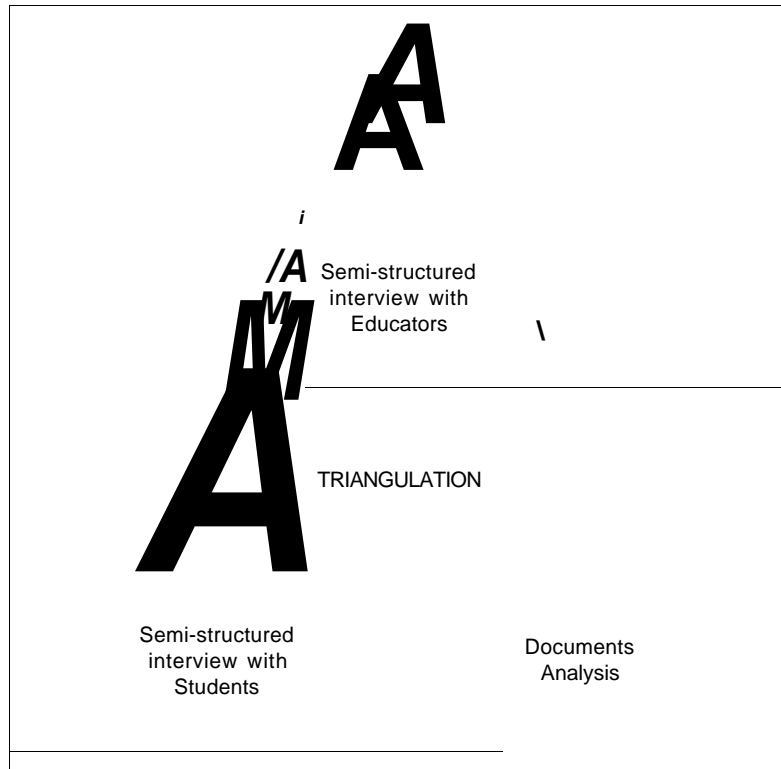


Figure 3.4 Multiple Sources of Data Collection

### 3.6.1 Semi-structured Interviews

This study utilized the interview method in collecting primary data. The interview examined the understanding and experiences of interior design educators and students regarding the integration of critical thinking skills in current teaching instructions. In qualitative research projects, interviews are the most popular method of data collection. This may be because they allow us to directly ask study participants about their viewpoints (Saldana, J., 2011). The research questions on the educators' and students' sides were gathered through the semi-structured interview method. When people's behaviour, emotions, or perceptions of their environment are not directly observable, interviews must be conducted. Similarly, when the aim is to learn more about historical events that are not repeatable, interviews are also necessary (Merriam, S.B., & Tisdell, E. J., 2015).

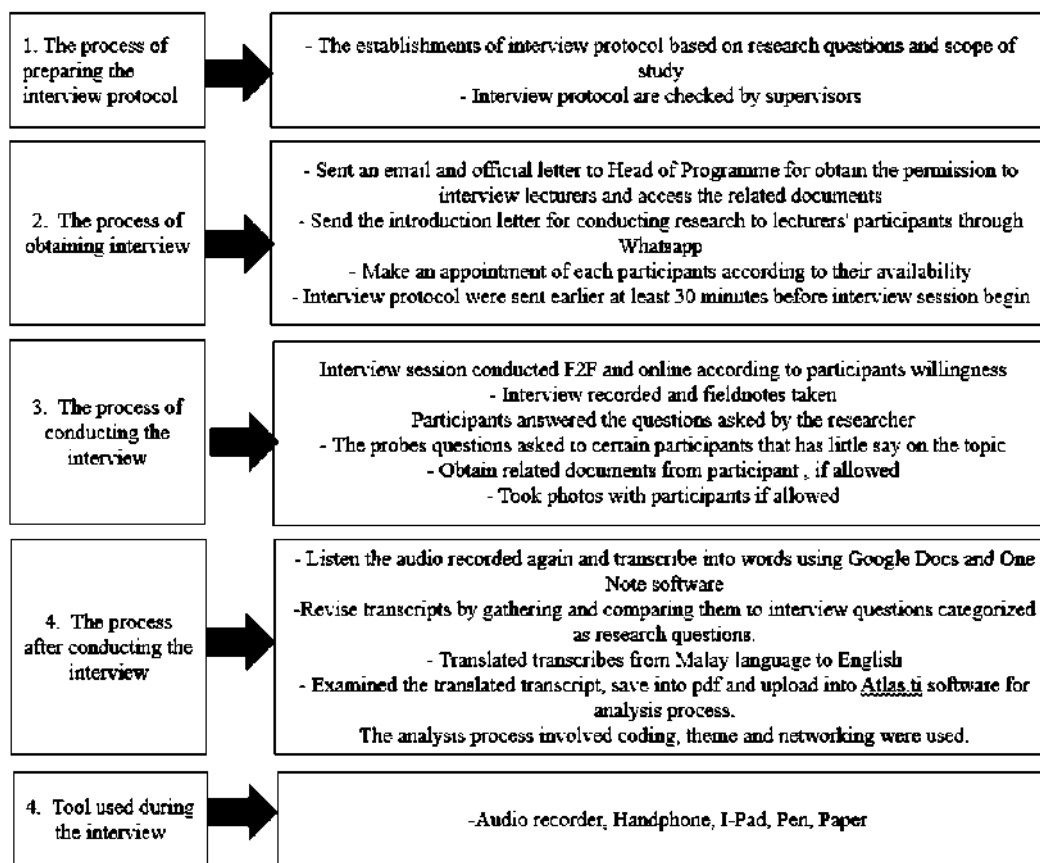


Figure 3.5 Interview Data Collection Process

Individual interviews offer the chance to delve deeply into people's viewpoints, comprehend the human context in which the study phenomena are situated, and explore a wide range of topics in detail (Ritchie, J., & Lewis, J., 2005). Figure 3.5 presents the process of collecting data through a semi-structured interview. The process involves preparing an interview protocol, obtaining permission, and scheduling interviews. Interviews are conducted face-to-face or online, recorded, and documented. Notably, transcripts were revised, translated, and analysed using ATLAS.ti software. Additionally, tools like audio recorders, iPads, and notes aid data collection. The analysis includes coding, themes, and networking for insights.

There are three types of interview questionnaires. First are structured questions, second are semi-structured questions, and third are unstructured questions. This study utilised the semi-structured interview protocol to gain more information on participants' experiences. Semi-structured interviews are used for data collection to gather insights from key informants with personal experiences, attitudes, perceptions, and beliefs related to the topic of interest (DeJonckheere, M., & Vaughn, L. M., 2019). Through

the use of semi-structured interviews, the researcher was able to provide participants the freedom to talk about relevant topics (Indar, D., 2016).

Furthermore, there are four types of interviews as described by Darusalam, G., and Hussin, S. (2021) in their book, which are intensive interviews, tandem interviews, re-interviews, and focus group interviews. The details of different types of interviews were explained in Table 3.4. This study employed the tandem interview method, using the same interview protocol for all participants.

Table 3.4  
Types of Interviews Method

<b>Types of interviews</b>	<b>Description</b>
Intensive interview	Asking the same interview question of the same informant many times at various intervals to verify the accuracy of their response.
Tandem interview	Two or more different informants were asked the same interview questions to obtain replies that were identical or nearly identical.
Re- interview	The study involves conducting multiple interviews with the same or different informants at different intervals to gather more information.
Focus Group Interview	Group or focus group interviews involve a researcher gathering a small group of more than three informants to answer all research questions.

Source: Adapted from Darusalam, G., & Hussin, S. (2021)

Some of the interview sessions with educators were held using the Google Meet platform due to the educators ' availability and logistical issues. The researcher is no longer limited by geography when selecting subjects, which is one of the obvious advantages (Merriam & Tisdell, 2015). Those educators who were interviewed through the Google Meet platform agreed with the method as they were more than happy to help the researcher gain the required data. Some of the educators were willing to be interviewed even at night through the online platform.

Ten out of seventeen educators were interviewed through an online platform, while the rest were interviewed face-to-face at their offices. Notably, it is important to choose a peaceful location that gives participants some privacy when speaking, and makes them feel safe and at ease (Saldana, J., 2011). Moreover, Indar, D. (2016), in their study, claims that the use of semi-structured interviews allowed participants to discuss pertinent issues. There are many studies investigating critical thinking skills in programs that employ this method. The studies are demonstrated in the table below.

### 3.6.2 Documents Analysis

This section outlines the findings derived from the examination of undergraduate interior design course documents at the Interior Architecture Department, UiTM Puncak Alam. The examination concentrated on the incorporation and evaluation of critical thinking elements as evidenced in learning outcomes, pedagogical strategies, and assessment methods.

A qualitative study consists of various data collection methods, including interviews, document analysis, and observation. Qualitative researchers normally combine those methods in collecting the data. However, certain studies might not engage individuals. Instead, they might concentrate on document analysis, artefact analysis, and other material items created by humans (Saldana, J., 2011). Content analysis is a method used in qualitative studies to analyze documents (Merriam, S. B., 2009). On the other hand, documents are written and visual materials that have been recorded without the need for a researcher's intervention (Bowen, G. A., 2009). A document encompasses various types of written, visual, digital, and physical materials relevant to a study, including visual images (Meriam & Tisdell, 2015). Conversely, Merriam, S. B. (2009) highlighted that qualitative data analysis is a content analysis that focuses on the content of interviews, field notes, and documents. Content analysis is a process that involves reading and making judgments about the information presented (Cohen, L., et al., 2018). Document analysis is an iterative process that involves skimming, reading, and interpretation, combining content and thematic analysis to organize information into categories related to the research's central questions (Bowen, G. A., 2009).

This study involved several documents, including project briefs, syllabi (which encompass course information), and rubrics. The objective is to examine how critical thinking is integrated into the interior design program, specifically addressing Research Question three. The analysis of the document data was guided by the critical thinking model outlined in the Critical Thinking Skills (Facione, P. A., 1990). The data underwent systematic thematic analysis, which involved a coding process before identifying themes and subthemes. Data was analysed using ATLAS.ti software (version 23). The documents included in the content analysis are listed in Table 3.5.

Table 3.5  
The list of documents analysed

Nos.	Program code	Semester	ID.
1	INA 521 Course Information	4	CI5214
2	INA 611 Course Information	5	CI6115
3	INA 621 Course Information	6	CI6216
4	INA 631 Course Information	8	CI6318
5	INA 521 Project Brief	4	PB5214
6	INA 611 Project Brief	5	PB6115
7	INA 621& 631 Project Brief	6	PB6216&PB6318
8	INA 631 Rubrics	8	RB6318
9	INA 621-631 Students Works's Sample	8	WSA_8

Table 3.5 presents the documents selected for analysis to address the research questions of this study. These documents include course information documents, project briefing notes, students' design portfolios, and assessment rubrics. The analysis aims to examine the presence and nature of critical thinking elements embedded within these materials, specifically how critical thinking is articulated, operationalized, and evidenced across curriculum design, instructional tasks, and assessment practices within the interior design program.

According to Bowen, G. A. (2009), the document has several purposes. To begin with, documents offer context and historical insight to research participants, helping researchers understand the historical roots of issues and the conditions affecting current phenomena. They can be used to contextualize data collected during interviews. Subsequently, research topics and possibilities for observation are guided by the insightful information identified in documents. Moreover, documents serve as supplemental data and important contributions to a knowledge base, providing insightful and useful research data. Furthermore, documents enable researchers to track change and development by comparing accessible drafts of a document to identify changes. Notably, it is possible to analyze documents to confirm results or validate data from other sources.

The rationale for using document analysis is to improve the validity of data collected from different sources to answer the research questions. Examining information from several sources helps the researcher minimise biases in a single study and validate findings (Ismail, N. M., 2023). Content or documents analysis is a systematic method used to analyse large quantities of written material, including

documents, interview transcripts, media products, and personal interviews, facilitated by computer-assisted analysis, which is often used for large-scale text analysis (Cohen, L., et al., 2018). During the conduct of a case study, numerous relevant documents will be gathered (K.Yin, R., 2018). The main justifications for document analysis include the importance of documents in case study research, their significance in methodological and data triangulation, and their effectiveness as a stand-alone technique for specific types of qualitative research (Bowen, G. A., 2009).

This study employed content analysis through coding and formulated themes from interview transcripts. Interviews are recorded and converted into written transcripts or digitally downloaded software programmes for data documentation and analysis (Saldana, J., 2011). According to Cohen, L., et al. (2018), content analysis is a systematic method used to analyse large quantities of written material, including documents, interview transcripts, media products, and personal interviews, facilitated by computer-assisted analysis, which is often used for large-scale text analysis. In addition to conducting semi-structured interviews with educators and students, this study also analysed related documents to examine the existence of elements of critical thinking in current teaching and learning practices of the interior design studio programme. Furthermore, the document analysis was carried out through the course information, project brief notes, and student portfolios. The study examines how these abilities are now integrated into the teaching and learning process. Table 3.11 below illustrates the list of documents involved in this study. The table presents four types of documents analysed in this study to explore the integration of critical thinking into the syllabus and instructional design

The project brief serves as a guideline for students, outlining essential project details, objectives, and requirements. It includes instructions, project goals, scope of work, scheduling, planning, and assessment criteria. Rubrics are a tool for educators to establish design goals and direct their decisions toward the desired types of design practice (Koh, J. H. L., et al., 2015). Additionally, the student work document features sample presentation boards that showcase interior design projects completed by students. The results from the content analysis of relevant documents reveal the presence of critical thinking within the interior design program. The findings identified two primary themes: the existence of critical thinking elements in instructional design and its reflection in students' design portfolios, as illustrated in Figure 4.27. Furthermore,

Table 4.8 provides a detailed overview of the themes, sub-themes, codes, and examples of evidence.

### **3.7 Research Instruments**

Qualitative researchers consider various data gathering tools, including artefacts, documents, voice and video recordings, field notes, participant observation, journal notes, interviews, diaries, and so on (Cohen, L., et al., 2018). This study employed a multimethod of qualitative data collection. The data collected through the semi-structured interview and document analysis. Moreover, the instruments of this study are the interview protocol, audio recording, and students' reflective journals. The interview protocol was used to conduct the interview session. It was designed based on research questions. Hence, next section will describe the research instruments further.

#### **3.7.1 Interview Protocol**

In qualitative research, an interview protocol is a formal strategy or guide used by researchers to conduct interviews with participants. It offers a framework for the conversation and lists the subjects or questions that will be discussed throughout the interview. An interview protocol is a document that a qualitative researcher uses to write down and capture data from interviews (Creswell, J. W., & J., 2018). Typically, the interview protocol includes only a select few issues that are thought to be pertinent to that interview (K.Yin, R., 2011). The interview protocol for this study was designed differently for educators and students and consisted of seven to eight open-ended questions. This is aligned with the suggestions by Creswell, J. W., and J. (2018), who indicated that a rough estimate of the overall number of questions is five to ten.

However, a specific figure cannot be provided. As suggested by Creswell, J. W., and J. (2018), the interview protocol designed for this study included basic information such as the time and date of the interview, the name of the interviewee, and the place of the interview. The opening questions, content questions. During the interview session, the researcher also used probes with some interviewees who had little to say. In the last part of the interview, the researcher also added the closing instruction at the end of the interview session.

Furthermore, the researcher prepared a list of questions in advance of the interview session to ensure the interview went more smoothly. This is known as an

interview protocol according to some methodologies (Saldana, J., 2011). This procedure follows the framework by Castillo-Montoya, M. (2016), which consists of four steps in designing the interview protocol. Firstly, it is crucial to ensure that the interview questions align with the research topics. Secondly, an inquiry-based dialogue should be created. Following this, input on the interview questions should be obtained, and lastly, the interview protocol should be piloted. The researcher conducted the pilot study with the other group of participants. Altogether, there are three versions of pilot questions created in this study. The third version of the interview protocol was used to collect the final data from the participants. In addition to giving information about the interview procedure, the interview protocol permits notetaking throughout the interview, which helps researchers organise thoughts on headings, starting and finishing ideas, terminating, and thanking the respondent (Creswell, J. W., & Poth, C. N., 2002). Additionally, the interview protocol designed for this study was based on the research questions.

### 3.7.1.1 Educator's Interview Protocol

The interview protocol for educators in this study used a less structured open-ended questionnaire. According to Merriam, S. B., and Tisdell, E. J. (2015), less structured forms assume that each respondent has their own definition of the world. For this reason, open-ended questions should be asked more. The semi-structured interview is a less regimented option.

Table 3.6

Interview Protocol for Educators' Participants.

No	Objective	Interview Protocol
1	RO 1: To describe educators' perceptions of critical thinking and its integration in undergraduate interior design program.	How do you define the term critical thinking skills? How are the critical thinking skills in the context of the interior design programme? In your opinion, are critical thinking skills important in an interior design programme? What are the examples of teaching methods that you used to encourage students to use critical thinking skills in interior design projects?
2	RO 3: To investigate the way critical thinking is fostered into an undergraduate's interior design program..	As an educators in an interior design studio, especially, how do you encourage students to think critically?
3	RO : To distinguish challenges that hinder the successful implementation of critical thinking integration into undergraduate interior design programs.	Have you encountered any challenges in encouraging critical thinking skills in your teaching?

The question to the educators consisted of eight questions, designed based on the research questions. This includes the educator's knowledge and understanding of critical thinking skills and their definitions. Followed by the questions on their perception towards the critical thinking skills in the interior design program context, and their importance. The subsequent question is crucial to be asked, such as "How do they encourage critical thinking skills in the interior design classroom?". The final significant question is the challenges and barriers they are facing in encouraging students to think critically. Furthermore, the interview protocol has been written in two pages with double spacing so that the researcher can take brief notes during the interview session. Table 3.6 displays the interview protocol designed based on the research objective.

### 3.7.1.2 Student's Interview Protocol

The interview protocol for the students consisted of seven open-ended questions. The questions are formulated based on the objectives of the research. The interview session with the student's respondents was conducted in Bahasa Melayu, as all participants are Malays and Bahasa Melayu is their mother tongue

Table 3.7  
Interview Protocol for Students' Participants

No	Objective	Interview Protocol
1	RO 2: To comprehend students' perceptions of critical thinking and its integration in undergraduate interior design program..	Do you think critical thinking is important in an interior design programme? If so, why? What's your point of view on solving problems in the interior design project, primarily, but not using critical thinking? Can you add this sentence? For me, critical thinking is
2	RO 3: To investigate the way critical thinking is fostered into an undergraduate's interior design program.	Through your experience from semesters 04 to 08, what teaching methods did your lecturers use to encourage you to think critically within the studio interior design in particular? Did you use critical thinking in solving project interior design problems? How did you do it?
3	RO 4: To distinguish challenges that hinder the successful implementation of critical thinking integration into undergraduate interior design programs.	Are the obstacles you face in thinking critically in solving the interior design problem?  Did you use critical thinking in solving project interior design problems? How did you do it?
4	RO 5: To formulate a framework of critical thinking in the undergraduate interior design program.	Is the suggestion you think can help you think critically in the interior design class?

. This approach was conducted to make it easier for respondents to share their views more easily and in greater detail. The interview protocol has also been written in double spacing on two pages to allow the researcher to take notes during the interview session. Table 3.7 depicts the interview protocol questions for the students that aligned with the objectives of the research.

### **3.7.2 Audio Recording**

Audio recording is the main instrument of this study. The primary goal of audio recording is to record information for reporting and data analysis (Given, L. M., 2008). When it comes to interviews, audio recordings are undoubtedly a more accurate representation than handwritten notes (Yin, R.K., 2018). However, researchers still took handwritten notes of materials during the interview session. Concurrently with the advice by Creswell, J. W., and Poth, C. N. (2018) to take notes during interviews even if they are recorded, just in case the recording device breaks down. Yin, R. K. (2018) emphasised that one should never take a recording without consent. In the researcher's case, all participants do not mind the interview being recorded. According to Tracy, S. J. (2019), effective audio recordings must include voices that can be heard and recording equipment that is operating correctly.

Currently, due to technological advancements, there are plenty of software and gadgets that can be used for audio recording purposes. In this study, all audio recordings were made using the readily available software on the iPad and supported by a Sony recorder. Regarding the audio-recorded file taken during the interview, Bogdan, R. C, and Biklen, S. K. (1997) mentioned that some participants may request an audio recording to ensure that the information discussed is not revealed at their expense.

In this study, no participants requested an audio recording after the interview session. Nevertheless, most participants requested that the researcher not record any sensitive issues during the interview session. Voice recording is effective for qualitative data collection in one-person interviews, while digital video recording simplifies small group interviews or focus groups, especially with child and adolescent participants (Saldana, J., 2011).

### 3.7.3 Written and Visual Documents

Qualitative research always employs documents as a primary source of data. In program research, documents often contained unpublished material, making them less accessible than reports of empirical studies in professional journals (Cohen, L., et al., 2018). Documents normally encompass a wide range of written materials, such as manuscripts, charters, laws, official minutes or record archives, files, letters, memoranda, memoirs, biographies, official publications, wills, newspapers, and magazines. They may also include maps, diagrams, catalogues, films, paintings, inscriptions, recordings, transcriptions, logbooks, and research reports (Cohen, L., et al., 2018). There are also visual materials used in qualitative study, such as artefacts, photographs, video recordings, and websites, that chronicle human experiences about other people and/or oneself in relation to social activity and reflective states (Saldana, J., 2011).

Additionally, document analysis is a systematic approach to reviewing and evaluating various types of documents, including both printed and digital materials, such as computer-based files and online content (Bowen, G., 2017, p.27). This process is iterative, involving skimming, in-depth reading, and interpretation. It incorporates content analysis, which involves organizing information based on key research questions, and thematic analysis, which identifies recurring patterns and meanings (p.32). Content analysis is a technique used to summarize and report written data, focusing on core content and key messages (Cohen, L., Manion, L., & Morrison, K., 2007).

The document instrument utilized in this study is the visual form of documentation. It included the students' final presentation boards, also known as design portfolios. To conduct social research, most qualitative studies will watch and interview people. However, some studies may only use records, artefacts, and/or media that have been made by humans (Saldana, J., 2011). Students' work was collected from the participants with their permission. Their creative works were used to identify the existence of critical thinking skills in students' works. This is supported by Creswell, J. W. and Poth, C. N. (2018), where the objective of qualitative research is to choose places deliberately, individuals, documents, or visual materials.

### 3.8 Data Analysis Procedure

Data for this study collected from multiple sources includes semi-structured interviews with educators, semi-structured interviews with students, and document analysis of various forms of documents. Analyzing data from multiple sources is challenging in a qualitative study. According to Creswell and Poth (2018), data analysis is an ongoing research process that involves analyzing participant information through both general and specific steps. It involves using computer programs, representing findings in tables, graphs, and figures, and interpreting the results. Analyzing qualitative data requires classifying, accounting for, and interpreting information based on participant definitions while identifying trends, themes, categories, and regularities (Cohen et al., 2018).

#### 3.8.1 Thematic Analysis

Thematic analysis is a method that identifies, analyzes, and reports patterns within data, providing a detailed description of the data set (Braun, V., & Clarke, V., 2006). This method is used to characterize data, and it results in interpretation when choosing codes and creating themes (Ismail, N. M., 2023). The procedure entails a thorough, more concentrated rereading and study of the information. After examining the chosen data more closely, the reviewer codes and creates categories based on the data's features to identify themes related to a phenomenon (Bowen, G., 2017).

Table 3.8  
Phases of Thematic Analysis

No	Phase	Description of the process
1	Familiarizing with the data	Transcribing data (if necessary), reading and re-reading the data, and noting down initial ideas.
2	Generating initial codes:	Coding interesting features of the data systematically across the entire data set, collating data relevant to each code.
3	Searching for themes:	Collating codes into potential themes and gathering all data relevant to each potential theme.
4	Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5	Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6	Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating the analysis to the research question and literature, and producing a scholarly report of the analysis.

Source: Adopted from Braun, V., & Clarke, V. (2006).

A theme encapsulates a significant aspect of the data concerning the research topic and signifies a degree of structured response or meaning within the dataset (Braun, V., & Clarke, V., 2006). Table 3.8 illustrates the steps in thematic analysis utilized in this study.

Raw data gathered from semi-structured interviews with educators and students was recorded using an audio recorder during the interview session. The audio recording was based on participants' permission to be recorded for research purposes only. According to Miles, M. B., Huberman, A. M., & Saldana, J. (2014), raw field notes require expansion and typing, audio recordings need transcription and correction, and photographs must be documented and analyzed. Audio recording was used to ensure the accuracy of the transcription of data. (Braun, V., & Clarke, V., 2006).

### ***3.8.1.1 Stage 1: Familiarizing with data***

In the first phase, the verbal data collected from the interviews was transcribed into written text using digital tools such as Google Documents and the OneNote program. The researchers reread the transcription and listened to the audio recordings repetitively to ensure the transcription's accuracy.

After the data was transcribed, the researcher reread the transcription again to immerse in the data. According to Braun and Clarke (2006), immersion often involves the 'repeated reading' of material and actively engaging with the data to seek interpretations, patterns, and related concepts. Once the raw data was transcribed verbatim into Microsoft Word, then it was exported into PDF before being inserted into ATLAS.ti software version 23 to assist in the coding process. Figure 3.6 displays the PDF file imported into ATLAS.ti software for the coding process.

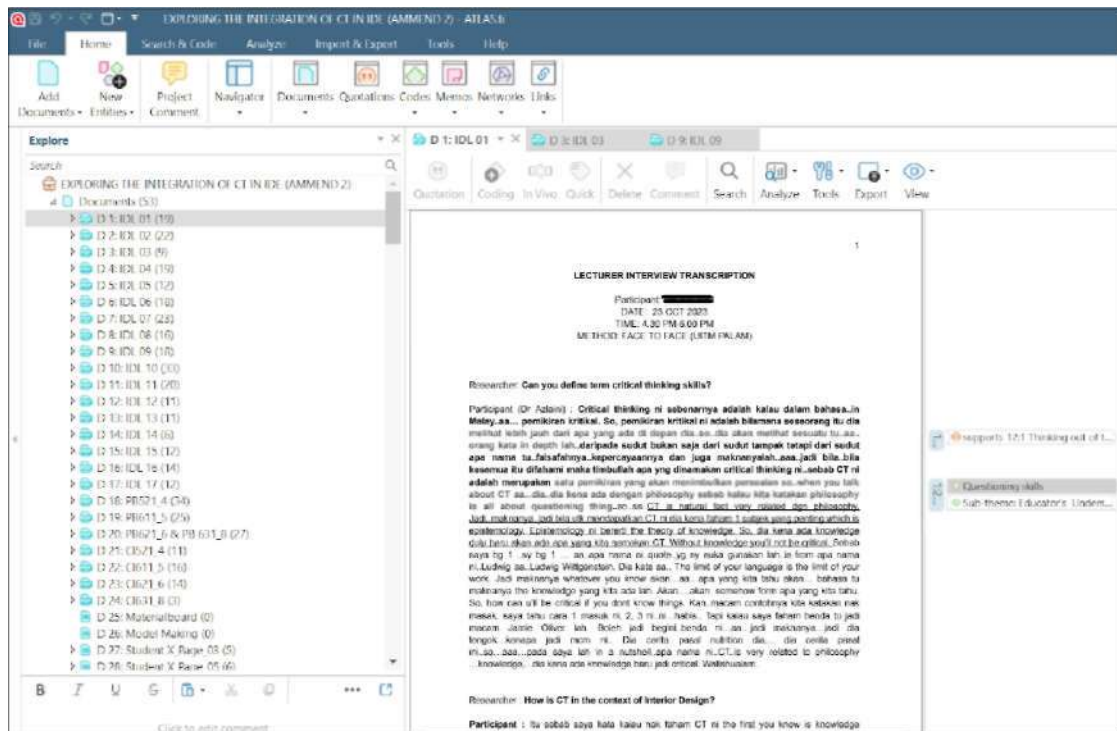


Figure 3.6 Transcribed Data Inserted into ATLAS.ti software

Designed for social scientists, ATLAS.ti is widely used across various academic fields, including psychology, literature, religion, medicine, nursing, linguistics, stylistics, history, and geography (Given, 2008). The translated PDF transcript was imported into the ATLAS.ti software for further analysis. Figure 3.5 shows the documents from three sources, including the transcription of interview data and related documents, which were inserted into the ATLAS.ti software for subsequent steps in data analysis.

### 3.8.1.2 Generating Initial Codes

The process of generating initial codes begins after becoming familiar with the data. This involves creating an initial code that identifies what is present in the data and highlights its intriguing aspects. Coding serves as a method to categorize and group data into "families" based on shared characteristics, marking the onset of a pattern (Saldana, J., 2013). Saldana (2016) further refined the codes-to-theory model for qualitative inquiry, as depicted in Figure 3.7, which has been adapted for this study.

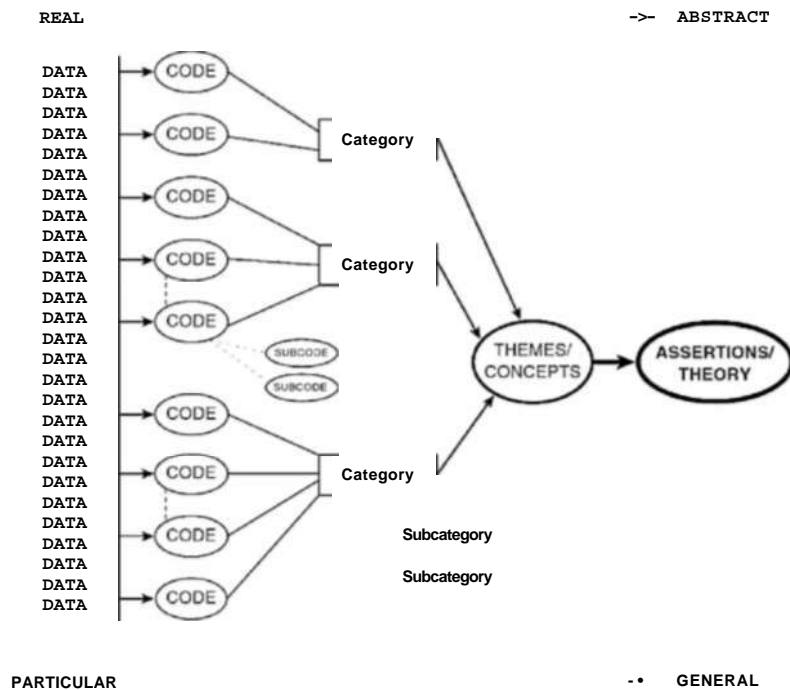


Figure 3.7 The Process of Coding to Theory  
 Source: Adopted from Saldana, J. (2016)

A code is a researcher-generated construct used in qualitative data analysis to represent and attribute meaning to individual data points for the purpose of pattern detection, categorization, theory building, and other analytical processes (Saldana, J., 2013). Open coding is the initial stage of data analysis, which involves labelling and categorizing phenomena based on the initial data collection (Osman, S., Abu, M. S., Mohammad, S., & Mokhtar, M., 2015). Table 3.9 below presents a sample of open coding from the initial findings stage of this study.

Table 3.9  
 Sample of open coding

Interview transcript	Code phrase
<i>Critical thinking, or "pemikiran kritis" in Malay_involves looking <b>beyond what is immediately in front of you.</b> It requires seeing things in <b>greater depth.... considering not only the visible aspects but also the philosophy....</b> Beliefs... and meaning behind them.... When all these elements are understood... .then critical thinking emerges. This is because critical thinking is a <b>form of thought that raises questions...</b> . . . and it is closely related to philosophy. Philosophy, after all, is about questioning things.... so critical thinking is naturally linked to it. To develop critical thinking.... one must understand an important subject, which is epistemology. Epistemology refers to the theory of knowledge. You <b>need knowledge first before you can be critical.</b> Without knowledge, you will not be able to think critically.</i>	<b>Beyond thinking</b> <b>Depth thinking</b> <b>Questioning</b> <b>Require knowledge</b>

<p>Respondent          Kalau..aa... in terms of uriluk permulaan maybe... aaa...suruh mereka carl..., what is the content and contacts of the subjek matter lah... and then develop into..kalau boleh buat mind map he... Kan? and then so that baru dia orang faham certain keywords from that mind map..so from that keywords tu yang akan highlight kan okey...guideline lah dia orang pergi jauh ke dalam dia orang punya projek so the keyword kat silu is mata one of tulang belakang lor that projek lah. So they don't... they don't... apa ni... pergi ke awang-awangan lah... so ada satu yang membuatkan dia orang grounded. So the keywords lah and then they transform into site kan...so that keywords tu yang tu yang jadi tulang belakang lah.</p> <p>Researcher: Hmm...ok..ada lagi ke nak lambah pasal teaching method tu?</p> <p>Teaching method er...hmm... CT..dia kena..apa tu. so a u trit...aa.. Tu rjasa lah kan... crri... lepas Lu yang yang the most important., adalah support i rasa kalau dia duduk seorang seorang and then dia tak... dia tak mengeluarkan all the things that dia punya idea development and so fourth...dia tak ada peer support... dia tak ada... apa... face to face dengan lecturer critics session.... so benda tu dia. dia lak... dia tak berjalama dia kena ada critic session</p>	<p>S9 Mind mapping          E Sub-theme: Constructive learni...</p> <p>V? Lack of Initiative and Engagem...          F 'S 9:17 like we say A, he... explains          Sub-theme: Students Barriers          Sub-theme: Students' Barriers</p>
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Figure 3.8 Coding Process of this study using ATLAS.ti software

Figure 3.8 displays the sample coding process conducted in this study using ATLAS.ti software version 23. The data from this study were analysed using semantic level analysis, which involves identifying themes based on the explicit or surface meanings of the data. The analyst avoids seeking interpretations beyond the statements made by participants or the written content (Braun, V., & Clarke, V., 2006). Figure 3.9 shows that this study produced initial codes approximately 152 codes. The coding procedure continued until the analysis of all participant data was completed, since data saturation was not reached during the first phases of analysis. This methodology guaranteed that no emergent themes were disregarded and that the conclusions were based on the full dataset.

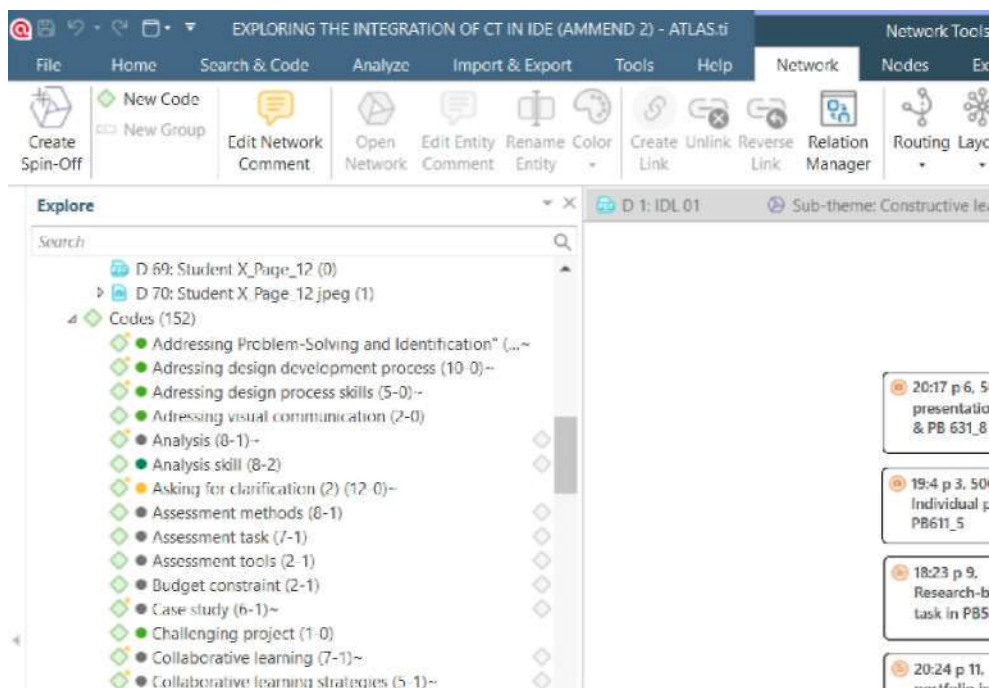


Figure 3.9 Codes generated in ATLAS.ti software

### 3.8.1.3 Searching for Themes

Once the coding process is complete, the next step is to search for themes. At this stage, the analysis shifts to identifying broader themes by sorting codes into potential themes and gathering relevant coded data within these themes (Braun, V., & Clarke, V., 2006). The process of categorizing data involves assigning codes to segments of data and reviewing marginal notes and comments to group those that align with the overall transcript (Merriam, S. B., 2009). Themes represent significant findings in qualitative studies and are often used as headings in the finding's sections of the studies (Creswell, J. W., & Creswell, J. D., 2018). Some literature refers to this as a category, which is similar to a theme, pattern, finding, or answer to a research question; however, it should be understood as a broader concept (Merriam, S. B., 2009). This study uses the term "theme" as main attribute while "sub-theme" to represent category of codes. Sample of visual network of themes and sub-themes created using ATLAS.ti 23 as shown in Figure 3.10.

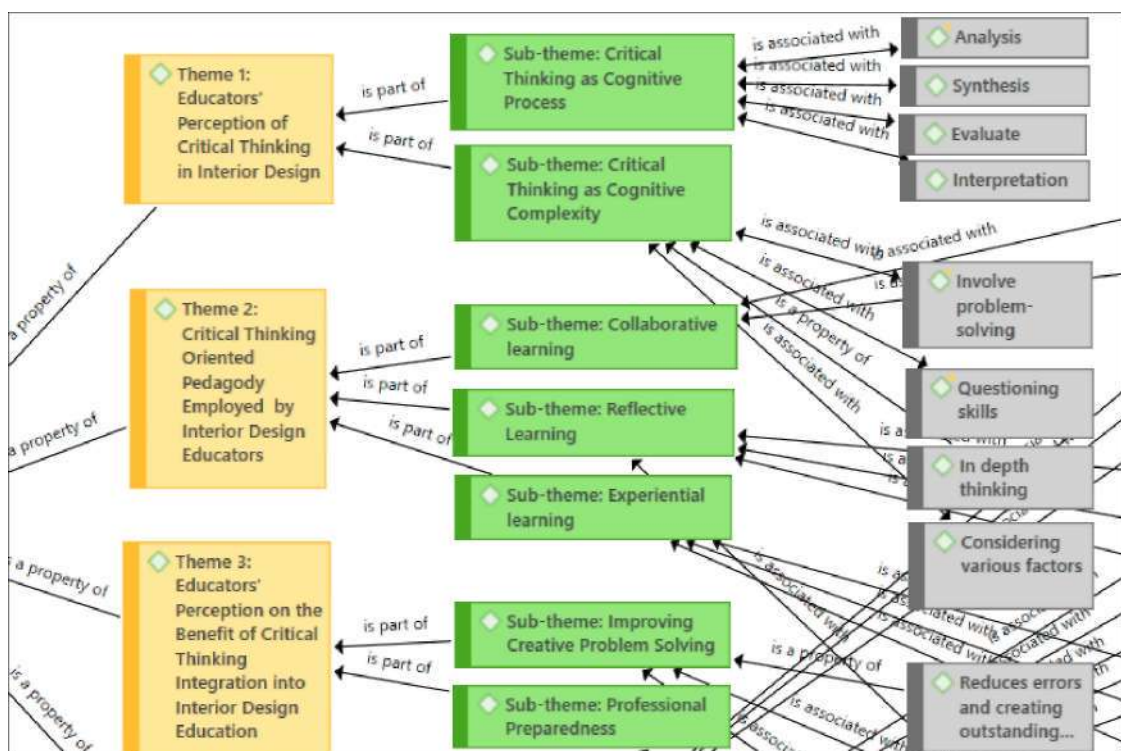


Figure 3.10 Sample of Network Diagram generated by ATLAS.ti Software to show the relationship among themes and sub-themes.

#### ***3.8.1.4 Reviewing the Themes***

After completing the search for a theme, the next phase involves identifying and refining candidate themes. It is crucial to assess whether certain themes are invalid due to insufficient or overly diverse data or whether they overlap, such as when two seemingly distinct themes merge into one (Braun, V., & Clarke, V., 2006). Figure 3.10 illustrates the evidence for reviewing and defining themes in this study. This process was conducted iteratively to revise themes and create subthemes. Braun and Clarke (2006) emphasize that sub-themes provide structure to complex themes and clarify the hierarchy of meaning within the data, effectively serving as themes within a theme. Braun and Clarke (2006) recommend presenting a comprehensive analysis of each specific theme in Chapter 4.

#### ***3.8.1.5 Defining and Naming Themes***

Table 4.11 in Chapter 4 presents the final names of themes that reflect research questions one through four. The name of the themes was defined according to the research question of this study. While sub-themes were identified based on the category of codes established in the analysis. Sub-themes are defined as smaller themes that exist within a larger overarching theme. They play a crucial role in organizing and structuring expansive and intricate themes, while also illustrating the hierarchical relationships among meanings contained within the data (Braun, V., & Clarke, V., 2006).

#### ***3.8.1.6 Producing the Report***

Lastly, the theme and sub-themes presented in visual presentation. Visual representations, such as network diagrams generated by qualitative software like ATLAS.ti, can help visualize relationships among codes and identify potential overlaps. These tools are valuable for examining and analyzing the complexity of emerging concepts. Sample of network diagrams created with ATLAS.ti software, showcasing the relationships among themes and sub-themes shown in Figure 3.10.

### **3.9 Trustworthiness**

As this study involves qualitative research, trustworthiness serves as a key criterion for evaluating its quality (Cohen, L., Manion, L., & Morrison, K., 2007).

Qualitative research must clearly outline the study's design, sample selection, data collection, and analysis, while also ensuring trustworthiness, whether presented as a comprehensive chapter of a prospective dissertation or as a condensed methods section (Merriam, S. B., 2009). Given, L. M. (2008) identifies several strategies to ensure trustworthiness, which include data triangulation (the use of multiple data sources), prolonged engagement within the community or study setting, member checking (consultation with participants to confirm the accuracy and validity of the data and findings), and maintaining an audit trail (documenting analytical decisions made throughout the study).

In the context of his research, the credibility was established by data triangulation, peer debriefing for the examination of codes and themes, and expert validation to authenticate the presented framework. This study's data collection included three distinct sources: semi-structured interviews with educators, semi-structured interviews with students, and document analysis, which included students' design portfolios. The coding process and determined theme were conducted using the peer debriefing approach, which includes both peers and supervisors. This research created audit trails with ATLAS.ti software throughout the coding process. This research does not use member checking, since its objective is to develop theme knowledge and conceptual insight into the perception of critical thinking and its integration within the interior design program, rather than to authenticate individual narratives as factual confirmation.n.

Table 3.10  
Information of Experts

<b>Criteria</b>	<b>Expert 1</b>	<b>Expert 2</b>	<b>Expert 3</b>
<b>Academic qualification</b>	Doctor of Philosophy in Built Environment	of Doctor of Philosophy in Real Estate	Doctor of Philosophy in Education and Human Resources Studies
<b>Years of Experiences</b>	14 years	22 years	19 years
<b>Area of Expertise</b>	Interior Design, Built Environment, Architecture, Applied Science and Technology	Housing, Estate management, Curriculum Development	Curriculum and Instruction, Critical Thinking, Technical and Vocational Education and Training (TVET)
<b>Relevant to study field</b>	Interior Design	Curriculum Development	Critical Thinking Curriculum Development

The expert validation method involved three experts in critical thinking and interior education. The experts were comprised of professors and senior educators from public universities with specializations in either critical thinking, interior design education, or curriculum development. Those experts were not from the list of participants. There were three experts selected based on:

- i) minimum 10 years' experience in the field of critical thinking or interior design education or curriculum design
- ii) research experience in higher education pedagogy and/or critical thinking

Table 3.10 presents the information of chosen experts who validate the suggested framework of this research. They originate from diverse backgrounds but are pertinent to my academic situation. Their significant contributions are essential for enhancing the formulated framework of this study.

The reliability of qualitative content analysis is often characterized by concepts such as credibility, dependability, confirmability, and transferability (Elo, S., Kaariainen, M., Kanste, O., Polkki, T., Utriainen, K., & Kyngas, H., 2014). They emphasize that trustworthiness is crucial throughout all phases of qualitative content analysis, from data collection to the reporting of results. It is important to evaluate the trustworthiness of each phase, which includes preparation, organization, and reporting. Those concepts will be explained in detail in the next section.

### **3.9.1 Credibility**

Credibility, often referred to as internal validity, pertains to the extent to which study findings accurately reflect reality (Merriam, S. B., & Tisdell, E. J., 2015). Merriam, S. B. (2009) emphasizes the need to consider the ethical conduct of the researcher in establishing a study's credibility. She posits that qualitative researchers can enhance consistency and reliability by employing various strategies, such as triangulation, peer examination, investigator's position, and audit trails.

The reliability of the findings detailed in chapter 4 was guaranteed using a methodical and transparent thematic analysis procedure. Every topic and sub-theme were based on repeated pattern among participants as well as rich verbatim excerpts. The triangulation of data among instructors, students, and documented proof enhances the credibility of the conclusions. Reflexive procedures and peer review were used throughout the analysis to mitigate researcher bias and ensure interpretations accurately

reflected participants' viewpoints (Braun & Clarke, 2006; Lincoln & Guba, 1985; Creswell & Poth, 2018). Bowen, G. (2017) reinforces this approach, asserting that the convergence of information from diverse sources strengthens the credibility of research findings and increases reader confidence. Elo, S., et al. (2014) further validate this assertion by indicating that establishing trustworthiness in content analysis begins with the selection of the most appropriate data collection method to address the research questions.

Figure 3.11 provides evidence of the triangulation method employed in this study. Data processed using ATLAS.ti software were obtained from the three sources. Ahmed, S. K. (2024) adds that careful recordkeeping and thorough examination of evidence throughout the research process enhance the reproducibility and scrutiny of findings, thereby improving the credibility and reliability of qualitative research.

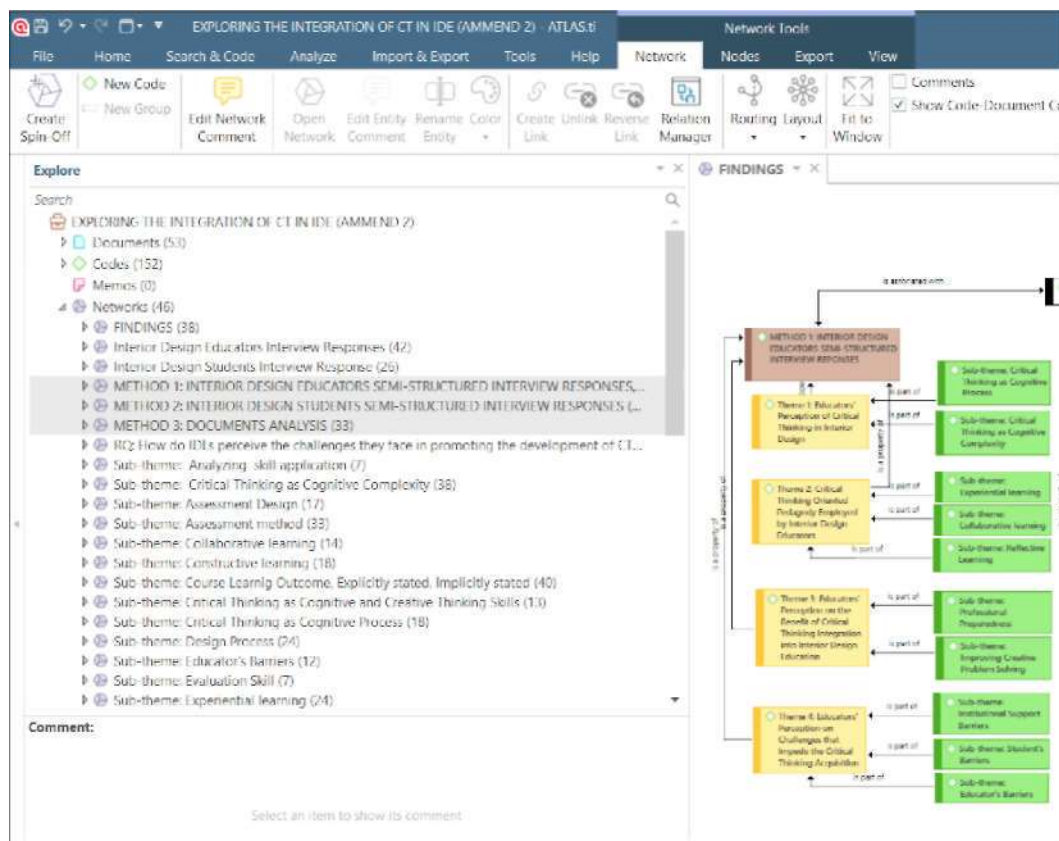


Figure 3.11 Evidence of Data Triangulation from Different Sources Analysed in ATLAS.ti software

Moreover, as explained earlier, this study also employed the peer debriefing strategies in clarifying interpretations, and challenging assumptions, thus enhancing the credibility of their findings, analyses, and conclusions (Given, L. M. ,2008). He added that the selection of a peer debriefer(s) is crucial for peer debriefing as they can

effectively interrogate the research both substantively and methodologically. The peer debriefing used in this study comprised supervisors who are specialists in the qualitative method and content of this research.

Finally, the iterative process of data analysis also contributes to the credibility of this study. The researcher uses an iterative process to identify themes or categories, revisiting previously identified categories and resolving contradictions as the text is repeatedly analysed (Given, L. M. ,2008). An iterative process of this study took place by cycling through data coding, interpretation, and theoretical development. Given, L. M. (2008) explains that qualitative inquiry typically involves a design that continuously evolves through iterative data collection and analysis processes, requiring the researcher to make frequent decisions that may change the direction of the study. He adds that the researcher employs an iterative approach to identify themes or categories, revisiting previously identified categories and resolving contradictions as the text is analysed repeatedly.

### **3.9.2 Transferability**

Transferability refers to the ability to apply findings to different contexts or populations (Elo, S., et al., 2014). It is grounded in the notion that discoveries can be extended beyond their original setting. One effective strategy to enhance transferability is to use a thick description. L. M. Given (2008) explains that thick description offers a detailed account of the context, participants, and research design, enabling readers to evaluate the study's transferability. Similarly, Merriam, S. B., and Tisdell, E. (2016) argue that thick description effectively contextualizes the research, allowing readers to determine whether their situations are comparable to the research context and whether the findings are applicable. This study utilizes a case study approach to deliver a thick description. Merriam, S. B. (2009) asserts that a case study serves as a thick description due to its comprehensive, grounded, holistic, and lifelike nature, along with its simplified data, clear interpretations, and effective communication of tacit knowledge.

In addition, Merriam, S. B. (2009) asserted that a key strategy for enhancing transferability is to give careful attention to the selection of study samples. She emphasized that selecting a typical or modal sample can illustrate the degree of representativeness of a program, event, or individual in relation to others within the same category, thus enabling users to compare their own circumstances. This study

employs non-random purposive sampling criteria for sample selection. The transferability of this study is achieved through a thorough description of the sampling criteria, as detailed in Chapter 3. 4. Leavy (2017) recommended maximizing the transferability of sampling strategies by first identifying the population from which subsequent assertions will be formulated. Afterward, it is essential to delineate the study population, which consists of the cohort of elements from which samples will be drawn. Additionally, it is necessary to establish the dimensions of the samples

### **3.9.3 Dependability**

Dependability is also known as reliability in quantitative research. Elo, S., et al. (2014) stated that dependability represents the consistency of data over time and in varying circumstances. Cohen, L., Manion, L., & Morrison, K. (2018) affirmed that dependability in research involves member checks, peer debriefing, triangulation, field engagement, persistent observations, reflexive journals, negative case analysis, and independent audits to ensure consistent results with data. According to Merriam, S. B. (2009), an audit trail in qualitative research provides a detailed account of data collection, category derivation, and decision-making processes throughout the inquiry.

Additionally, Given, L. M. (2008) stated that computer software for qualitative data analysis can assist in creating an audit trail by saving and documenting the stages of data processing and recording notes during the analysis. This study also employed audio recording and field notes during interview sessions to achieve the dependability of the research. The evidence of the audit trail using computer software is shown in Figure 3.12. The trail of evidence includes notes on data collection experiences, design changes, the researcher's experience, and memos generated during data analysis (Given, L. M., 2008).

### **3.9.4 Confirmability**

Confirmability refers to the objectivity of research, particularly the ability of two or more independent individuals to agree on the correctness, relevance, or significance of the data (Elo, S., 2014). In alignment with Roman, K.M. (2020), this study's confirmability was established by transparently presenting raw data, maintaining an audit trail, and documenting field notes to ensure accurate representation.

Conducting an audit of a study is an effective approach to enhancing the credibility and trustworthiness of findings and interpretations in qualitative research.

### **3.10 Summary**

This study aimed to explore the educators' and students' understanding and perception of critical thinking skills generally and in interior design education. The research also attempts to examine the techniques used by interior design educators in encouraging critical thinking skills in the interior design studio. Students' experiences with the integration of critical thinking skills in interior design teaching were also examined. Furthermore, this phenomenological research employed the multimethod qualitative method to achieve the aim of the research. Data collected using the semi-structured interview with educators and students, as well as documents such as the syllabus and briefing notes, have also been explored. Moreover, the data collected from three sources were analysed thematically using ATLAS.ti digital software. The validity and reliability of this study were improved through the triangulation of data collection from multiple data sources. Additionally, the data was also collected from the educator's view, students' experiences, and document analysis. The members' checking of preliminary findings has also been conducted to improve the validity and reliability of the research.

## CHAPTER 4

### FINDINGS AND ANALYSIS

#### 4.1 Introduction

This chapter presents the data analysis from the qualitative exploratory case study, which investigates how critical thinking is perceived, integrated, and fostered in undergraduate interior design programs. The finding was gathered from multiple sources of data, including semi-structured interviews with interior design educators and final-year students, as well as document analysis of course outlines, project briefs, assessment rubrics, and students' design portfolios. Data were analysed using thematic analysis, allowing recurring patterns and meanings related to the integration of critical thinking to emerge from participants' experiences and institutional practices.

The findings are organized in accordance with the research questions. Sections 4.2 and 4.3 present educators' and students' perceptions of critical thinking and its integration in the interior design program. Section 4.4 reports how critical thinking is fostered through instructional design, pedagogical approaches, and studio practices. Section 4.5 highlights the barriers that hinder the effective development of critical thinking skills, including issues related to student disposition, assessment practices, and institutional support.

#### 4.2 Research Question 1: How educators perceive critical thinking and its integration in the undergraduate interior design program?

The first research question focused on educators who are teaching the Bachelor's Degree in Interior Architecture at UiTM Puncak Alam. The demographic details of the participants are presented in Table 4.1. All participants met the specified criteria mentioned in Chapter 3.4.1. The majority of educator participants hold a master's degree and have over 10 years of experience teaching interior design programs.

Table 4.1  
Demographic of Educator's Participants

Gender		Highest qualification		Years of teaching		
Male	Female	Master's Degree	PhD	5-10	10-20	Above 20
7	10	11	6	4	8	5

Table 4.2 provides comprehensive details about each of the 17 educators who took part, including the date and time of the interview, the method and location of the interview, and a list of participants identified by code number. The interview session was conducted in person with four senior educators. However, the other participants were interviewed using Google Meet due to logistical and time constraints. The date and time for each interview session were arranged based on the participants' availability.

Table 4.2  
List of Educator's Participants

<b>Bil</b>	<b>Code</b>	<b>Date &amp; Time Interview</b>	<b>Venues</b>	<b>Methods</b>
1	IDL01	23 October 2023 @ 4.00 pm	UiTM Office	Online (Google Meet)
2	IDL02	24 October 2023 @ 11.00 am	UiTM Office	Online (Google Meet)
3	IDL03	23 October 2023 @12.00 pm	UiTM Office	Online (Google Meet)
4	IDL04	20 December 2023 @12.00 pm	UiTM Office	Online (Google Meet)
5	IDL05	22 December 2023 @12.00 pm	Ruang Studio Office	Face to face
6	IDL06	24 October 2023 @ 2.30 pm	UiTM Office	Face to face
7	IDL07	4 November 2023 @ 9.00 pm	Google Meet	Online (Google Meet)
8	IDL08	17 November @ 11.00 am	Google Meet	Online (Google Meet)
9	IDL09	10 November 2023 @11.00 am	Google Meet	Online (Google Meet)
10	IDL 10	17 November 2023 @ 3.00 pm	Google Meet	Online (Google Meet)
11	IDL 11	24 November 2023 @ 11.00 am	Google Meet	Online (Google Meet)
12	IDL 12	7 November 2023 @ 2.30 pm	Google Meet	Online (Google Meet)
13	IDL 13	22 November 2023 @ 9.30 am	Google Meet	Online (Google Meet)
14	IDL 14	22 November 2023 @ 3.00 pm	Google Meet	Online (Google Meet)
15	IDL 15	21 December 2023 @ 12.00 pm	Google Meet	Online (Google Meet)
16	IDL 16	15 November 2023 @ 9.00 pm	Google Meet	Online (Google Meet)
17	IDL 17	28 December 2023 @ 10.00 am.	Google Meet	Online (Google Meet)

IDL = interior design educators

The study focused on educators' perception obtained via semi-structured interviews with the participating educators. The thematic analysis identified two themes and 10 sub-themes regarding educator's perceptions. The primary concept is that educator's expressed an implicit comprehension of critical thinking as a result of studio practice. The second theme pertains to their opinion of the benefit associated with the adoption of critical thinking within the interior design program.

Table 4.3  
Themes and Sub-theme of Research Question 1

Theme	Sub-themes
1. Superficial Understanding of Critical Thinking	<ul style="list-style-type: none"> <li>&lt;&gt; Interpretation</li> <li>&gt;&gt; Analysis</li> <li>&gt;&gt; Evaluation</li> <li>&gt;&gt; Synthesis</li> </ul>
2. Tacit Understanding of Critical Thinking Articulated in Studio Practice	<ul style="list-style-type: none"> <li>&lt;&gt; Considering various factors</li> <li>&lt;&gt; In-depth thinking</li> <li>&gt;&gt; Involve problem solving</li> <li>&gt;&gt; Involve questioning</li> </ul>
3. Valued of Critical Thinking in Interior Design Program	<ul style="list-style-type: none"> <li>&lt;&gt; Improving Problem Solving Process</li> <li>&lt;&gt; Professional preparedness</li> </ul>

Table 4.3 displays a summary of findings related to research question one. There are three main themes and 10 sub-themes (categories) to respond to research question one on how educators perceive critical thinking and its integration in the interior design program, which emerges from semi-structured interview analysis. The elaboration of each theme will be explained in the next sections.

#### 4.2.1 Theme 1: Superficial Understanding of Critical Thinking

The first theme to respond to research question one on how educators perceive critical thinking and its integration into the interior design program reveals that educators have a tacit understanding of critical thinking in studio practice instead of a solid understanding. When asked to define critical thinking skills, educators mostly mentioned terms like interpretation, analysis, and evaluation, as mentioned in Facione, P. A. (1990). Their responses indicated a superficial understanding of critical thinking, as they only mentioned the terms without providing further explanations for each one.

Some participants mentioned that critical thinking involves interpretation skills. Only two participants mentioned critical thinking, which includes evaluation and synthesis skills. Excerpts by participant DDL 07 and participant DDL 16 are as follows:

*[...] gathering of information on knowledge about an issue as well as about something matters and then he....what... he analyzes or he **interprets** wisely [...]* (7:25,p2- IDL 07)

*[..] something that topic that can be., to be analyzed and..uh..**interpret**. Evaluate and then they make a judgement based on the context that they research in [...]* (17:12, pi -IDL 17)

Five out of 17 interior design educators' participants associated critical thinking with the analyzing skills. According to Facione, P.A. (1990), the analysis skill involves identifying similarities and differences between arguments or identifying the problem using graphs or pictures. Participant IDL 17 mentioned analyzing skills as a critical thinking element.

*[...] he needs to wisely **analyze** the data obtained [...] (7:5,p2-IDL 07)*

*[...] someone need to **analyze...** and organize the things they have already analyzed [...] (9:1,pi-IDL 09)*

*[...] to my understanding, yeah, critical thinking is... something that involves **analyzing, interpreting, evaluating,** and then making judgments based on the context of their researchf.J (17:l:pl-IDL 17).*

Only one educator provided a definition of analysis instead of merely mentioning the term. IDL 05 described the meaning of analysis when asked about understanding critical thinking.

*[...J how do you want to **break out certain things** for students to understand [...] (IDL 05)*

Only two out of the 17 participants in this study, when asked about their understanding of the critical thinking term, mentioned the term "evaluate." Their excerpt evidence is:

*[...] then what will the person do..**evaluate** the design... wether the design is capable og being used in the context of that space itself [...] (10:29,p2-IDL 10)*

*[...] **evaluate** and then they make a judgement [...] (17:l,pl-IDL 17)*

Based on analysis of interview responses, the findings suggest that educators only demonstrated a limited understanding, as their explanation was largely confined to mentioning the term without deeper or conceptual clarification of its meaning. Although educators in this study mentioned several of these terms when describing critical thinking, their responses were always associated with the process within studio-based learning.

#### 4.2.2 Theme 2: Tacit Understanding of Critical Thinking in Studio Practice

Second theme emerge from the interview responses from educators exposed that they demonstrated tacit understanding of critical as articulated in studio-based learning practices. Several educators perceive critical thinking in the context of interior design as in-depth thinking, considering various factors and involved questioning.

Seven participants described critical thinking as considering various factors. This is reflected in Loh, W. L. (2020b), who stated that critical thinking also includes assessing the thought process itself, which examines the reasoning behind the conclusion reached or the various elements considered when making a decision. A sample of evident educators mentioned critical thinking related to considering various factors, by participant DDL 11 and DDL 14, respectively:

*"[•••] g° Mo detail from **different perspectives** about that thing [...]"*  
(11:20,pl-IDL 11)

*[...J Approaching the project with **critical consideration** of the relevant context [...J* (14:2,pl-IDL 14)

Another five participants linked critical thinking to the process of problem-solving. The sample of evidence in Figure 4.4 mentioned by IDL07 and respectively represented by Documents 7, Quotations 8, and page 3 (7:8, p3):

*[...] critical thinking is about defining the problems and.... what.... searching or the **process of searching for the solution*** (7:8:p3-IDL 07)

*[... he will encounter an issue or **problem that he wants to solve**. J* (12:2, p2-IDL 12)

While, about six out of 17 participants see critical thinking involving in-depth thinking and considering various factors, while five related it to the process of involving problem solving. This conclusion is consistent with Fisher, A. (2011), who said that creative thinking, inventive methods, and the capacity to think outside traditional bounds are frequently necessary for successful critical thinking.

*[...] ability to think and react **beyond the straight line** [...]* (8: 1,pl-IDL 08)

*[...] it **has to be deeper** to the ... I would say..uhhh.. to the root [...]* (12:2,pl-IDL17)

Furthermore, Figure 4.4 shows that about nine out of 17 participants associated the critical thinking process with the questioning method. Yurtsever (2017) supports this conclusion, affirming that asking questions enhances individuals' critical thinking abilities. The sample of evidence participants associated critical thinking with questioning, as shown in Figure 4.4. It was mentioned by participant DDL 12 and IDL 13, represented respectively by Documents, Quotation, and page (12:6,p4) and (13:2, pi).

*[...] . if possible he's good... if we tell him **he'll question.**, why., right, aa...  
**always think** [...] (12:6,p4 - IDL 12)*

*[...] **we ask back the question**, like okay...what can you conclude from the  
finding that you got? [...] (13:2, pi- IDL 13)*

In summary of theme one, educators perceive critical thinking as cognitive maturity involving in-depth thinking, multi-faceted consideration, problem-solving, and questioning methods. This aligns with design education pedagogy and constructivist theories like Vygotsky's Sociocultural Theory and Schon's Reflective Practice. The findings supported that the educator participants of this study portray a tacit understanding of critical thinking, as it is an integral part of iterative, user-responsive, and reflective processes in interior design.

### **4.2.3 Theme 3: Improve Creative Thinking Process**

Interior design educators of this study view the integration of critical thinking into interior design programs as beneficial for improving creative problem-solving skills. Educators believed that the application of critical thinking skills during the process of problem-solving warrants precision, reduces errors, increases evidence-based decision-making, and thus creates outstanding ideas that contribute to the improvement of creative problem-solving skills. Evidence of this benefit can be seen in the excerpt of Participant IDL 04 and IDL 08:

*[...]Only then can he think critically about how he wants the strange subject  
matter to be **the best** [...] (4:22,p4-IDL 04)*

*[...]because the more he does research, in fact... the more he can actually make his **brain bigger and articulate to think**, for example [...] (8:18, p2-IDL 08)*

Furthermore, they believed that incorporating critical thinking into interior design education could help reduce errors and mistakes in developing interior design solutions. Evidence of this benefit can be seen in the excerpt of Participant IDL 04:

*[...] the guidance from critical thinking matters, **it will make the work more meticulous, correct, and less prone to errors**. [...]results that are **out of the box, very good**. If not, they're just ordinary, just typical, the wow factor is missing. That's why all building services in interior design are **very important to include in critical thinking to relate to how the design will become practical** (4:8, p3- IDL 04)*

Moreover, educators noted that critical thinking in the interior design program contributes to generating exceptional ideas and enhancing the quality of design. Evidence of this benefit can be seen in excerpt of Participant DDL 04:

*Design students are diverse, and their approach to design varies. Generally, students with critical thinking skills **tend to generate ideas that are out-of-the-box, fresh, unique, and carry their own identity** [...] (4:3, p1-IDL 04)*

Educators highlighted that without the assistance of critical thinking in the interior design program, students' work may lack depth and accuracy and be prone to mistakes. Educators view critical thinking as a crucial skill in design education, combining creativity with logic, enabling students to make evidence-based decisions, improve accuracy, and create innovative interior design solutions. Apart from improving creative problem-solving, interior design educators see the implementation of critical thinking in interior design programs as also benefiting professional preparedness. DDL 08 sees critical thinking as essential for students to develop a strong "sense of survival" in design. It equips them to think ahead, adapt, and address challenges effectively, enabling them to excel in competitive environments. Evidence of this benefit can be seen in the excerpt of Participant DDL 08:

*[...] I have a critical thinking; he has a **high sense of survival**. Survive in our context is survive in design. Because he will be further ahead. Because if he is an ordinary person, he has low critical thinking, the sense of survivor is less. [...] (8:6, p3-IDL 08)*

In summary of theme three, educators believe the integration of critical thinking in interior design programs has a positive impact on graduates' outcomes. This reflects that critical thinking enhances academic performance and fosters adaptability and enhancing overall performance. This approach aligns with experiential, reflective, and sociocultural theories of learning, ensuring that critical thinking not only enhances students' design outcomes but also prepares them for lifelong learning and real-world readiness.

### **4.3 Research Question 2: How students perceive critical thinking and its integration in the undergraduate interior design program?**

The second research question involved participants who are interior design students from the Bachelor's Degree in Interior Architecture at UiTM Puncak Alam. The demographic details of the educators' participants are presented in Table 4.4. All participants met the specified criteria mentioned. The majority hold a master's degree and have over 10 years of experience teaching interior design programs. The interview session was conducted through an online platform due to their logistics and availability. After the interview session finished, the researcher found that two of the participants needed to be taken out due to the poor quality of the audio recording. Table 4.4 shows the number of participants by gender and years of learning interior design experiences. About four male and six female students were involved in this study.

Table 4.4  
Gender of Student's Participants

	<b>Male</b>	<b>Female</b>
Gender	<b>4</b>	<b>6</b>
Years of learning interior design education	<b>5.5</b>	<b>5.5</b>

Table 4.5 displays the list of student participants involved in this study, along with the dates and times of their interviews. All participants are only available to be interviewed through the online platform due to logistic constraints. Most participants are busy during the day, so they are willing to be interviewed at night. The interview session with all participants took about ten days to complete. The data gathered was analyzed through the thematic analysis method using ATLAS.ti software version 23.

Table 4.5  
List of students' participants

Bil	Name Of Educator	Date of interview	Time	Platform	Gender	Notes
1	IDS 01	12 November 2023	10.00am	Google Meet	Female	
2	IDS 02	12 November 2023	10.00pm	Google Meet	Female	
3	IDS 03	15 November 2023	11.30 am	Google Meet	Female	
4	IDS 04	14 November 2023	4.00 pm	Google Meet	Female	
5	IDS 05	15 November 2023	9.00 am	Google Meet	Female	
6	IDS 06	24 November 2023	9.00 pm	Google Meet	Female	
7	IDS 07	23 November 2023	2.30 pm	Google Meet	Male	
8	IDS 08	20 November 2023	8.30 pm	Google Meet	Female	
9	IDS 09	18 November 2023	9.00 pm	Google Meet	Female	
10	IDS 10	19 November 2023	9.30 pm	Google Meet	Male	
11	IDS 11	16 November 2023	8.00 pm	Google Meet	Females	Rejected due
12	IDS 12	21 November 2023	9.00 pm	Google Meet	Female	Poor audio
13	IDS 13	23 November 2023	9.00 pm	Google Meet	Male	quality

The findings related to this research question reveal two themes from the semi-structured interview responses by Bachelor of Interior Architecture students at UiTM Puncak Alam. The perception of students on the critical thinking concept is crucial to its development in higher education. A study by Franklin, E. I., et al. (2022) exposed that students' lack of understanding of critical thinking leads to a lack of interest in engaging with it. The second objective of this study aims to comprehend students' perceptions of critical thinking and its integration in the undergraduate interior design program..

Table 4.6  
Themes and Sub-theme of Research Question 1

Theme	Sub-themes
1. Lack of Critical Thinking Understanding	<ul style="list-style-type: none"> <li>↳ In-depth thinking</li> <li>↳ Thinking out of the box</li> <li>↳ Problem solving</li> </ul>
2. Valued of Critical Thinking in Interior Design Program	<ul style="list-style-type: none"> <li>↳ Improving Problem Solving Process</li> <li>↳ Professional preparedness</li> </ul>

The first theme addresses students' understanding of the definition of critical thinking. The second theme pertains to their perception of the benefits of implementing critical thinking skills in the interior design studio. Table 4.6 presents the details of the themes, subthemes, and codes that emerged from the thematic analysis of responses from interior design students. Each theme and sub-theme will be explained further in the next sections.

### 4.3.1 Theme 1: Lack of Critical Thinking Understanding

The findings from the analysis of interview excerpts revealed that interior design students in this research had a deficiency in critical thinking comprehension. Their elucidation of critical thinking pertains to thinking out of the box, in-depth thinking and problem-solving capabilities. This indicates that they have conflated critical thinking with creative thinking as expressed in design-based studio learning. Faux, B. J. (1992) posits that creative thinking includes adjectives like divergent, original, and imaginative thinking, while critical thinking comprises convergent, inductive, deductive, analytical, and evaluative thinking.

Six out of ten student participants view critical thinking in interior design as a form of in-depth thinking. Students generally associate critical thinking with problem-solving and the ability to think deeply. The sample of evidence of students relates to in-depth thinking mentioned by participants IDS 01 and IDS 04:

*[...] it involves thinking about **something more deeply and extensively**, exploring solutions in a way that doesn't just stop at a single point [...]*  
(42:12,p4-IDS01)

*[...] it means I have **to think a bit further** ..., I have to think more than that*  
[...J (45:1 p 1-IDS 04)

Other than that, students perceive critical thinking with the term "out-of-the-box thinking." A sample of evidence on students mentioning thinking out of the box and relating critical thinking with problem-solving, mentioned by IDS 06:

*[...J so I think that's one of my...critical thinking because I have to **think outside of..out of my out of the box** [...J (47:1,pi - IDS 06)*

They also view critical thinking as a problem-solving process, mentioned by IDS 07 and IDS 08:

*[...] ...critical thinking is one of the methods that is quite... interesting and very functional which the student... **to solve very complicated design problems...** [...]* (49:6,p5- IDS 08)

*[...] can **solve the problem** at the same timef.J (48:l,pl-IDS 07*

This finding reflects that student possess a basic and surface-level understanding of critical thinking, which is frequently conflated with design thinking. This perception appears to be shaped by the studio-based pedagogical environment, where emphasis is placed on iterative design development, visual exploration, and creative problem-solving, with limited explicit articulation of critical thinking as a distinct cognitive process.

### 4.3.2 Theme 2: Enhance Design Quality

The second theme under the second research question is the students' perception of the benefit of implementing this skill in the interior design program. Thematic analysis revealed the uses of critical thinking in the interior design program contribute to the improvement of design quality and efficiency, as shown in Figure 4.8. This conclusion is mirrored in the statement by Dubriea, V. R., & Punb, K. F. (2013), that the problem-solving process in the domain necessitated critical thinking abilities to ensure high-quality decision-making that mitigated risk.

Students asserted that the advantages of critical thinking in interior design enhance design quality and efficiency. This finding is similar to Azizah, U., & Ibrahim, M. (2019), who stated that critical thinking benefits avoiding mistakes, enhancing understanding, and efficiently solving problems in various situations, particularly in everyday life. The findings revealed that students mentioned that the integration of critical thinking into the interior design program helps create outstanding ideas, increases problem-solving efficacy, and reduces errors creating outstanding ideas. The next section will explain each piece of evidence.

Sample of evidence from students regarding the benefits of integrating critical thinking into their interior design program, emphasizing its capacity to reduce errors and foster outstanding ideas, as noted by excerpt of participants IDS 08 and IDS 10:

*[...] it allows you to generate designs and ideas that are truly out of the box. So, you need to have critical thinking to come up with designs that are different from others. (49:3,p1 -IDS 08).*

*[..] we didn't use that critical thinking,, we were only thinking about the system and the aesthetics basically.... **the project didn't meet the project criteria** [...] (51:12,p2-IDS 10)*

Overall, students valued critical thinking as a vital skill to improve their design competency. This further reinforces the value of critical thinking not only in the design process but also in producing comprehensive and refined design outcomes. These insights suggest that embedding critical thinking within interior design education is key to enhancing both student learning and professional-level outcomes.

#### 4.4 Research Question 3: How is critical thinking fostered in undergraduate's interior design program?

This study's third research question explores how an undergraduate interior design program fosters critical thinking. The findings revealed that the interior design program fosters critical thinking through the immersion approach. According to Ennis, R.H. (1989), the immersion approach in instructional design entails students thoroughly interacting with the subject matter, although it does not explicitly define the concepts of critical thinking. In addition, Bellaera, L., et al. (2021) reported that critical thinking is being taught implicitly through subject matter with less emphasis on formal instruction. Ghamdi, A., Deraney, P. M., and Hamdan, A. K. (2016) stated that critical thinking should ideally be included in students' academic careers rather than being limited to a single, stand-alone course if they are to develop into critical thinkers.

Table 4.7  
Themes and Sub-theme of Research Question 3

Theme	Sub-themes
Instructional design	<ul style="list-style-type: none"> <li>&lt;&gt; Course Learning Outcome</li> <li>&gt;&gt; Instructional Strategies</li> <li>&gt;&gt; Assessment design</li> </ul>
Teaching Strategies in Studio-based Learning	<ul style="list-style-type: none"> <li>&lt;&gt; Experiential learning</li> <li>&gt;&gt; Collaborative learning</li> <li>&gt;&gt; Reflective learning</li> </ul>
Implementation of Critical Thinking in Design Project	<ul style="list-style-type: none"> <li>&lt;&gt; Interpretation</li> <li>&lt;&gt; Analysis</li> <li>&gt;&gt; Evaluation</li> <li>&gt;&gt; Inference</li> <li>&gt;&gt; Explanation</li> <li>&gt;&gt; Self-regulation</li> </ul>

This study exposed that critical thinking is implicitly fostered through instructional design, teaching strategies employed and experienced by students, the design process, and the implementation of critical thinking in interior design portfolios. Table 4.7 displays a summary of findings related to research question three. There are three main themes and 12 sub-themes (categories) to respond to research question three

on how critical thinking is integrated into the interior design program. The elaboration of each theme will be explained in the next sections.

#### **4.4.1 Theme 1: Instructional Design**

The finding from the document analysis revealed that critical thinking implicitly integrated into the instructional design. According to Ragan, T. J., & Smith, P. L. (1999). Instructional design is a systematic process that translates learning and instruction principles into plans for materials, activities, resources, and evaluation. Hokanson, B., Gibbons, A., Thinking, D., & Process, D. (2012) added that an instructional design includes a description of the structural nature of the content to be taught, comprising implicit or explicit divisions of subject matter and performances into units, lessons, and activities, as structured by teachers.

Course information and project briefing documents contain these learning outcomes. The course information document offers comprehensive details about a specific course, including its learning outcomes, covered topics, teaching approaches, and types of assessment. Meanwhile, the project brief acts as a guide for interior design students in this study context, outlining key project information, such as objectives, requirements, scope of work, timelines, and evaluation criteria. In addition, student work documents feature sample presentation boards that display completed interior design projects.

##### ***4.4.1.1 Course Learning Outcomes***

The documents analysis found that the critical thinking skills outlined in the course learning outcomes are reflected in both the course information and project brief documents but in implicit way. The skills implicitly mentioned the verb mentioned in critical thinking skills (Facione,P.A, 1990) include interpretation, analysis, and evaluation. Additionally, some skills that are, evaluation, inference, explanation, and self-regulation.

Table 4.8 display the sample of critical thinking skills verb promoted implicitly in the documents. The document emphasizes the importance of analysis in the design process, with interpretation more prevalent in project briefs than course information. Interpretation and evaluation are present but limited to course outlines, suggesting less emphasis on reflective judgment in design tasks.

Table 4.8  
List of Critical Thinking Skills Implicitly Stated in Syllabus

Type of document	I	A	E	In	Ex	SR
INA 521 Course Information	x	x	x	x	x	x
INA 611 Course Information	x	x	x	x	x	x
INA 621 Course Information	x	x	x	x	x	x
INA 631 Course Information	x	x	x	x	x	x
Project Brief INA 521	x	x	x	x	x	x
Project Brief INA 611	x	x	x	x	x	x
Project Brief INA 621	x	x	x	x	x	x

I-Interpretation A-Analysis E-Evaluate In- Inference Ex- Explanation SR- Self-Regulation

Table 4.9 displays the sample of descriptions stated in the course learning outcome and project briefing notes, which encourage critical thinking implicitly. The statement does not mention explicitly the abilities of critical thinking but rather mentions the verb associated with critical thinking skills by Facione,P.A (1990). The analysis verb is mentioned in Table 4.9; however, it still left a gap in how critical thinking should be demonstrated. Some of the verbs are mentioned explicitly, but they lack clear definition and structure.

Table 4.9  
Sample of Description of Critical Thinking Skills Implicitly Stated in Syllabus based on Critical Thinking Skills (Facione,P.A,1990)

Critical Thinking Skills	Example of Activity (Facione, P. A. ,1990).	Sample of instruction in interior design syllabus	Document
<b>Interpretation</b>	Summarizing an article in one's own words, or identifying the main points in an article	<i>"Addressing design issues and hypothesis".</i>	INA 621 Course Information (CI6216)
		<i>"Establishing design brief based on analysis "</i>	
		<i>Interpret a schematic design process through space planning, space programming and space visualization in creative presentation composition</i>	<b>INA 621 Course Information</b> (CI621_6)
<b>Analysis</b>	Identifying similarities and differences between two arguments or finding a way to identify the problem through sketching a graph or drawing a picture.	<i>Analysis and reflection of conceptual statement through trending issues and cultural behaviour</i> (PB/INA 521/P8/L2)	INA 521 Project Brief (PB5214)
		<i>CLO1: "Students will be able to identify various design methodologies, application of design elements with regards to various school of thoughts "</i>	<b>INA 611 Course Information</b> (CI611_5)

<b>Evaluation</b>	Ability to determine the credibility of the source of information the author used, or the ability of judging two statements that are contradicting each other (APA, 1990).	<b>Evaluate issues, problems, creative solution</b> [...] (CWNA521/CL0 1)  <i>To show comprehensive research of ideas in the content of design development and annotations.</i>	INA 521 Project Brief (PB5214)  INA 521 Course Information (CI5214)
<b>Inference</b>	Ability to make a prediction of what will happen in the future from given information (APA, 1990).	Program Learning Outcome: <i>"Able to propose a creative solution towards selected issue through project proposal focuses on project intention and site selection "</i>	INA 621 Course Information (CI6216)
<b>Explanation</b>	Ability to present an argument using one's own words seeking the best understanding or the ability to explain to someone a problem using one's own words to reach the maximum understanding of the problem.	Assessment method: <i>Tutorial/ Critiques</i>  <i>Individual Presentation</i> <i>Project 2: (40%)</i>	INA 521 Project Brief (PB5214)
<b>Self-regulation.</b>	Ability to constantly evaluate your opinion to make sure that it does not have any bias (APA, 1990).	Program Learning Outcome: <i>"CLO3 Students will be able to execute the design process in interior design works "</i>	INA 611 Course Information (CI6115)

In summary, the critical thinking skills outlined (Facione, P.A 1990) are implicitly reflected in the course learning outcomes, as demonstrated in Tables 4.8 and 4.9. The findings suggest that the critical thinking promoted implicitly is due to the nature of interior design studio-based learning pedagogy. Thus the study suggests that critical thinking should be explicitly stated in the course learning outcome even though it is embedded in the subject matter content. However, Snyder, S. J., Edwards, L. C, and Sanders, A. L. (2019) argued that explicit teaching enhances clarity in instruction, enabling students to apply specific critical thinking skills in new contexts and to demonstrate their understanding of when to use them.

#### 4.4.1.2 Instructional Strategies

The content analysis of related documents discovered several teaching approaches that could develop the critical thinking abilities designed in instructional strategies, as shown in Figure 4.30. Those teaching approaches found in the project brief and course information include experiential learning, collaborative learning, inquiry-based learning, problem-based learning, and project-based learning. Figure 4.30 reveals

that the project brief provides more detailed explanations of most teaching approaches compared to the course information.

The experiential learning approach was developed as part of the instructional strategies for the interior design program. According to Pamungkas, S. F., Widiastuti, I., and Suharno (2019), experiential learning activities facilitate student-centered learning and effective management for the 21st century. Djabarouti, J., & O'Flaherty, C. (2019) highlighted that the practical, hands-on learning assignment may have improved test group participants' capacity to enhance design quality. These activities enable students to construct knowledge and deepen their understanding through hands-on experiences. The analysis reveals that the instructional design encourages hands-on activities like modeling, sketches, site observations, and case studies that promote experiential learning.

A sample of evidence promoting experiential learning strategies through model making and sketches is presented in Figure 4.30. This type of evidence is represented by Documents PB6216 and PB6318:

*[..]Refinement Sketch model + sketches 3D Modelling [..] (PB6216 & PB 6318)*

While a sample of evidence indicates real-world activities, such as site observation, shown in Figure 4.30 and stated in Document PB5214,:

*[..] Observation checklist Site Measurement Site review (Group Work) Field Trip [..] (PB5214)*

*[..] Site Visit Site Observation [..] (PB521J)*

The analysis of related documents indicates that the interior design program's instructional design promotes an inquiry-based learning approach. As noted by Ngang, T. K. (2011), inquiry-based learning is an educational method driven primarily by students' curiosity about their environment.

The findings suggest that the instructional design in interior design effectively enhances inquiry-based learning through a range of activities, including presentations, reflections, concept exploration, and questioning techniques. The evidence syllabus promotes inquiry-based learning through a design that emphasizes conceptual and critical reflection. Documents PB5214 and PB611, respectively, represent this aspect.

*[...] reflection on concept and ideas through sketches, images, drawings*  
**Λ..J(18:18,p9-PB521\_4)**

*[...] to question new dimension of structural behaviour, physical form and its meaning of Functionality - using multiple keywords and emotion[...]*  
*(19:24,p4-PB611\_5)*

The evidence from Document PB5214 indicates that the exploration of issues and ideas emphasizes student involvement. It encourages students to ask questions, explore, hypothesize, test, and develop their own design solutions based on real-world issues.

*[...] the project aims to delve into current design issues, explore ideas for spatial transformation and derive a dimensional design proposal [...]*  
**(18:6,p3-PB521\_4)**

Apart from that, the research also revealed that problem-based learning was fostered within interior design instructional strategies. As mentioned by Zabit, M. N. M. (2016), a problem-based approach involves using an ill-structured real-world problem, stimulating students' thinking through inductive and horizontal reasoning, and deductive and vertical reasoning to generate hypotheses through sufficient information and sufficient memory stimulation. This approach evidence is incorporated into the interior design program through the problem-solving project. The evidence of this approach stated in project brief documents PB5214 and PB6115:

*[...] the project aims to delve into current design issues, explore ideas for spatial transformation and derive a dimensional design proposal. The design proposal will be based on receiving current issues and unfolding them into an individual spatial program . [...]* (18:4,p3- PB514)

*[...] therefore, you will require to look into an issue that is tangible and how to use this issue to come out with a design brief and design solution.*  
*(19:19,p5-PB611\_5)*

Through this instruction, students are encouraged to analyze and evaluate the problem context and creatively solve it through spatial manipulation. It involves examining a specific issue and creating a clear design brief to guide the creation of your design proposal.

Additionally, the document analysis discovered that the interior design program's instructional design promoted project-based learning. This approach, which is encouraged through authentic, real-life projects (e.g., residential, commercial, institutional), requires students to solve practical problems. Project-based activities that involve direct interaction with a site or user group provide numerous opportunities for data collection and evaluation. (Tiwari, A., Lai, P., So, M., & Yuen, K., 2006). This evidence is shown in Figure 4.30, extracted from the document project brief (PB6115) and course information (CI6115):

*[...] therefore, **our project** is to look into new possibilities from the site-specific issue that will be part of space program development. (19:6, p4-PB611J)*

*[...] the research phase will be carried out as a **group project** [...] (22:4,pl-CI611J)*

The instructional design of the interior design program also promotes problem-based learning, as previously explained. There is a difference between problem- and project-based learning. According to Lavi, R., & Marti, D. (2023), project-based learning focuses on knowledge acquisition, while problem-based learning involves the application of knowledge. Both approaches encourage students to take ownership of their learning by identifying issues, setting design objectives, conducting research, and generating creative solutions.

The findings from the document analysis indicate that the instructional strategies in the interior design program promote collaborative learning. According to El-Daghar, K. (2020), collaboration is a practice in which individuals work together to achieve a common business goal, with a team's success determined by its collective performance. Figure 4.30 illustrates how the research accomplished this type of learning through group discussions and tutorial critique sessions.

The evidence of instructional design in interior design promotes tutorial and group discussion activities, which are drawn from the course information (CI 5214) and the project brief document (PB6115):

*[...] **Tutorial, Discussion** [...] (21:12,pl- CI521\_4)*

*[..] You going to do a progression and ^Dimensional space composition with a substantial space design. Transition between squeal can **be discussed** further **during your tutorial session** [..] (19:20 p 5- PB6115)*

This learning approach has the potential to enhance critical thinking skills among students in interior design programs. This idea is supported by Zou, Y., Mustakim, S. S. B., Sulaiman, T., and & Lei, X. (2024), who discovered that problem-based teaching—especially when involving group collaborative learning, role-playing, and STEAM (Science, Technology, Engineering, Arts, and Mathematics) contexts effectively improves students' critical thinking, creativity, and problem-solving abilities.

The instructional strategies outlined in the interior design syllabus align with constructivist and sociocultural learning theories, including Kolb's Experiential Learning Theory, Vygotsky's Sociocultural Theory, and Schon's Reflective Practice Model. These strategies promote critical thinking skills such as analytical reasoning, reflective judgment, creative problem-solving, and engagement with complexity in design contexts.

#### *4.4.1.3 Assessment Design*

The research examined how the assessment design supports critical thinking within the instructional design of the interior design program. The data analyzed categorized the assessment design into methods, tasks, and tools, as illustrated in Figure 4.10. The findings indicated that the assessment methods and tasks effectively promote elements of critical thinking. However, the assessment tasks were found to be less supportive of evaluating critical thinking skills.

\ The study found that the assessment task in the instructional design of the interior design syllabus supports the development of critical thinking skills. Types of assessment tasks extracted from the project brief and course information are individual and group projects, final presentations, design proposals, research-based tasks, and design portfolios. The abilities of students in design and critical thinking could be evaluated from those methods. Similarly, Tarn, N., & Tien, T. (2024) discovered educators in Vietnam utilized various assessment techniques such as peer review, reflective writing, case study analysis, teamwork projects, research-type assessments, and problem-solving to enhance undergraduate students' critical thinking abilities.

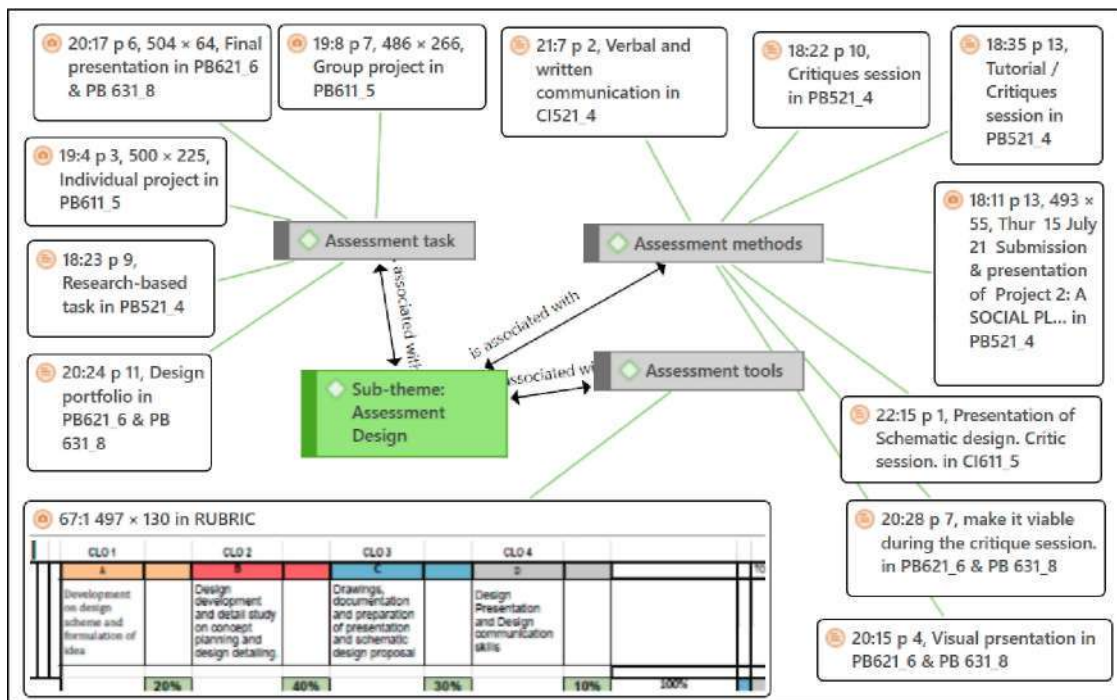


Figure 4.1 Network of Sub-theme of Assessment Design Generated from ATLAS.ti software Version 23

A sample of evidence of the assessment task designed for the syllabus is shown in Figure 4.1. The final presentation is represented by Document 20, Quotation 17, page 6 (20:17, p6), an extract from the project brief (PB621\_6&PB631\_8). Group and individual project evidence in Figure 4.3.1 are represented by Document, Quotation, and page (19:04, p3) and (19:8, p7), respectively.

Moreover, the instructional design also required students to produce a design portfolio. According to MAPS (2013), the portfolio review should be integrated into the evaluation process as a "check and balance" by impartial evaluators. Loh, W. L. (2020a) stressed that the quality of students' critical thinking may be evaluated by the documentation. A sample of evidence on the design portfolio is shown in Figure 4.1; this is represented by Document 20, Quotation 24, on page 1 (20:24, p1):

*[...] your portfolio will be evaluated through your **extensive study and design development process**. Final works will not be taken as your final work representation for entire semester[...] (PB621\_6&PB631\_8)*

Apart from that, the instructional design also promoted the research-based task in the interior design project. This type of assessment was found in the project briefing

instruction, as shown in Figure 4.1, represented by Document 18, Quotation 23, page 9 (18:23, p. 9):

*[...] to show **comprehensive research** of ideas in the content of design development and annotations [...] (18:23,p9- PB 521 \_4)*

A study by Campo, L., et al. (2023) revealed that, from the students' perspectives, research activity is one of six techniques that predominantly foster critical thinking, besides debates, project-based learning, real-context practices, cooperative learning, and case studies. This indicates a deliberate emphasis on research-based design thinking, where students must analyze, interpret, and explain their choices. This task supports the development of critical thinking skills such as analysis, inference, and explanation (Facione, P.A., 1990). It fosters critical thinking through profound engagement with information, thoughtful design integration, and transparent reasoning communication.

In addition, this study identified several assessment methods designed within the instructional framework to enhance critical thinking. Figure 4.31 illustrates the assessment methods that could promote critical thinking abilities in the interior design program, including verbal, written, and visual communication, as well as tutorial and critique sessions. Evidence of this can be found in Figure 4.1, which is represented by Documents and Quotations (21:7, p2) that encompass verbal and written presentations, visual presentations (20:15, p4), and critique sessions (20:28, p7). An example of critical thinking fostered through visual presentations is evident in Document 20, Quotation 15, and page 4 (20:15, p4):

*[...] production of **required visuals and documents** such as construction and detail drawings, technical specification, bill of quantities, and final **presentation visuals** are to be completed by the end of the semester [...] (20:15,p4- PB6216 & PB6318).*

*[...] verbal and written communication [...] (21:7,p2- CI521\_4)*

*[...] make it viable **during the critique session** [...] (20:28,p7- PB6216 & PB6318)*

This is aligned with Sulaiman, N. L. (2012), who discovered that presentation is one of the types of assessment tasks used to assess critical thinking in the Polytechnic program in Malaysia. The use of hand-drawn and computer-aided drawing in

architecture and interior design has been prevalent since the 1960s, highlighting the importance of both methods in the design process (Islamoglu, O. S., & Deger, K. O., 2015). He added that the hand drawing utilized during the presentation phase delineates the structural elements of the project. The presentation method encouraged in the interior design program, as evidenced in Figure 4.31, represented by Document 22 and Quotation 15, page 1 (22:15, pi), encourages students to critically evaluate and defend their design decisions and enhances their verbal communication and justification skills.

In summary, the review of instructional design documents reveals a structured integration of critical thinking within the interior design curriculum. Critical thinking skills are embedded in course outcomes and reinforced through pedagogical strategies. This aligns with a curriculum that treats critical thinking as a core educational goal, fostering analytical, reflective, and problem-solving competencies essential to interior design practice.

#### **4.4.2 Theme 2: Teaching Strategies in Studio Learning**

The findings from semi-structured interview with educators and students revealed critical thinking is fostered through the teaching strategies used by interior design educators and students' engagement in interior design studio learning that positively cultivate critical ability. According to Ahmad, L., Sosa, M., & Musfy, K. (2020) design studio education emphasizes individualized teaching between faculty and students, particularly in architecture and interior design. The term "design studio" encompasses both the pedagogical method and the physical environment used for instruction. The study revealed that the critical thinking fostered in design studio learning through experiential, collaborative, and reflective learning.

##### ***4.4.2.1 Experiential Learning***

Interior design educators shared that they use experiential learning as one of their teaching methods for interior design programs. Pamungkas, S. F., et al. (2019) stated that experiential learning is a process in which experiences change to help people learn. It adopts a student-centered approach, based on the belief that active learning is the most effective method. Educators shared that they encourage their students to be involved in case studies, field trips, and model making, which they believe could strengthen their critical thinking skills.

Six out of seventeen educators shared that they encourage the field trip and case study method as part of their interior design studio learning. The evidence of educators encouraging the case study and field trip activities is provided by participant DDL 01, IDL 02, and participant IDL 16 respectively:

*f.JTell them to go out... like... these part six students, I said the first thing I want you to do before you start this project is: **go out first. Go and observe first** [...]. "(1:7, pi5 - IDL 01)*

*[...] that's why we tell students to go to... do **some case study** okay as a reference or guideline for him [...] (2:8, p4-IDL 02)*

*[...] it needs to go with the case study.... visit several **case studies** that he can do...at the same time go with the precedent study [...J (16:5, p2-IDL 16)*

This is evidenced when students shared that real-world exposure involves activities such as site visits and case studies that stimulate their thinking. They emphasized that case studies and site visits help them think critically, particularly in understanding human behaviour within a space. The sample of quotation are by IDS 01 and IDS 10 respectively:

*[...]for example, like Mdm Z... she likes us to go out... **She tells us to experience that thing.** Meaning, we go to that **place**. For example, if I'm designing a cafe, don 'tjust look at Pinter est. **..She tells us to go out and see how human behaviour is in that place.** [...] (42:5,p2 - IDS 01)*

*[...J for critical thinking, from various perspectives, if we start from zero, for example, when **we go for on-site observation, conduct case studies, and perform research**, basically, we need to research first about a particular thing [. J (51:7,p5 - IDS 10).*

This shows that educators emphasized that real-world exposure, which involves the case studies and fieldwork, is important in promoting critical thinking. According to Putra, P. D. et al. (2021), critical thinking skills can be developed through teaching methods that encourage students to tackle real-world problems during the learning process. Similarly, a study by Campo, L., Galindo-Dominguez, H., Bezanilla, M. J., Fernandez-Nogueira, D., & Poblete, M. (2023) discovered that case studies are one of the methods that significantly contribute to developing critical thinking among students

alongside debates, project-based learning, real-world practice, research, cooperative learning, and case studies.

Apart from that, educators also stress that making physical models in the studio is another way to help students improve their critical thinking abilities. They thought that constructing models helped students picture the area and have a better idea of how the building was built. The sample of quotation mentioned by Participant DDL 06:

*[..] They are unable to visualize 3D in semester 01, so I give him a pattern assignment and **ask him to create a model based on it**. This way, when they get to semester 02, they can look at the 3D plan and train their brain cells to see 3D, even if they are unable to sketch it [...] (6:5, p3 -IDL 06)*

Students' participants also highlighted that they engaged with critical thinking during the design process through hands-on tasks like model-making. This evidence mentioned by participant IDS 04:

*[..] i will study **model making** again... how can it become like that?[..]*  
*(45:5,p4-IDS 04)*

Interior design educators in this study believed that physical model making is beneficial for students who are unable to create sketches. They alert that student to having different pace and ability, especially the sketching skills and visualization skills. According to Afify, H. M. N., et al. (2020) research, creating models helps students develop their critical thinking skills.

Findings show that educators favour case studies, fieldwork and model making for fostering critical thinking in interior design education. These methods encourage students to engage with real-world design contexts, analyse environmental and social factors, test ideas physically, and reflect on design decisions' implications. This aligns with Kolb's Experiential Learning Theory and Schon's Reflective Practice.

#### *4.4.2.2 Collaborative Learning*

Collaborative learning is another approach applied by educators in interior design studio learning. According to Godat, M. (2012), collaborative learning is crucial for professional groups, requiring participants to behave in a collaborative manner, going beyond unstructured interaction or task allocation. In the interior design studio, collaborative learning includes peer discussion, brainstorming and critique session.

Educators' participants of this study mentioned that they always pushed their students to learn together through group discussions and working with people in the field. About six educators participants reported that they encourage their students to engage in discussions on various topics in small groups, particularly during brainstorming sessions or debates in the studio. The evidence was brought up by Participant DDL 06 and IDL 09 respectively:

*[...] so you have to create a peer learning group...ha... **peer learning group**... because students learn faster through their friend rather than he critic one-on-one [...]* (6:13, p6-IDL 06)

*[...] they need to **brainstorm** with each other, design students... with the lecturer [...]* (9:5,p2- IDL 09)

Students also indicated that activities related to collaborative learning stimulate their critical thinking skills. According to Doheim, R. M., and Yusof, N. (2020), collaborative learning entails students working in groups or pairs to enhance their critical thinking abilities, thereby improving their problem-solving, creativity, and decision-making skills. Students reported engaging in collaborative learning through critique sessions, group discussions, peer discussions, and brainstorming activities.

Students' participants of this study indicate that they experience the group discussion, peer discussion and brainstorming activities. This is highlighted by IDS 03 and IDS 04:

*[...] ask a lot of seniors, **ask a lot of seniors** how to look at their projects afterwards [...]* (44:9,p4- IDS 03)

*[. J after that, he gave the opportunity to the other friends... aa.. **give us their opinion** [...]* (45:5,p2- IDS 04)

*[..J we discuss through **brainstorming sessions** with our studio mates or anyone who has relevant experience [...]* (47:5,p3 - IDS 06)

These strategies aim to foster a supportive environment where students feel confident expressing their opinions. Dwee, C. Y., et al. (2016) highlighted that such small group activities help students enhance their critical thinking skills. Through group brainstorming, students collaborate, share diverse perspectives, explore ideas, and deepen their understanding of the subject.

The critique session is an essential component of interior design studio learning activities. According to Yaman, S., & Koca, D. (2023), a critique course in interior architecture education enhances students' understanding of design processes and fosters a critical culture essential for discipline and profession. Six out of ten students emphasized that critique sessions guide them to think critically. Some of the evidence about the critique session mentioned by IDS 07 and IDS 09, respectively:

*[...] I think the most impactful thing is what I think... is ... if we... we **go to crit**, right... when crit design, what is it... the lecturer is not a spoonfeed solution, but... he **lets us think** about it too... [...](48:10,p2- IDS 07)*

*[...] it's the critique session, I think the **critique session** really helps us to **get the critical thinking** [...] (50:11,p3- IDS 09)*

During these sessions, students present their work and receive constructive feedback from both educators and peers.. Megayanti, T., Aryanti, T., & Dewi, N. I. K. (2019) stressed that critique sessions enable students to assess their ideas, sharpen their critical thinking skills, and learn how to adapt and refine their designs.

Questioning method is one of the method that stimulate the critical thinking skills. According to Snyder, L. G., & Snyder, M. J. (2008) critical thinking instruction employs questioning techniques to encourage students to analyze, synthesize, and evaluate information to solve problems and make decisions, rather than simply memorizing. The finding reveals students believed that educators' practice of consistently asking questions further in studio encouraged them to think more critically. This evidence can be seen in Figure 4.21, mentioned by IDS 01 and IDS 06, represented by Document, Quotation, and page (42:6, p2) and (47:3, p2), respectively:

*[...]not yet, but once the brainstorming starts, that's when the critical thinking begins to emerge. It's like I start thinking, "**Oh, why is that? Where is it? How does it work?**" [...]( 42:6,p2 - IDS 01).*

*[...] they also question us **in return, asking, "What are you doing?"** [...] (7:3,p2-IDS06).*

Students noted that this questioning approach often took place during critique sessions or lectures in the studio, prompting more profound engagement with the topic or subject matter. This is supported by Yurtsever, B. (2017) the cultivation of critical thinking skills will start with exercises that highlight the importance of inquiry.

Another technique employed by educators under collaborative learning is industry engagement. A sample of evidence of participant-related industry engagement is shown in Figure 4.7, mentioned by Participant 10, Quotation 25, Page 8:

*[...] we want students, you go find them. Sometimes if we know people in the industry, you **go meet people in the industry** and say I told you to meet themf...] (10:25, p8-IDL 10)*

The industry professionals that educators are referring to include university practitioners and professionals from both public and private agencies. Educators constantly encourage students to learn more from appropriate individuals in real-world scenarios, as they feel their expertise is limited. This shows that industry engagement can help educators align curriculum content with professional expectations, emphasizing the significance of critical judgment in design decisions.

The interview responses from educators discovered that methods of teaching such as group discussions, debates, peer brainstorming, critique sessions, and industry expert knowledge sharing are implemented by educators in teaching and learning activities. These activities encourage dialogue, inquiry, and authentic engagement, allowing students to explore multiple perspectives and apply critical judgment in professional settings. Aligned with Vygotsky's Sociocultural Theory and collaborative learning pedagogy, these approaches view critical thinking as a shared, negotiated, and context-responsive process essential for professional interior design practice.

#### *4.4.2.3 Reflective Learning*

The third subtheme under the teaching approach, as emphasized by educators, is reflective learning. According to Moon, J. (2007), reflective thinking is critical when considering self, focusing on a specific characteristic or activity with the aim of improvement. There are three teaching strategies employed by interior design educators that encourage reflective learning: mind mapping, the questioning method, reflective dialogue, and doing research.

Data analysis shows that educators most frequently use the questioning method to encourage students to think more critically. About nine out of seventeen participants shared that they always used this method to spark students' thinking. Dalim, S. F., Ishak, A. S., & Hamzah, L. M. (2022) emphasized that through consistent questioning, students can develop self-generated knowledge and regulate their thoughts. The

examples of this method were mentioned by participant DDL 10 and IDL 13, respectively:

*[...] even in class, when **we ask a question...** for example, when we ask... we ask what you understand about the subject matter [...] (10:28, p 6- IDL 10)*

*I think the method of encouraging students is we always ask **them to ask questions**. But then if he's a questioner, we always answer with another question, which means we won't give a straight answer [...] (13:4, p2-IDL 13)*

This method allows them to assess students' understanding of the subject matter or the project at hand. Questioning enables students to express their current understanding of a subject, connect with other ideas, and become aware of their knowledge gaps. These questions aim to direct students' thought processes, encouraging more profound analysis and critical reflection (Rahman, Z. A., 2014). According to Snyder, L. G., & Snyder, M. J. (2008), instruction that fosters critical thinking incorporates questioning techniques that encourage students to analyze, synthesize, and assess information to solve problems and make informed decisions, rather than simply recalling and repeating it.

Apart from that, interior design educators pointed out that they always tell their students to do research before coming out with the solution. Figure 4.8, as mentioned by Participant DDL 07 :

*[...] we ask him **to do the research** towards the problem... find... literature has sources rather than literature has sources first [...] (7:26, p3-IDL 07)*

Landa-Blanco, M., & Cortes-Ramos, A. (2021) suggested that research is beneficial in promoting empirical epistemic values and fostering critical openness. Figure 4.9 displays about eight participants shared that they encourage their students to do research in cultivating them to think critically towards their project. Through this method, educators aim to equip students with evidence-based design choices, such as user needs, spatial analysis, case studies, and sustainability data, to align with real-world design practice.

Furthermore, interior design educators also highlighted that the mind mapping method has always been incorporated into their teaching to encourage their students to think critically. According to Oxman, R. (2004), a concept map is a graph-like

representation of knowledge structures, consisting of nodes representing conceptual elements and links representing the relationship between nodes, which may or may not be labelled to describe the type of information. About seven out of 17 participants mentioned that mind mapping is one of the methods they used in the interior design studio. Mind mapping is a visual tool that aids students in organizing information, analyzing, understanding, synthesizing, recalling, and generating new ideas by merging texts, graphics, and images into a unified diagram (AboWardah, E. S., 2020). A sample of evidence of participant relation to mind mapping mentioned by Participant DDL 13:

*[...] so normally we ask them to come out with a **mind map**., it's calm that everyone has an opinion about things [...] (13:6, p4-IDL 13)*

Alsabban, H., & Farouq, R. (2021) found that critical thinking could be fostered through the mind mapping task. Educators believe that mind mapping allows students to visualize the relationships between key concepts, ideas, and projects more easily. They believe it helps students to translate abstract ideas into cohesive concepts that guide their design solutions. Finally, some participants shared that they encourage to involve in reflective dialog

In summary, this study discovered three teaching approaches commonly practiced by them, including experiential learning, collaborative learning, and reflective learning, which align with constructivist and sociocultural learning theories like Kolb's Experiential Learning Theory, Vygotsky's Sociocultural Theory, and Schon's Reflective Practice Model. These strategies cultivate critical thinking through real-world engagement, peer interaction, and self-directed reflection, indicating that critical thinking is not a discrete skill but an intentional pedagogy embedded in the design studio culture.

#### **4.4.3 Theme 3: Implementation of Critical Thinking in Design Project**

The finding from document analysis exposed that critical thinking promoted in the portfolios of interior design students. The research utilized these portfolios to examine how critical thinking elements are reflected in the students' work. According to Kanik, F. (2010), critical thinking can be assessed using various methods, including portfolios, open-ended questions, essay questions, multiple-choice exams, and non-intrusive techniques. Additionally, more accurate evaluation results can be achieved through the documentation of actual student portfolios, which develop case histories of

what students can do and have accomplished over time, rather than depending solely on their responses to a standardized assessment administered under artificial conditions at a single point in time (cited by Patton, M. Q.,2015).

A total of three final semesters of undergraduate interior design students' portfolios were analysed. The purpose of document analysis is depth of understanding rather than representativeness through quantity. The selection of three student design portfolios was guided by purposeful sampling, which aims to identify cases that are most relevant to the research questions and capable of providing rich evidence of critical thinking elements within studio-based design outputs. Thematic coding was employed, guided by the six core critical thinking skills as outlined in the critical thinking skills (Facione, P.A., 1990), including interpretation, analysis, evaluation, inference, explanation, and self-regulation. The project students' portfolio was collected from final-year project students with consent of their respective educator.

The findings reveal the critical thinking skills applied in students' design portfolios. The Critical Thinking Skills (Facione, P.A., 1990) identifies five critical thinking skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. The students' design portfolios clearly demonstrate these skills. However, this study only identifies the types of critical thinking elements applied and does not measure the level of skills practiced by the students.

#### ***4.4.3.1 Interpretation skill***

The content analysis found the interpretation skills promoted in the student's design portfolio. Interpretation skills refer to the ability to express an article in one's own words or to identify its main ideas. Facione, P. A. (1990). Sharif, H. R., Abhar, H., and Goudarzi, F. (2014) identified interpretation as one of the most vital skills in architectural design thinking. This skill plays a significant role in the transformation phase, where conceptual models evolve into design models.

The document analysis reveals that interpretation skills are promoted through problem identification, the identification of main points in precedent studies, and the interpretation of site context, as shown in figure 4.33.

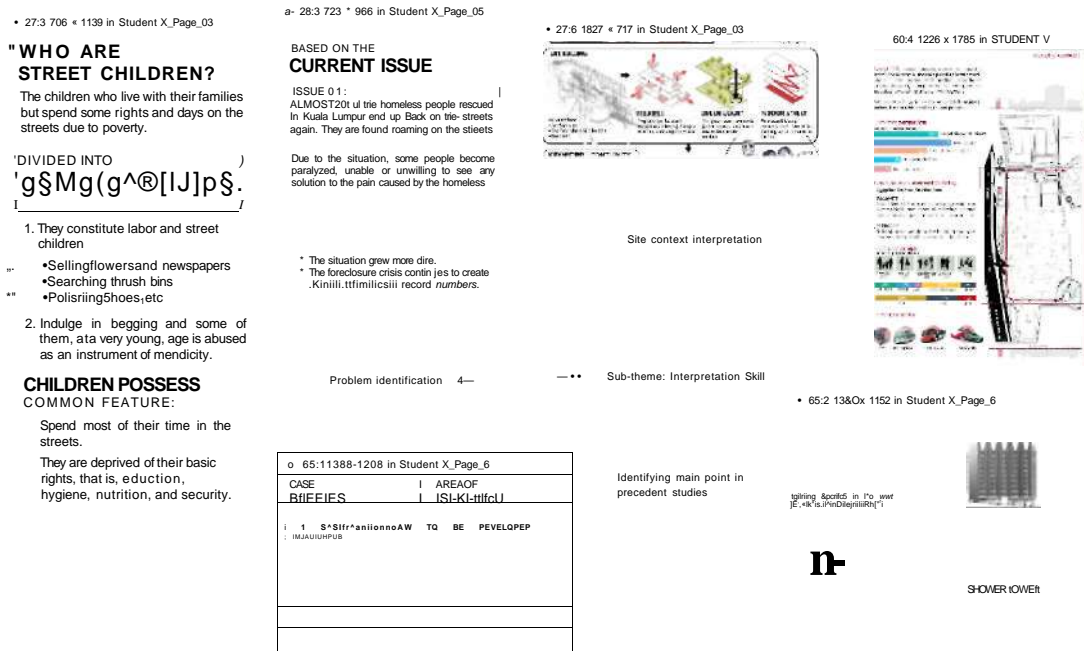


Figure 4.2 Network of Sub-theme of Interpretation Skill Generated from ATLAS.ti software Version 23

A sample of evidence on the student-identified problem in the project can be seen in Figure 4.2. Document 27, Quotation 8 (27:8\_Student X, Page 03) and Document 28, Quotation 3 (28:3\_Student X, Page 05) revealed a critical engagement with the design brief and broader societal issues. Through visual and textual analysis, it was evident that the student framed the issue not just descriptively but evaluatively, posing the question, "But what if there's no action?" This reflects an emerging capacity for problem framing and critical reflection, which is a key aspect of interpretation skill in design thinking.

The semi-structured interview with students also exposed that students' participant shared that understanding the client brief and identifying problem encourages them to think more critically. Figure 4.2, mentioned by DDL 01 and IDS 08, respectively, is represented by Document, Quotation, and Page (42:7, pi) and (50:1, pl): The sample of evidences of students going through this process mentioned by IDS 01 and IDS 09, respectively:

*[...] it's like... the client... Then, we identify their issues... and after that, we will brainstorm with my lecturer, um... From those issues, and then... for future... um... how to say it... From those issues, we think about future designs [...] (42:7,pi- IDS 01)*

*f...]we have to **think about what the client wants**. So think about what...  
what can save money like... what materials should the client use to save  
money?[...] (50:1,pi- IDS 09)*

Conceptualization, as noted by Soliman, A. M. (2017), is one of the processes involved in the design process, along with preliminary design, initial drawings, drawing relationship programs, and design sketches. Students highlighted that they demonstrated critical thinking during the conceptualization phase, which involves developing ideas from a selected subject matter.

The student also demonstrated interpretative ability in analyzing the site context evidence in Figure 4.2, represented by Document 27, Quotation 6 (27:6\_Student X, Page 03). The drawings presented spatial strategies such as "Flexible Use," "Green Court," and "Indoor Street" that indicating a thoughtful response to both the physical and socio-cultural environment of the site. These interpretations reflect an integration of design logic with environmental and human-centric considerations, which is vital in nurturing critical thinking within design education.

While evidence of identifying the main point from precedent studies is represented in Figure 4.2 by Document 65, Quotation 2 (65:2\_Students X, Page\_6), which focuses on the application of various sustainable technologies, this aligns with Facione, P. A. (1990). He described an activity involving interpretation as the ability to identify the main point from an article. In these instances, students can extract the main idea of the shower tower concept, represented by the inverted umbrella in the precedent study. Here, the student analysed considerations and design needs, demonstrating an ability to derive key lessons from case studies. This skill of identifying relevant insights from existing projects is essential for informed design decisions and reflects higher-order cognitive engagement with precedents.

Additionally, some students stressed that teaching activities, including mind mapping and idea interpretation encouraged by educators, make them think critically about the subject matter. According to AboWardah, E. S. (2020), a mind map is a visual tool that integrates text, graphics, and pictures into a cohesive spatial structure. These activities contribute to the reflective learning goal of developing critical thinking skills. Evidence of students mentioning they were involved with mind mapping displays in Figure 4.2, mentioned by IDL 04 and IDS 07, respectively, is represented by Document, Quotation, and Page (42:9, p4) and (48:6, p3):

*[...] what I read, I extracted the keywords to **create a mind map** [...]*  
(45:6,p4-IDS04)

*[...] we did the assignment based on the song... and then came up with the  
keywords [...] we must take it out ourselves to **make a mind map** [...]*  
(48:6,p3-IDS07)

This is aligned with a study by Afify, H. M. N., et al. (2020), which found that students with weak grades in the first semester improved in the second semester using model-making strategies, leading to higher course grades. These strategies improved dialogue, critical thinking, and active participation, creating an enhanced learning environment.

#### **4.4.3.2 Analysis skill**

The second critical thinking skill evident in students' design portfolios is analysis. According to Critical Thinking Skills (Facione, P. A. ,1990) analysis skill involves identifying similarities and differences among arguments or recognizing problems using graphs or images. The findings indicate that students actively engaged in analytical skills by analyzing precedent studies and spatial relationships, both of which are crucial for effective decision-making in interior design, as illustrated in Figure 4.3. The portfolios of interior design students demonstrate their analytical capabilities through their examination of spatial relationships, precedent studies, and site analysis.

Figure 4.34 illustrates the evidence of spatial relationships gathered during the project's programming phase. Students engaged in an in-depth exploration of spatial zoning and adjacency planning, demonstrating higher-order analytical thinking. This understanding is evident in Figure 4.34, specifically in Document 1, Quotation 4 (61:4, Student Y), which analyses the flow and hierarchy of spaces in a spatial zoning context. It shows how various areas interact based on user function and accessibility. This work highlights the students' ability to evaluate spatial logic, which is crucial for ensuring that both form and function meet user needs.

While the students analysed the precedent studies illustrated in Figure 4.3, as represented in Document 60, Quotation 1 (60:1, Student Y), they were able to break down various criteria in these studies, such as main spaces, backhouse spaces, activities,

and available facilities. This analysis helps understand the function of a precedent, its intended audience, and potential elements that could be integrated into its design.

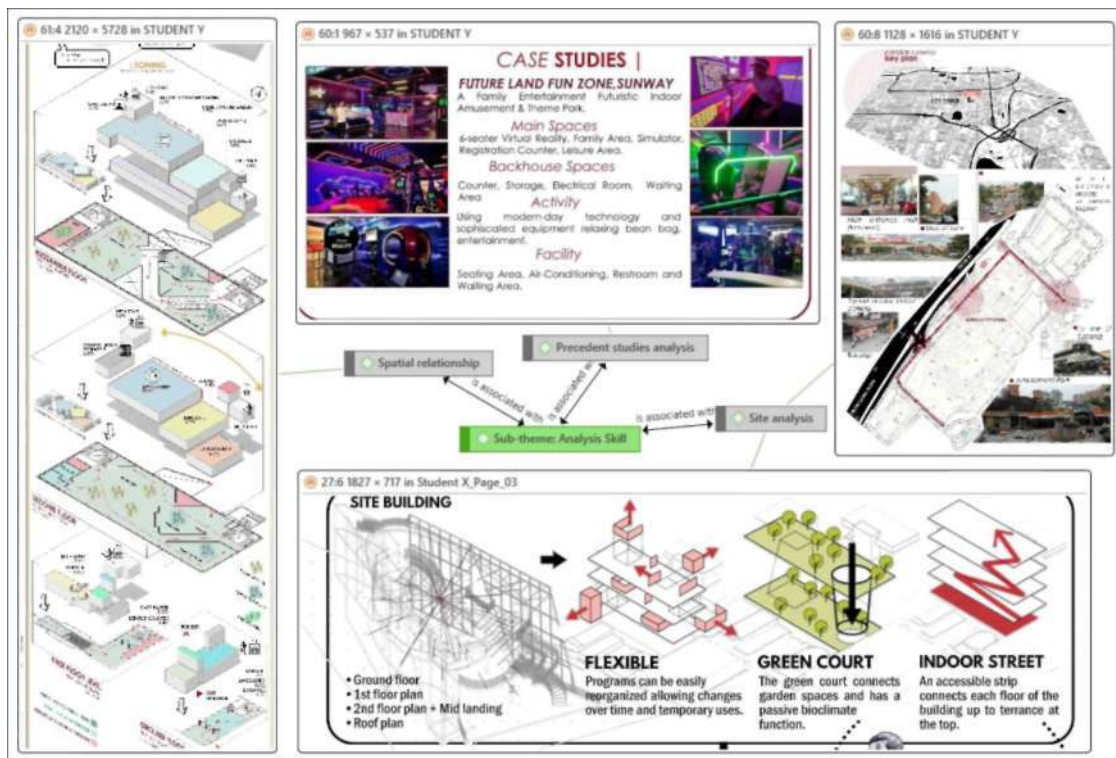


Figure 4.3 Network of Sub-theme of Analysis Skill Generated from ATLAS.ti software Version 23

These findings confirm that analytical skills in interior design education are evident in students' abilities to investigate, interpret, and apply design data to inform spatial decisions. These abilities are hallmarks of critical thinking in the design process.

#### 4.4.3.3 Evaluation skill

Evaluation skills encompass the ability to assess the reliability of sources cited by an author and to analyze and compare conflicting statements (Facione, P. A., 1990). Ghadi, I. N., Bakar, K. A., Alwi, N. H., and Talib, O. (2013) suggest that interpretation involves evaluating the effectiveness and reliability of a statement, as well as assessing the strength of its arguments and proposed solutions. In the field of interior design, evaluation skills are demonstrated through students' abilities to judge, prioritize, and refine ideas based on design objectives, user needs, and contextual constraints, as shown in Figure 4.4.

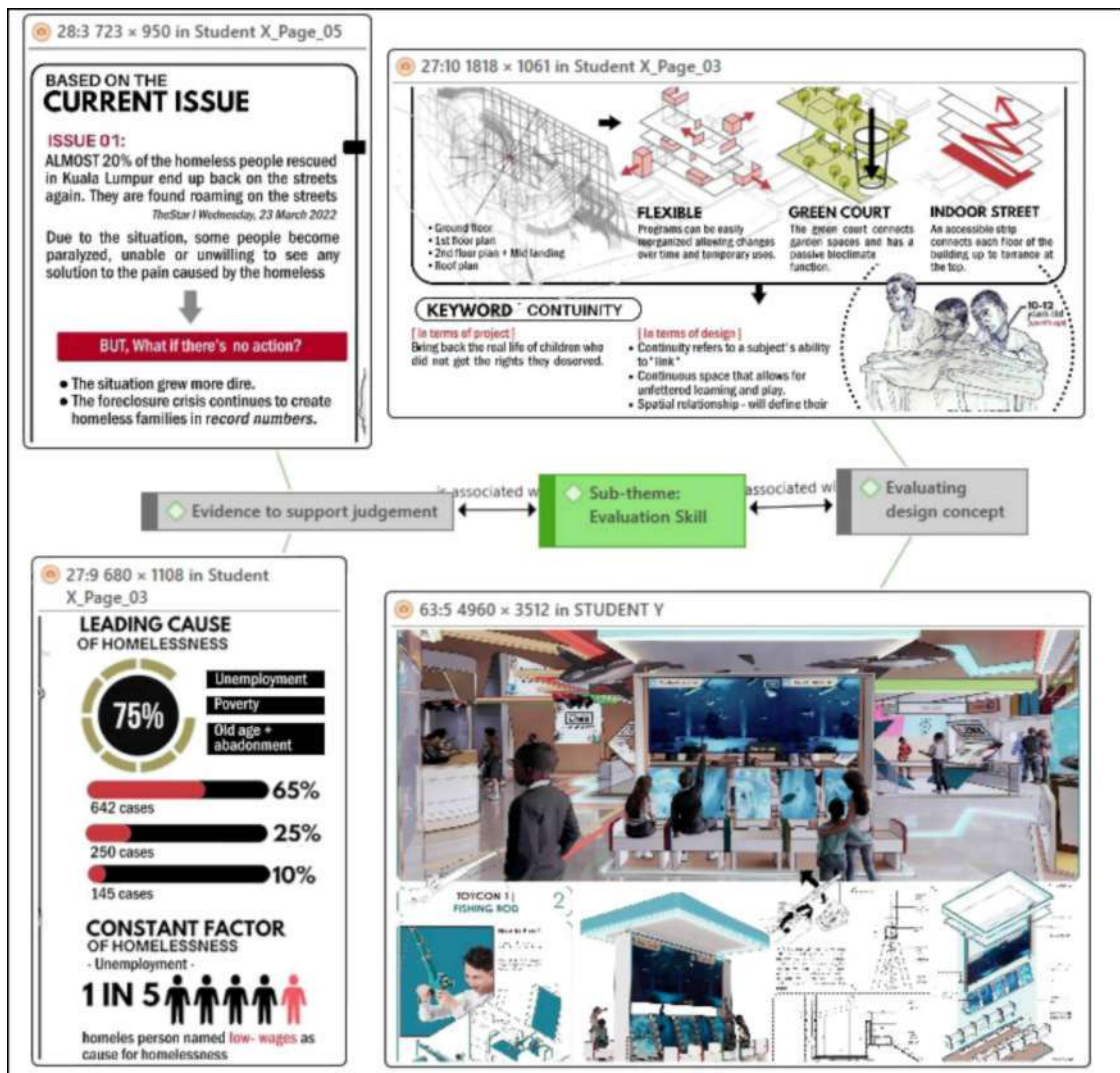


Figure 4.4 Network of Sub-theme of Evaluation Skill Generated from ATLAS.ti software Version 23

The evidence supporting the judgment is presented in Figure 4.4 Document 17, Quotation 9 (27:9, Students XPage 3), which focuses on research-driven problem framing. The student included statistical data that identifies the primary causes of homelessness: unemployment (65%), poverty (25%), and old age or abandonment (10%). This information is accompanied by a visual infographic. Additionally, a news excerpt underscores the persistent issue of homelessness in Kuala Lumpur, emphasizing the urgency of addressing this matter. The student utilized this data to shape the project's social focus on enhancing the lives of children impacted by homelessness.

Next, the evaluation of the design concept was evident in Document 27, Quotation 10 (27:10, Students XPage 3), particularly in how spatial strategies were proposed and critiqued for their potential effectiveness. Student X conceptualized spaces that included flexibility, the integration of green courts, and indoor streets to

support continuous learning and play, directly linking these elements to the identified social issue. This section demonstrates a thoughtful process of assessing whether the proposed spatial arrangements could achieve the intended social and functional outcomes.

Similarly, Student Y demonstrated evaluation skill in an aquarium-themed interactive installation concept as evidenced in Document 63, Quotation 5 (63:5, Student Y). The student supported the design intent with experiential renderings, functional drawings, and construction details, which were assessed against the aim of engaging visitors and delivering educational value. The inclusion of both visualization and technical detailing reflects a balanced judgement between aesthetic appeal and practical feasibility. Overall, the students' design portfolio demonstrates students' use of evaluation skills by substantiating their design decisions with verifiable evidence and evaluating the effectiveness of their design concepts against project objectives.

#### *4.4.3.4 Inference skill*

Inference is the ability to predict future outcomes based on available information (Facione, P. A., 1990). The evidence presented in this analysis falls under the sub-theme "Inference Skill" and encompasses drawing design direction based on evidence and proposing logical design decisions within interior design projects. Students demonstrate their use of inference skills in their interior design portfolios by predicting user experience and forecasting functional performance, as illustrated in Figure 4.11.

As illustrated in Figure 4.5, students demonstrated the ability to predict user experiences, as shown in Document 29, Quotation 7 (29:7, Student X, Page 11). Student X suggests that atrium concepts, which utilize natural light, air circulation, and water recycling, can teach important lessons about recycling, conservation, sustainability, biology, environmental science, and the ecosystem cycle. Similarly, evidence in Document 63, Quotation 7 (63:7, Student Y), indicates that Student Y envisions a fishing game where the user inserts a fishing rod into a designated slot in a box. This rod is connected to a switch that activates the screen, allowing the user to engage with the game.

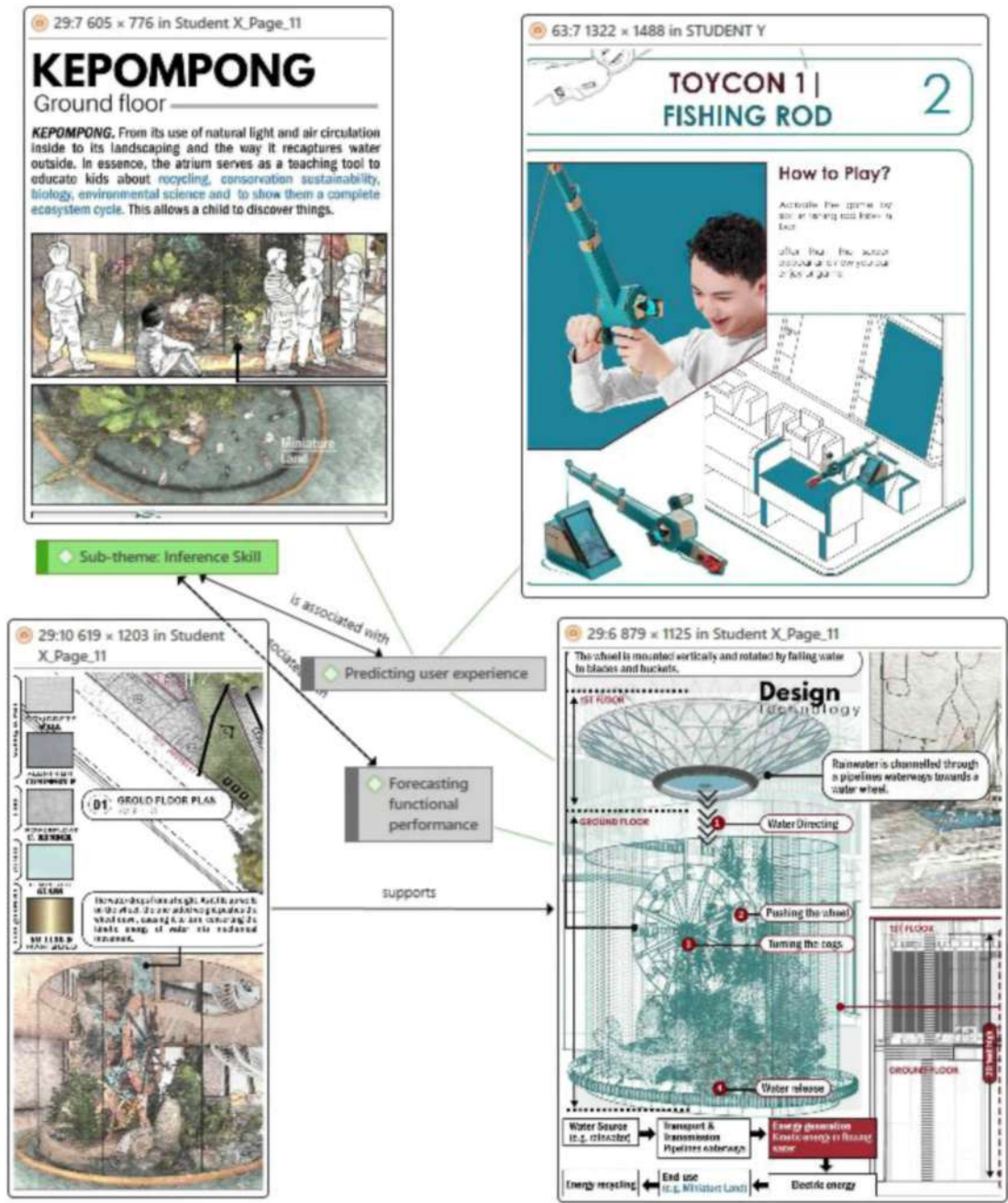


Figure 4.5 Network of Sub-theme of Inference Skill Generated from ATLAS.ti software Version 23

Furthermore, students strengthened their inference skills by predicting functional performance, as shown in Figure 4.5. Document 29, Quotation 6 (29:6, Student X, Page 11). Student X can estimate the conversion of kinetic energy into electrical energy based on factors such as the water flow system, blade size, and wheel rotation mechanism. Students infer how the collection of rainwater and the generation of energy will reduce reliance on external electricity sources.

Students demonstrate inference skills in their portfolios by predicting the user experience and functional performance of their designs. They logically extend available information, such as site data, user needs, and precedent analysis, to anticipate design outcomes. This higher-order thinking supports design decisions with well-reasoned projections of real-world scenarios, demonstrating their ability to anticipate design outcomes.

#### *4.4.3.5 Explanation skill*

Explanation is the skill of being able to present an argument using one's own words seeking the best understanding or the ability to illustrate to someone a problem using one's own words to reach the maximum understanding of the problem (Facione, P. A., 1990). This skill is particularly important in interior design education, where articulating the rationale behind design choices is essential. Effective communication in this field typically encompasses both visual and written forms. Student portfolios demonstrate the capacity for explanation through two main components: the design rationale and the visual/written presentation.

Students demonstrated their ability to explain and justify the design direction based on symbolic, functional, and aesthetic reasoning, as illustrated in Figure 4.6. Evidence of students showcasing their explanation skills through both visual and written presentations can be found in Document 29, Quotation 12 (29:3, Student X, Page 11). The butterfly life cycle served as the inspiration for their visual and written design narrative. The student effectively communicates the concept using natural metaphors, visual storytelling, and direct connections between the life cycle and design performance. Students explained:

*Same goes to the atrium, life will only began with the presence of rainwater  
. The atrium area will be alive with lighting and movement produced by  
kinetic energy in the flowing water. (29:12, Students X Page 11)*

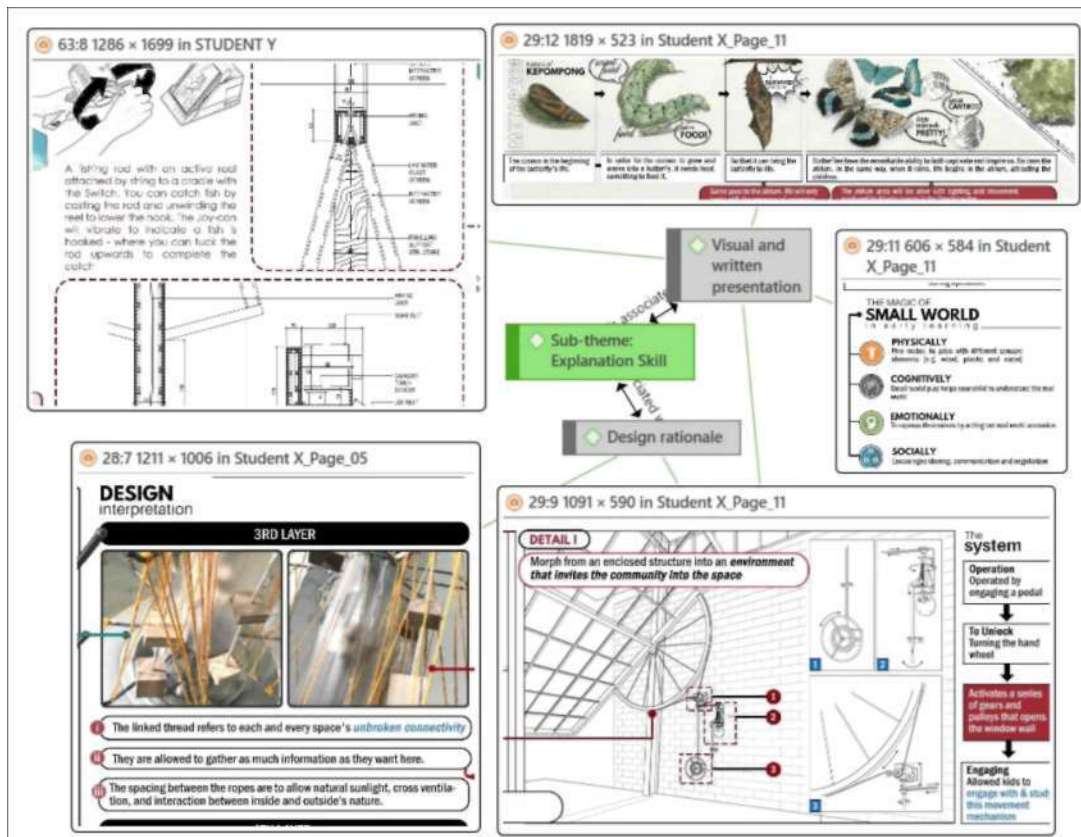


Figure 4.6 Network of Sub-theme of Explanation Skill Generated from ATLAS.ti software Version 23

The evidence presented in Figure 4.6, Document 63, Quotation 8 (63:8, Student Y), demonstrates that Student Y effectively visualizes the details of design mechanisms, accompanied by a written explanation. This reflects a solid understanding of how concepts translate into spatial experiences. These examples underscore the students' capacity to articulate the conceptual basis of their designs through narrative and metaphorical connections, reinforcing the role of explanation as a vital component of critical thinking. Beyond written justification, students employed visual techniques, such as detailed drawings and sequential storytelling, to communicate their ideas effectively.

Students also showcase the design rationale in their design portfolios. Evidence of this can be found in Document 28, Quotation 7 (28:7 Student XPage 05), which offers a visual and written explanation of the design rationale as follows:

*The linked thread refers to the each and every space's unbroken connectivity.. User allowed to gather as much information they wanted. The spacing between the ropes are to allow natural sunlight, cross ventilation, and interaction between inside and outside nature. (28:7 Student XPage 05),*

The clarity and integration of diagrams and texts demonstrate the student's capability to explain design strategies and functionality comprehensively. Additionally, Document 29, Quotation 9 (29:9, Student X, Page 11), includes detailed technical annotations and labeling to illustrate the mechanism of the window wall, showing a step-by-step depiction of its operating system. This highlights the student's attention to technical detail and the rationale behind the spatial solution. Furthermore, Student X justified the rationale for the window wall design by explaining its purpose and functionality as follow:

*Morph from an enclosed structure into an environment that invites the community into the space (29:9, Students X Page 11)*

The findings reveal that explanation skill, as conceptualized by Facione, P.A (1990) is well demonstrated in students' portfolios. Through symbolic storytelling, visual representation, and technically detailed annotations, students exhibited the ability to justify, clarify, and present their design rationale effectively. These elements are fundamental in nurturing critical thinking in interior design education. In conclusion, students' interior design portfolios exhibit core critical thinking skills, including interpretation, analysis, evaluation, inference, and explanation in their interior design portfolios. These skills, based on Facione's model, demonstrate creative design outcomes and structured, reflective, and evaluative reasoning.

#### ***4.4.3.6 Self-Regulation Skill***

Self-regulation skills involve the consistent ability to assess and eliminate bias in opinion. This competence is a critical skill emphasized by the American Psychological Association (APA) (Facione, P. A. ,1990). Allamnakhrah, A. Y. (2013) noted that self-regulation includes several sub-skills, such as self-examination and self-correction. Students exhibit these skills through independent research activities, including the analysis of case studies and the setting of goals based on project briefs.

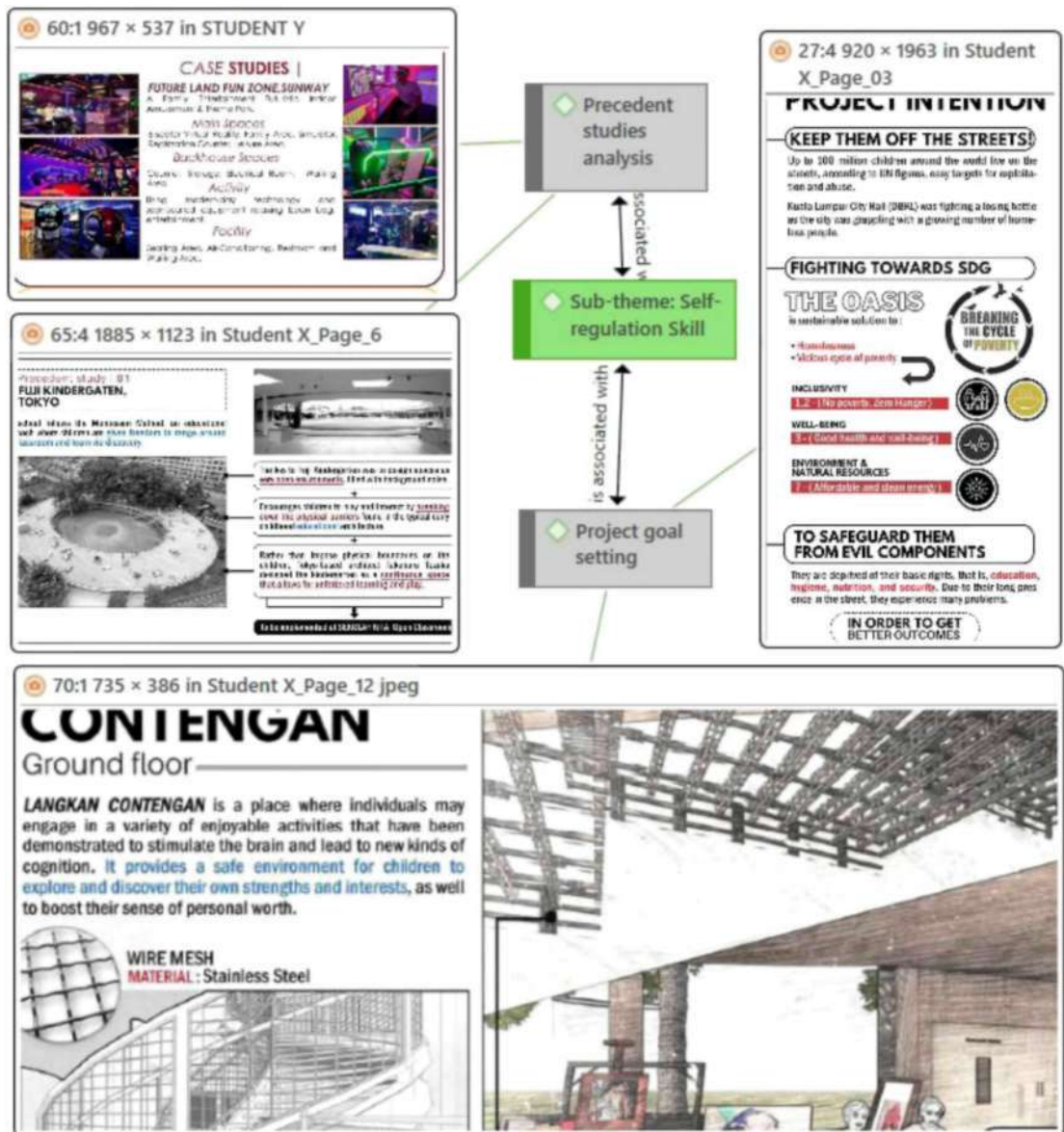


Figure 4.7 Network of Sub-theme of Self-regulation Skill Generated from ATLAS.ti software Version 23

Independent studies of precedent cases enable students to apply these skills. Students regulate their decision-making based on information gathered from these case studies. Evidence of such competence can be seen in Figure 4.7, which includes Document and Quotations (60:1) and (65:4), respectively. Moreover, students promoted self-regulation by outlining their project statements in the portfolio and explaining whether the results aligned with the original goals. This evidence presented in Figure 4.7 is represented by Document 27, Quotation 4 (27:4), where students expressed the intention of the project, and Document 70, Quotation 1 (70:1), which illustrates how the outcome met the project goal.

In summary of theme 10, the findings demonstrate that all six core critical thinking skills (Facione, P.A,1990), such as interpretation, analysis, evaluation, inference, explanation, and self-regulation, are evident in students' design portfolios. The findings reveal that undergraduate interior design students demonstrate a holistic use of critical thinking skills across their design process. The integration of these skills reinforces the alignment between critical thinking and design thinking, positioning the portfolio as both a reflective learning tool and an assessment instrument for evaluating higher-order cognitive engagement.

#### **4.5 Research Question 4: What are the challenges that hinder the development of critical thinking skills in an undergraduate interior design program?**

Research objective four aims at examining the challenges that hinder the development of critical thinking in the interior design program. The findings from the triangulation of data from semi-structured interviews with students and educators as well as document analysis revealed four main themes and nine sub-themes related to challenges that impede the development of critical thinking in interior design studios, namely 1) students' barriers, 2) educators' barriers, 3) instructional alignment barriers, and 4) institutional support barriers, as shown in Figure 4.10 below.

Table 4 10  
Themes and Sub-theme of Research Question 3

Theme	Sub-themes
1) Student's Barriers	<ul style="list-style-type: none"> <li>• Course Learning Outcome</li> <li>• Instructional Strategies</li> <li>• Assessment design</li> </ul>
2) Educator's Barriers	<ul style="list-style-type: none"> <li>• Experiential learning</li> <li>• Collaborative learning</li> <li>• Reflective learning</li> </ul>
3) Instructional Design Alignment Barriers	<ul style="list-style-type: none"> <li>• Implicit Critical Thinking Stated in Course Learning Outcome</li> <li>• Absent Critical Thinking Oriented Assessment tools</li> </ul>
4) Institutional Barriers	<ul style="list-style-type: none"> <li>• Limited Facilities</li> <li>• Budget Constraint</li> <li>• Time Constraint</li> <li>• Limited Resources of Critical Thinking</li> </ul>

#### 4.5.1 Theme 1: Student's Barriers

The triangulation of data from semi-structured interviews with interior design students and educators revealed a gap in students' barriers related to a lack of knowledge about critical thinking concepts and dispositions. This conclusion is mirrored in a study by Franklin, E. I., et al. (2022) that many students express disinterest in critical thinking, often due to a lack of familiarity with the concepts involved. Chapter 4.3.1 has previously addressed the deficiency of critical thinking knowledge among students. This constitutes a barrier from the students' perspective that impedes the development of their critical thinking abilities. This part only addressed the student's challenges to the absence of critical thinking disposition. Facione, P. A. (1990) report outlined various dispositions, such as open-mindedness, truth-seeking, self-confidence, willingness, cognitive maturity, and inquisitiveness. Semi-structured interviews with educators and students revealed that students' barriers related to disposition, such as low self-confidence, a failure to seek truth, a lack of inquisitiveness, and cognitive immaturity, impede the development of critical thinking in the interior design program.

##### 4.5.1.1 Lack of Critical Thinking Disposition

The findings revealed that educators and student participants emphasize the lack of self-confidence among students that becomes a challenge to practice critical thinking in the interior design studio. Ghadi, I. N. M. (2013) defined self-confidence as having trust in one's own reasoning abilities rather than relying on the views or techniques of others to address a situation. However, the study found that students lack this ability.

The sample of quotation mentioned by educators on the student lack of confident level mentioned by Participant DDL 09 and IDL 12:

*[...] they **don't have the confident level...** because they shy ... over... over shadow... his physicality [...]* (9:18, p5-IDL 09)

*[...] from a critical perspective, what can I say... because students these days are hard... They don't talk much. They're **quite passive**, aren't they? [...]* (12:5, p4- IDL 12)

Similarly, students' shared that they have lack of self-confidence and inquisitiveness hindered the development of these skills. A sample of evidence related to self-confidence and inquisitiveness mentioned by IDS 06 and IDS, respectively:

*[..]fear of being wrong, fear of people not understanding that our life experiences with other people are different [...J (47:6,p3 -IDS 06)*

*[...] because maybe I don't have the knowledge.. It's not that I don't have the knowledge., **it's just that I haven't done the research** [...J (42:11 p 4-IDS 01).*

Furthermore, educators emphasized that students have less of the truth-seeking attribute. Ghadi, I. N. M. (2013) defined truth seeking as the courageous pursuit of optimal solutions or knowledge, influenced by personal beliefs or backgrounds. This study found that poor reading habits and lack of initiative and engagement relate to truth-seeking habits, which hinder the development of critical thinking in the interior design program. This evidence is mentioned by DDL 10 and DDL 11:

*[..] because if we look at us as students, when the student...if we ask for an A, he will give an A. He won't... he won't... **he won't give an ABC**. So that... that is also one of the real challenges for lecturers, but in the context of the students [...J (10:12, p4-IDL 10)*

*[..] it means **he doesn't read**, he just takes pictures, especially for Pinterest, just takes pictures [...] (11:6, p3-IDL 11)*

The data analysis of semi-structured interviews with students supports that student have poor truth-seeking ability. A sample of evidence of this skill mentioned by IDS 01 and IDS 04:

*[. J **sometimes I don't think critically**, I just do it as I 'm playing around... [...J (45:8,pl-IDS 04)*

*[..] we want to see exactly **what it is in on Pinterest** [...] (42:15,pl-IDS 01)*

The findings show that students have a low ability to seek the truth, as they show little interest in deep investigation and often copy design ideas from sites like Pinterest without thinking critically or doing proper research to back up their design decisions.

Inquisitiveness is another attribute of the critical thinking disposition mentioned by students and educators. Ghadi, I. N. M. (2013) refers to inquisitiveness as the curiosity and eagerness to learn more even if the knowledge is not immediately apparent. The sample evidence from educators on this attribute mentioned by DDL 10 andIDL 12::

*[...]you have to do research,... have to read, nut students do not do it [...]*  
(10:16,p5-IDL10)

*[...]I see that our students do not read much [...]* (12:4, p2-IDL 12)

The analysis of interview responses also revealed that the students reported a lack of interest in participating in research and engaging in critical thinking, as they prefer faster results. Sample of responses by students mentioned by IDS 01 and IDS 10:

*[...] because maybe I don't have the knowledge.. It's not that I don't have the knowledge., **it's just that I haven't done the research** [...]* (42:11 p 4-IDS 01).

*[...]I want to make the work easier. One more thing... **I want the process to be faster** [...]* (51:15, p6- IDS 10)

The findings indicate that students' lack of curiosity, shown through minimal reading and superficial research, reflects a weak critical thinking disposition rather than just a lack of cognitive skills. Facione,P.A (1990) says that critical thinking depends on traits like curiosity and open-mindedness that promote ongoing questioning and reasoning based on evidence. In interior design education, reliance on visual references without deeper investigation limits students' truth-seeking behavior and intellectual curiosity. This restricts their willingness to question design assumptions and develop critical thinking skills meaningfully. Therefore, fostering critical thinking in this context requires both pedagogical strategies and the cultivation of these critical thinking dispositions.

#### **4.5.2 Theme 2: Educator's Barriers**

The study exposed that the development of critical thinking is impeded by the educator-related barriers. Those barriers include the lack of critical thinking training provided and the lack of coordination among educators. This finding aligned with the study by Franklin, E. I., Iwu, C. G., & Dubihlela, J. (2022): many educators lack a solid foundation in critical thinking, which hinders their ability to effectively transfer expertise to students, according to student observations.

#### 4.5.2.1 Lack of Critical Thinking Training

The data analysis from the semi-structured interview with educators revealed that interior design educators lack training on critical thinking. Participant DDL 03, represented by Participant 3 in Figure 4.14 and Quotation 9 on page 4, shared that he never received any training specifically focused on critical thinking. He developed his knowledge of critical thinking through reading and observing his surroundings. Samples of evidence shown in Figure 4.15 related to lack of training among educators mentioned by DDL 07 and DDL 10, represented by Document, Quotation, and Page (7:23, p. 11) and (10:26, p. 9), respectively:

*[...] there hasn't been any direct training... we've never had training specifically aimed at developing critical thinkingf..] (7:23, p11-IDL 07)*

*[...] none at all... I used to teach at a private university college, so I understand how the processes differ, right?[...] (10:26, p9-IDL 10)*

Many of the educator participants conveyed that they had not received any critical thinking training since beginning their teaching careers. Most of them became aware of these skills through their previous academic or professional experiences.

#### 4.5.2.2 Lack of Coordination Among Educators

The coordination problem among educators is another barrier that impedes the development of critical thinking in the interior design studio, as shared by educators in this study context. Responses from interviews with educators' data revealed that five educators noted several of their colleagues prioritize defending their individual "school of thought" over teamwork, which leads to conflicts and a lack of mutual respect.

This disrupts the development of unified teaching approaches and smooth learning progression for students, thus hindering the effective development of critical thinking skills. Additional evidence regarding educators' attitudes is also presented in Figure 4.15, which includes references to DDL 05 and DDL 11, represented by Document, Quotation, and Page (5:9, p3) and (11:14, p5), respectively:

*[...] the problem lies in the attitude of the educators. They don't work together and don't respect each other. **They often blame others** [...] (5:9,p3-IDL05)*

*[...] another thing is... if in our interior design base, we partner... so we need to know our partner too, in terms of understanding the*

*direction, whether it's the same or not. Another thing here... they are very... very concerned because they each have their own school of thought* (11:14 p5-IDL 11)

The lack of collaboration among interior design educators results in mismatched expectations, disjointed learning outcomes, and insufficient alignment across courses. The absence of a unified educational strategy might render critical thinking initiatives unproductive. Furthermore, inadequate training and professional development opportunities lead to many educators lacking essential resources and confidence. Dwee, C. Y., et al. (2016) added that customized professional development programs are crucial for educators to gain a deeper understanding of critical thinking skills and apply instructional strategies to promote these skills in context.

### **4.5.3 Theme 3: Instructional Alignment Barriers**

Instructional alignment barriers are the third theme of challenges that hinder the development of critical thinking in interior design programs. Hokanson, B., Gibbons, A., Thinking, D., & Process, D. (2012) explained that an instructional design outlines the structural nature of the content to be taught, featuring both implicit and explicit divisions of subject matter into units associated with lessons and activities. The finding from document analysis indicates that instructional design implicitly encouraged critical thinking through course learning outcomes, while critical thinking was absent in the assessment tool.

#### ***4.5.3.1 Implicit Critical Thinking Stated in Course Learning Outcome***

The critical thinking skills outlined by Facione, P.A. (1990) are both explicitly and implicitly manifested in the course learning outcomes, as explained in chapter 4.4.1.1. The abilities of interpretation, analysis, and assessment are mostly explicitly articulated in the course learning outcomes, while inference, explanation, and self-regulation are implicitly fostered via the design process inherent in interior design knowledge. This study indicated that the concept of critical thinking abilities should be explicitly stated in the instructional design.

The evidence of critical thinking implicitly encourage in the course learning outcome stated in Document CI621\_6:

*Interpret a schematic design process through space planning, space programming and space visualization in creative presentation composition (CI621\_6)*

#### 4.5.3.2 Absent Critical Thinking Oriented Assessment tools

Critical thinking can be evaluated using various assessment models. According to Ennis, R.H. (1993), critical thinking can be evaluated using various assessment models, including open-ended, multiple-choice, and essay -tested critical thinking and performance assessment. The study by Utami, B., et al. (2019) attempted to detect critical thinking abilities in interpretation using a performance assessment criterion. The indications of critical thinking abilities related to interpretation comprised five elements: interpretation grounded in experience, interpretation derived from facts, interpretation informed by events, interpretation guided by processes, and interpretation based on judgement. The study by Shively, K., et.al, L. D. (2018) offers sample rubrics for independently assessing creative and critical thinking skills.

UNIVERSITY TEKNIK SEPTEMBER FACULTY OF ARCHITECTURE, CIVIL ENGINEERING AND ENVIRONMENTAL TECHNOLOGY PROGRAM: ARCHITECTURE COURSE: ARCHITECTURE SUBJECT CODE: INA 631		CLO 1		CLO 2		CLO 3		CLO 4		TOTAL		GRADE	
NAME	MARK	Development in design ideas and finalisation of site		Design development and detail study or space planning and design setting		Concept development and preparation of presentation and schematic design proposal		Design Presentation and Design communication skills		100%	100%	GRADE	GRADE
STUDENT A		a	b	c	d	Total CLO %	FINAL	GRADE	GRADE				
1.	72	14	74	29	70	21	67	7	72	71.7	B+	-	
2.	76	15	79	31	70	21	72	7	75	75.0	A-	-	
3.	77	15	72	29	77	23	72	7	75	74.5	A	-	
4.	72	14	71	28	72	22	64	6	71	70.7	B+	-	
5.	66	13	66	26	56	17	56	6	63	62.7	B-	-	
6.	55	11	51	20	55	17	53	5	53	53.2	C	-	
7.	0	0	0	0	0	0	0	0	0	0.0	FAIL	F	
8.	60	12	65	26	66	20	71	7	66	65.7	B	-	
9.	63	13	72	29	67	20	68	7	68	68.2	B	-	
10.	72	14	69	28	63	19	68	7	68	67.6	B	-	
11.	71	14	62	25	59	16	52	5	62	61.7	B-	-	
12.	74	15	74	29	72	22	67	7	73	72.7	B+	-	
13.	54	11	51	20	51	15	56	6	52	52.2	C	-	
14.	74	15	73	29	73	22	74	7	73	73.4	B+	-	
15.	57	11	47	19	53	16	57	6	52	52.1	C	-	
16.	73	15	56	23	64	19	56	6	63	62.9	B-	-	
17.	59	12	61	24	63	19	60	6	61	61.3	B-	-	
18.	73	15	73	29	69	21	68	7	71	71.1	B+	-	
19.	53	11	51	20	55	16	56	6	53	53.1	C	-	
20.	60	12	62	25	63	19	58	6	61	61.4	B-	-	

Figure 4.8 Sample of Rubric uses in Interior Design Studio

The finding revealed that the interior design program utilized the rubric as an assessment tool to evaluate students' design projects. Evidence of the rubric used to assess students' abilities is displayed in Figure 4.8, displays the rubric encompasses several criteria, including:

*CLO 1: Development on design scheme and formulation of idea (20%)*

*CLO 2: Design development and detail study on concept planning and design detailing (40%).*

*CLO 2: Drawings, documentation and preparation of presentation and schematic design proposal (30%)*

*CLO 3: Design Presentation and Design communication (10%)*

The currently designed rubric implicitly measures critical thinking quality through the design rationale and creativity while also guiding students in self-evaluating their work, a crucial aspect of self-regulated learning. It lacks explicit terms like "critical thinking," "analysis," "evaluation," "inference," or "reasoning," and does not specify how students will demonstrate or be assessed on their critical thinking processes. There is no specific criteria or descriptor for measurable critical thinking, such as making judgments, justifying decisions, and reflecting on choices. Facione, P.A (1990) asserts that critical thinking must be clearly defined and evaluated by observable behaviors, including making reasoned judgments, offering arguments, and assessing alternatives. Brookhart (2010) asserts that successful rubrics for critical thinking should have specific performance criteria to clarify expectations for students and enable educators to deliver constructive feedback.

In summary, the rubric used in interior design studio promoting critical thinking but lacks clear criteria and terminology, hindering its effectiveness in interior design education. Revising the rubric to include measurable indicators of critical thinking could improve its alignment with educational goals and enhance teaching and learning outcomes.

#### **4.5.4 Theme 4: Institutional Support Barriers**

Apart from students and educators' barriers, educator participants shared that they have less support from institutions to foster critical thinking in the interior design program. Educators describe several barriers, such as less critical thinking exposure, inadequate metrics of assessment, time constraints, lack of facilities, and budget constraints, that hinder the effort to foster critical thinking in interior design programs. This is similar to study by Akhter, A., Parveen, M., Hussain, Y., & Khan, A. (2023) that educators encounter challenges such as time constraints, student cooperation issues,

diversity in mental levels, large class sizes, and insufficient physical resources. These can be addressed through motivation and appropriate teaching methods.

Thematic analysis using ATLAS.ti software version 23 exposed that barriers related to institutional supports are limited of facilities that support critical thinking development, budget constraint, time constraint, and lack of resources as shown in Figure 4.9.

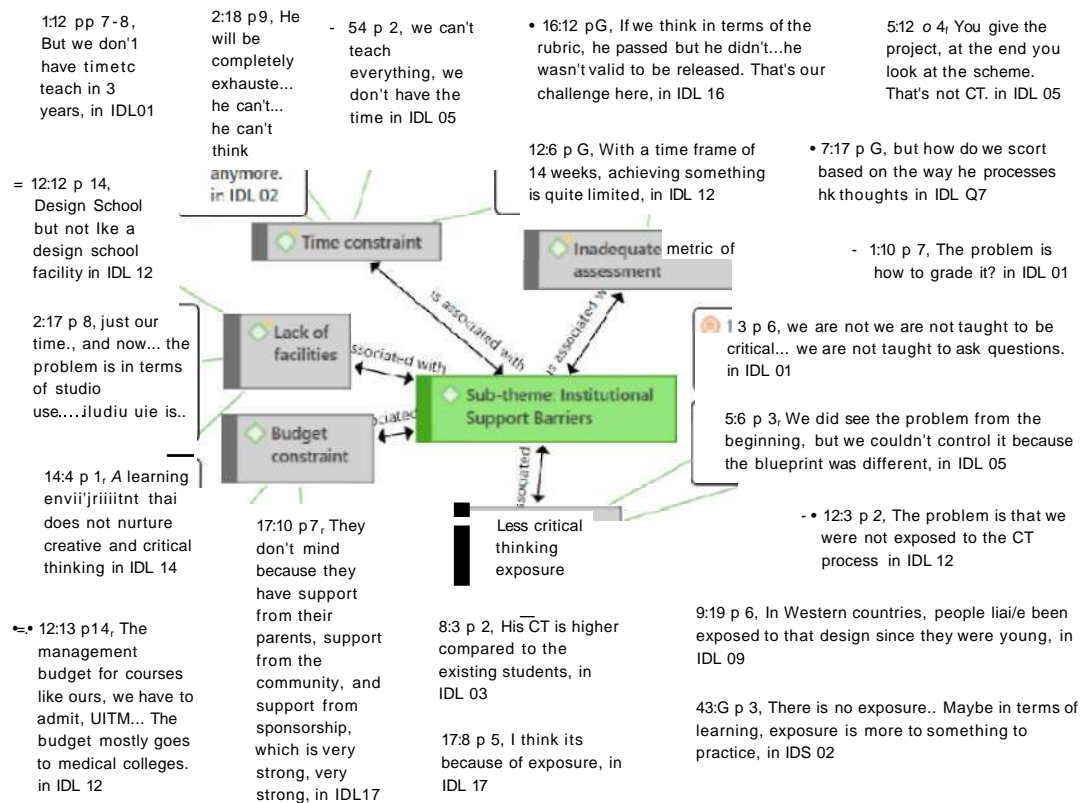


Figure 4.9 Network of Sub-theme of Institutional's Support Barriers Generated from ATLAS.ti software Version 23

#### 4.5.4.1 Limited Facilities

Semi-structured interview with educators described that the lack of facilities support could hinder the development of students critical thinking abilities. They mentioned that the physical studio environment does not support to nurture the critical thinking skills. This evidence presented in Figure 4.9, represented by Document, Quotation, and Page (12:12, p4) and (14:4, pi), respectively:

[...] design school, but not the design school [...] (12:12, p4-IDL 12)

*[...] learning environment that does not nurturing the creative and critical thinking [...] (14:4, pi-IDL 14)*

This finding suggest the improvement of physical studio setting in help students to actively engage with critical thinking process.

#### *4.5.4.2 Budget Constraint*

While the majority of educators did not identify financial resources as a primary barrier, a small number of participants (2 out of 17) highlighted budget constraints as an impediment to the development of critical thinking in the interior design program. Figure 4.9 presents a sample of evidence participants complained about the budget constraints, mentioned by IDL 12 and DDL 17, which are represented by Document, Quotation, and Page (12:12,p14) and (17:10,p7), respectively:

*[...] our **budget mostly goes to medical college** [...] (12:12, p14-IDL 12)*

*[...] like private universities [...] they **have support from parents, community and sponsorship** [...] (17:10, p7-IDL 17)*

This limitation will cut the learning resources and external engagement, which may limit the students' real-world exposure.

#### *4.5.4.3 Time Constraint*

Three out of 17 educator participants emphasized the time constraints they face in the interior design studio learning environment. The larger number of students in a studio makes them feel exhausted to encourage these skills in the studio. Figure 4.9 presents a sample of evidence indicating the lack of time, as mentioned by IDL 02 and IDL 05, which are represented by Document, Quotation, and Page (12:3,p2) and (9:19,p6), respectively:

*[...] he will be completely exhausted he can't think anymore [...] (2:18,p9-IDL 02)*

*[...] we can't teach everything; we don't have the time [...] (5:4,p2-IDL 05)*

Furthermore, they also stressed that teaching these skills and the subject matter content within 3 years is too time-consuming. They believe achieving their goals is unattainable.

#### 4.5.4.4 Limited Resources of Critical Thinking

One of the most significant issues identified is the lack of focus on critical thinking in the Malaysian education system. Several participants highlighted that the prior education system in Malaysia's primary and secondary schools did not encourage students to think critically, especially when compared to the overseas education system. Figure 4.9 presents a sample of evidence indicating the lack of critical thinking exposure, as mentioned by DDL 09 and DDL 13, which are represented by Document, Quotation, and Page (12:3,p2) and (9:19,p6), respectively:

*[...] the problem is that we were **not exposed to the critical thinking process**... J (12:3,p 2-IDL 12)*

*[...] in Western countries, people have **been exposed** to that design since they were young [...] (9:19,p6- IDL 09)*

The lack of opportunities to practice critical thinking in their learning journey further hampers its development, as they have not received any formal training or instruction focused on cultivating this skill. Additionally, students' critical thinking abilities vary due to differences in their backgrounds. Park, J. H., Niu, W., et al. (2021) highlight that cultural background significantly impacts how individuals conceptualize and perform critical thinking and creativity.

Apart from that, other barriers, such as inadequate metrics of assessment, time constraints, a lack of facilities, and budget constraints, were also pointed out by educators, which impede the development of these skills. The sample of that evidence is shown in Figure 4.9, represented by Document Quotation and Page (5:12, p4), (12:8, p6), and (12:13, p 14), respectively:

*[. J you give the project, at the end you **look at the scheme**. That's not critical thinking [...] (5:12, p4-IDL 05)*

*[...] in academia... For me, **time is quite limited**. Within 14 weeks to achieve something, it's quite limited... in terms of experience [...] (12:8, p6- IDL 12)*

*[...] so, like it or not, **our budget is now shrinking**... Getting smaller... yes., when the budget is this small, there are many limited program s [...] (12:13, p14-IDL 12)*

Summary of theme four shows educators believed that structural, pedagogical, and institutional factors hinder the development of critical thinking. Early exposure to critical thinking can lead to students lacking the foundational skills for higher-order thinking, making it difficult for educators to build on these abilities. The absence of appropriate assessment metrics limits the effectiveness of teaching strategies and feedback. Time constraints in studio-based learning restrict opportunities for reflection and engagement. Inadequate facilities and budget limitations also hinder the implementation of innovative teaching methods.

#### **4.6 Research Question 5: How is the framework to enhance critical thinking in the undergraduate interior design program?**

The proposed framework that integrated critical thinking into interior design learning is shown in Figure 4.10. The framework implemented Facione,P.A (1990) six critical thinking skills namely interpretation, analysis, evaluation, inference, explanation and self-regulations. The use of Facione,P.A (1990) six critical thinking skills model is guaranteeing a theoretical basis instead of subjective interpretation as a core of the framework. The framework is conceptualized as a systemic and interconnected model in which human factors, pedagogical approaches, instructional design and institutional support which operate interdependently to increase the development of critical thinking in interior design program.

In summary, pedagogical approaches serve as a crucial link between human factors and instructional design, transforming intentions for critical thinking into tangible learning experiences. The effectiveness of these approaches is heavily influenced by the pedagogical competence of educators and the dispositions of students, which collectively shape the design and implementation of instructional strategies and assessments. Additionally, institutional support plays a vital role by providing the needed structural and resource foundation that empowers educators to effectively apply these pedagogical methods. The interconnectedness of these elements underscores those deficiencies in any one area can limit the overall effectiveness of the others, thereby emphasizing the importance of a comprehensive and integrated implementation of pedagogical practices.

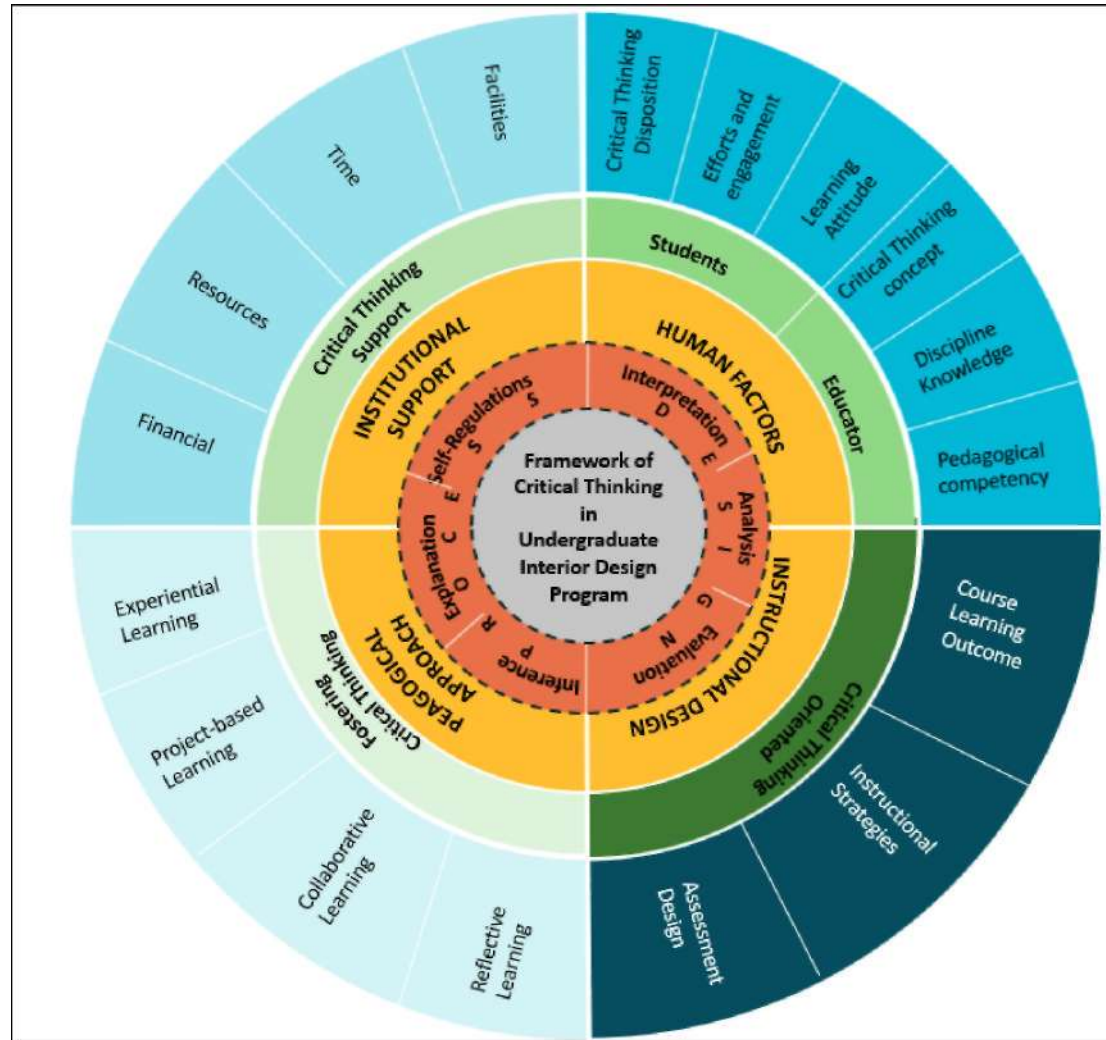


Figure 4.10 A Framework to Foster Critical Thinking in Undergraduate Interior Design Program

#### **4.6.1 Pillar 1: Human Factors**

This pillar emphasizes the significant role that both students and educators play in fostering positive critical thinking development. Both students and educators positioned the domain of human factors, yet their roles are distinctly different. Students are expected to cultivate critical thinking dispositions including open-mindedness, truth-seeking, self-confidence, willingness, cognitive maturity, and inquisitiveness as outlined by Facione (1990) report. On the other hand, educators become an agent responsible for facilitating the critical thinking process, which requires a deep understanding of critical thinking concepts, effective pedagogical skills for teaching these concepts, and substantial expertise in their specific fields.

From the students' perspective, characteristics such critical disposition and learning attitude influence how they engage with complex design problems and reflective learning activities. Students who demonstrate curiosity, willingness to question assumptions, and readiness to explore alternative solutions are more likely to engage meaningfully in critical thinking processes. This is aligned with Halpern, D. F. (2003) that fostering an attitude of critical thinking and disposition is as essential as learning critical thinking abilities; these talents become useless if not used.

In term of educators' perspective, this pillar highlights the importance of educators' understanding of critical thinking concept, pedagogical competence, and discipline knowledge. Similar to Essalih, S., Ourahay, M., & Khzami, S. E. (2022) exposed that the knowledge of educators on the critical thinking concept and pedagogical impact to the student's development. Educators play a critical role in shaping learning environments, framing design problems, and modelling critical inquiry through questioning, feedback, and reflective dialogue. Their interpretation of critical thinking directly influences how it is embedded in learning activities, assessed, and communicated to students. Inadequate conceptual clarity or limited training in critical thinking pedagogy may result in fragmented or implicit integration of these skills

Furthermore, it is essential for both groups to be exposed to critical thinking through various forms of knowledge acquisition, experiential learning, and targeted training, which collectively enhance their ability to engage in critical thinking effectively. Collectively, these elements reinforce the view that critical thinking is a socially constructed and learned process, developed through continuous interaction

between students and educators within an authentic learning context. This aligns with constructivist and sociocultural perspectives, which posit that learning occurs through active engagement, dialogue, and shared meaning-making rather than passive transmission of knowledge.

#### **4.6.2 Pillar 2: Instructional Design Alignment**

This pillar emphasizes the significance of constructive alignment in the systematic design of education that promotes critical thinking in the undergraduate interior design curriculum. Bigg's 3P learning theory (1987) suggested that constructive alignment promises consistency across course learning goals, instructional methods, and assessment frameworks, ensuring that critical thinking is purposely cultivated and assessed throughout the educational experience.

Initially, course learning outcomes must clearly outline critical thinking abilities as defined by the Critical Thinking Skill (Facione, P.A., 1990), including interpretation, analysis, evaluation, inference, explanation, and self-regulation. When critical thinking is explicitly articulated in learning objectives, it fosters a mutual understanding among educators and students about the expected cognitive processes, rather than relegating critical thinking to an abstract or secondary objective.

Secondly, instructional strategies must fit with these aims and be rooted in Constructivist learning theory by Jean Piaget 1896-1980, which emphasizes active knowledge production via experience, reflection, and social interaction. Instructional methodologies should prioritize problem-based learning, studio critiques, introspective exercises, collaborative dialogues, and real-world design scenarios above rote memorization or instructor-centered delivery. These methodologies enable students to actively comprehend design challenges, analyze limits, assess alternatives, and defend design choices are the essential activities of critical thinking in interior design education.

Third, assessment design is essential in fostering critical thinking by necessitating that student exhibit critical thinking skills instead of only recalling factual information. Assessments must be genuine and focused on design, prompting students to rationalize their choices, contemplate design methodologies, and address intricate or ambiguous challenges. Assessment tasks must fit with learning goals and instructional activities to maintain consistency in teaching, learning, and evaluation. Braun, H.,

Shavelson, R., Zlatkin-Troitschanskaia, O., & Borowiec, K. (2020) suggested a performance assessment framework for critical thinking encompasses the identification, evaluation, analysis, interpretation of information, synthesis of evidence, and reporting of conclusions in complex, real-world scenarios.

The use of assessment instruments focused on critical thinking, such as analytic rubrics or criteria directly associated with Facione's critical thinking abilities, allows instructors to examine students' critical thinking systematically and transparently. This pillar emphasizes that critical thinking may be successfully cultivated only when instructional design is deliberately matched with objectives, pedagogy, and evaluation. This study's results indicate that fragmented or implicit instructional design methods hinder critical thinking growth, whereas constructive alignment offers a systematic and pedagogically robust framework for integrating critical thinking into interior design education.

This pillar promotes interior design education by highlighting that successful integration of critical thinking depends on precise instructional alignment rather than just curricular aims. This expands constructive alignment theory to interior design studios, emphasizing the important impact of assessment methods on student critical thinking.

#### **4.6.3 Pillar 3: Pedagogical Approach**

This pillar emphasizes that the pedagogical approaches adopted within the undergraduate interior design program must intentionally create learning experiences that foster the development of students' critical thinking abilities. Findings from this study indicate that critical thinking is most effectively developed when learning activities require students to actively engage with complex design problems, reflect on their decision-making processes, and justify design solutions rather than passively receive information. This shows that the critical thinking could be encouraged through the constructivist orientation which is operationalized through pedagogical strategies such as project-based learning, collaborative learning, reflective learning, and experiential learning, which are commonly embedded in interior design studio pedagogy.

The study's findings show that critical thinking develops most effectively when students actively engage with complex design problems, reflect on their decision-

making, and justify solutions instead of passively receiving information. Experiential learning is vital, allowing students to learn through hands-on studio tasks, site analysis, and material exploration, aligning with the interpretive nature of design. This is supported by Duncan, E. (2012) experiential learning is crucial for instilling cognitive techniques and emotional attributes in design studio education. Likewise, the project-based learning fosters sustained inquiry and practical application of theoretical knowledge, encouraging the evaluation of design options and articulation of rationales, thus promoting higher-order thinking. Collaborative learning, through discussions and critiques, exposes students to diverse perspectives, enhancing their ability to communicate and justify decisions, reinforcing cognitive and metacognitive aspects of critical thinking. Problem-based learning engages students with open-ended design challenges, fostering analytical and evaluative skills by positioning them as active problem-solvers. Reflective learning supports self-regulation by enabling students to examine their decision processes and identify areas for improvement.

This study exposed that the integration of experiential, project-based, collaborative, problem-based, and reflective learning methods collectively enhances critical thinking in interior design education, providing meaningful opportunities aligned with professional practice demands. This is aligned with previous studies that Collaborative Learning (El-Daghar, K.,2020; Lamela, S.,2020; Afify, H. M. N., et.al.,2020.; Asefi, M., & Imani, E.,2018), inquiry-based learning (Yurtsever, B. ,2017; Salama, A. M.,2010) and Project-based learning (Milosevic, J.,2019; Cakir, G., & Yurtsever, B.,2013), enhance the critical thinking in architectural education.

#### **4.6.4 Pillar 4: Institutional Support**

Institutional support for critical thinking in the proposed framework encompasses resources, facilities, time allocation, and financial support that enable the effective enactment of critical thinking-oriented pedagogies. The facilities such as access to appropriate studio setting and well-equipped environments enhance experiential and project-based learning, contributing significantly to critical thinking development. Moreover, the availability of resources like learning materials and digital software is essential for fostering critical thinking. This mirror to study by Khalid, L., Bucheerei, J., & Issah, M. (2021) found that insufficient resources appeared as obstacles to fostering the development of critical thinking abilities in educational settings.

Students with access to diverse information can more effectively analyze, compare perspectives, and justify their design choices.

Apart from that, the development of critical thinking required time to achieve the result. Time allocation is identified as an essential factor such as insufficient time for studio activities, critiques, and reflection may limit students' opportunities for in-depth engagement with analysis and self-regulation. Similarly, Snyder, L. G., & Snyder, M. J. (2008) stated that time constraints hinder the integration of critical thinking skills in the classroom, as educators prioritize covering extensive content in limited time, leading to reliance on lectures and objective tests instead of focusing on student learning. Sufficient time and the appropriate number of student - lecturer ratio in the studio facilitates the iteration of design ideas, feedback reception, and reflection on decision-making, all crucial for developing critical thinking skills.

The study also reveal that financial support also impacts the successful integration of critical thinking-related activities. Adequate funding is needed for learning materials, studio equipment, industry exposure, and professional development for educators. Without sufficient financial backing, efforts to embed critical thinking consistently across the curriculum may weaken. Therefore, fostering critical thinking in interior design education requires a robust institutional ecosystem that provides adequate time, proper facilities, accessible resources, and financial support. When these conditions exist, they enhance the effectiveness of pedagogical strategies and curricular designs, thereby strengthening the integration of critical thinking in the program.

#### **4.7 Summary**

This finding reported based on thematic analysis of the from data was obtained from semi-structured interview with educators, students and documents analysis (Braun & Clarke, 2006). Summary of findings in this chapter shown in Table 4.11. In terms of the syllabi, the material was examined for implicit and explicit elements of critical thinking and how they appeared in the interior design studio courses as well as the implementation of critical thinking in student's design portfolios. The educators' and students' interview responses were analyzed to identify their perceptions of critical thinking, teaching strategies employed, experiences of implement this skills and challenges.

The discussion chapter will investigate the findings in relation to enhancing the teaching of critical thinking and the fostering of critical thinking in the study context.

Table 4.11  
Summary of Research Questions and Findings

Research Questions	Findings
1) How educators perceive critical thinking and its integration in the undergraduate interior design program?	Theme 1: Superficial Understanding of Critical Thinking Theme 2: Tacit Understanding of Critical Thinking in Studio Practice Theme 3: Improve Creative Thinking Process
1) How students perceive critical thinking and its integration in the undergraduate interior design program?	Theme 1: Lack of critical thinking understanding Theme 2: Enhance Design Quality
1) How is critical thinking fostered in an undergraduate's interior design program?	Theme 1: Instructional design Theme 2: Teaching strategies employed in studio learning Theme 3: Implementation in design projects
2) What are the barriers that hinder the development of critical thinking skills in an undergraduate interior design program?	Theme 1: Student's barriers Theme 2: Educator's barriers Theme 3: Instructional design alignment's barriers Theme 4: Institutional support barriers
3) How is the framework to enhance the critical thinking in the undergraduate interior design program?	Pillar 1: Human factors (students & educators) Pillar 2: Instructional design Pillar 3: Pedagogical approach Pillar 4: Institutional supports

These results together indicate a systemic misalignment rather than a singular pedagogical problem, needing a comprehensive framework that incorporates pedagogical, instructional, human, and institutional elements. The findings of this study indicate that critical thinking is predominantly fostered through studio-based, student-centered, and experiential learning practices. These approaches align with a constructivist philosophy of learning, where knowledge is actively constructed through reflection, critique, and problem-solving.

## CHAPTER 5

### DISCUSSION, CONCLUSION AND RECOMMENDATION

#### **5.1 Introduction**

This chapter discusses the five research questions, theoretical and practical implications, and recommendations for future research. This study employed an exploratory case study, which involved the interior design program at UiTM. The findings from this study are interpreted in the context of an undergraduate, highlighting perceptions, current practices, and barriers that impede the development of critical thinking in this case. The aim of this study is to formulate a conceptual framework for critical thinking in the interior design program through the examination of educators' perspectives, students' experiences, and program documents within this specific institutional context.

#### **5.2 Discussion of Research Findings**

The following subchapter provides a discussion to address the research questions of this study. First research question: How do educators perceive critical thinking and its integration in the undergraduate interior design program? Secondly, how do students perceive critical thinking and its integration in the undergraduate interior design program? Third Research Question: How is critical thinking fostered in an undergraduate's interior design program? Research Question 4: What are the challenges that hinder the development of critical thinking skills in an undergraduate interior design program? Research Question Four: How is the framework to enhance critical thinking in undergraduate interior design programs?

##### **5.2.1 Research Question 1: How educators perceive critical thinking and its integration in the undergraduate interior design program?**

The first research question examines the perceptions of interior design educators towards critical thinking and its integration into the interior design program. A study by Ramis, A. Al. (2018) exposed that interior design educators lack understanding of the meaning and concept of critical thinking. Due to the limited literature available related

to interior design and critical thinking, the following discussion is based on the findings from the analysis of the discussion of the interview transcript of educators.

The results of this study's thematic analysis revealed that UiTM bachelor's degree interior design educators only have a superficial and implicit grasp of the idea of critical thinking. The critical thinking that is naturally expressed in studio practices largely shaped their perception. According to the study, teachers recognize critical thinking to some extent. This is supported by a study by Choy, S. C, and Cheah, P. K. (2009), which found that teachers mistakenly believe they are promoting critical thinking in their students when, in reality, they are concentrating primarily on subject matter comprehension.

Previous literature in Chapter 2.5.1 indicates that in design-based disciplines, critical thinking is often assumed to develop naturally, situated within design thinking and creativity, and seldom expressed in formal cognitive terminology such as analysis and evaluation. Critical thinking can be confused with creative thinking because of the characteristics of design-based learning. According to Ucar, O., & Kandemir, O. (2018), during the design process, crucial information arises concurrently with critical thinking and a critical approach across stages, including problem-based research, analysis, assessment, the creation of inventive solutions, and final product development. This assertion is supported by Fisher (2011), who states that to achieve good critical thinking abilities necessitates a combination of creative thinking, imaginative approaches, and the capacity to think 'out of the box.'

However, despite having limited knowledge of the critical thinking concept, educators in this study acknowledge that critical thinking is a crucial aspect of problem-solving and in-depth thinking in interior design. Educators claimed that the use of critical thinking skills in interior design projects could enhance the quality of design reasoning and mitigate errors. Educators assert that integrating critical thinking into interior design programs positively influences graduates' outcomes and improves students' resilience. This is aligned with Deutsch, R. (2020), that critical thinking enhances our capacity to calmly and productively confront circumstances, resolve difficulties, and handle issues in a manner acceptable to all parties concerned.

In summary, the first research question revealed that the interior design educator in this study demonstrated a poor understanding of critical thinking, which resulted in a lack of effective teaching strategies based on assumptions rather than a well-organized structure. Consequently, the assessments of critical thinking are often implicit

and inconsistent, which contributes to a lack of clarity in evaluating students' understanding of the concept. Additionally, due to educators' lack of knowledge of the concept of critical thinking, students are afforded limited cognitive scaffolding, which further hinders their ability to grasp critical thinking skills. The combination of situations explains why students often exhibit a lack of understanding of critical thinking.

### **5.2.2 Research Question 2: How students perceive critical thinking and its integration in the undergraduate interior design program?**

Second research questions aim to inspect the student's perception on critical thinking concept and its application in undergraduate interior design program. McAdam, J. (2020) suggested that student views and experiences are crucial in comprehending how critical thinking affects their ability to change. Various studies in the Malaysian context highlighted that Malaysian higher education graduates have minimal to low critical thinking skills, but there is less focus on the design education program (Lee, M., Sohod, S., & Rahman, A., 2019; Noni, N. S., & Abdullah, A. H., 2019; Sharif, M., et al., 2021).

This study found that interior design students at the bachelor's degree level at UiTM lack knowledge of the critical thinking concept. They associated critical thinking with problem-solving, in-depth thinking, and thinking out of the box. This shows that they are conflating it with creative thinking that happened in the design thinking process. A study by Loes, C, et al. (2012) has shown that critical and creative thinking are strongly correlated. Fatmawati, A., Zubaidah, S., Mahanal, S., & Sutopo (2019) stressed that even though both are different cognitive processes, they can be seen as complementary aspects rather than the same process. Student participants in this study context described critical thinking in terms of tangible activities associated with design, such as generating ideas, solving design problems, producing creative outcomes, and responding to critiques. This condition indicates that students perceive critical thinking primarily as a set of actions performed by designers rather than as a cognitive process that influences how designers think.

The results also revealed that although students appreciated critical thinking's significance in the interior design program, they knew very little about it. They know these skills will ensure their decisions are correct and prevent them from repeating

errors. They are aware that it could produce exceptional ideas and raise the standard of design efficiency. The difference underscores a potential gap in understanding the underlying thought processes that contribute to effective design thinking. Their perception of critical thinking may be attributed to its tacit rather than explicit pedagogical approaches. Consequently, this finding indicates that while critical thinking may be present in interior design programs, it remains underdeveloped because students receive insufficient exposure to the thinking process compared to focusing solely on design results.

### **5.2.3 Research Question 3: How is critical thinking fostered in an undergraduate's interior design program?**

The third research question investigates the integration of critical thinking within the current interior design curriculum. Through semi-structured interviews, interior design educators were invited to explain the strategies they use to develop students' critical thinking skills during instruction. At the same time, students' experiences in the design studio were examined to gain insight into how they engage with and apply critical thinking in their learning.

Furthermore, the study revealed that the interior design process implicitly integrates critical thinking. This finding is aligned with the suggestion by Asefi, M., and Imani, E. (2018) that students should utilize critical thinking skills at every stage of the design process, including program studies, sketches, design development, evaluation, and conclusion, to ensure effective communication and problem-solving. Evidence from students' design portfolios showed that they used critical thinking at important points in the design process, such as program analysis, conceptual sketching, design development, and final evaluation. These portfolios illustrated students' engagement in interpreting design briefs, analyzing spatial and contextual constraints, evaluating alternative design solutions, and justifying final design decisions.

The study revealed that critical thinking is implicitly integrated within the interior design process itself. This is because the nature of the design process actually encourages the critical thinking process to achieve the better outcome. Asefi, M., and Imani, E. (2018) stressed that students should utilize critical thinking skills at every stage of the design process, including program studies, sketches, design development, evaluation, and conclusion, to ensure effective communication and problem-solving.

Evidence from students' design portfolios demonstrated that critical thinking was enacted through key stages of the design workflow, including program analysis, conceptual sketching, design development, and final evaluation. These portfolios illustrated students' engagement in interpreting design briefs, analyzing spatial and contextual constraints, evaluating alternative design solutions, and justifying final design decisions. This finding shows that critical thinking is naturally articulated in interior design studio learning. Notably, the inclusion of critical thinking in students' design portfolios serves as concrete proof that learners are employing critical thinking in their creative processes. Portfolios, serving as reflective and evidence-based artefacts, may proficiently demonstrate the amalgamation of interpretation, analysis, inference, and evaluation skills recognized in the as essential critical thinking skills.

This study also found that the pedagogical approach used by interior design educators in the interior design program, particularly within the studio environment, seems to enhance critical thinking abilities. It encourages several pedagogical approaches, such as collaborative learning, experiential learning, problem-based learning, reflective-based learning, and project-based learning. The studio learning, which includes critique sessions, group discussions, presentations, case studies, and field trips, is beneficial in fostering this skill in interior design learning. Those methods are believed to promote the constructivist learning approach. This is due to the nature of interior design pedagogy being parallel with the constructivism approach. Treado, C. (2018) asserted that constructivism allows the learner to generate knowledge through a sequence of events that foster introspection, concept filtering, experience with prior knowledge, and meaning making. He added that incorporating these critical thinking abilities through constructivist teaching methods may help students advance from lower-order thinking abilities like comprehension, application, and memorization to higher-order thinking abilities like analysis, evaluation, and creation.

Furthermore, the analysis also reveals that the lack of suitable evaluation instruments that directly measure critical thinking is a significant deficiency. Although assessment techniques and activities in interior design studio promote critical thinking, the instruments employed to evaluate student performance may not fully capture the extent of students' cognitive involvement. This mismatch indicates a disparity between instructional objectives and evaluation methods, a topic highlighted in previous studies that underscores the significance of assessment in reinforcing and validating critical thinking results (Facione,P.A, 1990; Binkley et al., 2012).

In conclusion, the findings of this third research question demonstrated that critical thinking was promoted naturally through the instructional design, interior design pedagogy approach, and project implementation. The study concludes that even though the interior design education implicitly encourages and promotes critical thinking, the assessment tools used only focus on subject matter comprehension. Thus, the ability of students in these skills is difficult to be assessed and developed due to a lack of attention and assessment methods for critical thinking ability.

#### **5.2.4 Research Question 4: What are the challenges that hinder the development of critical thinking skills in an undergraduate interior design program?**

The triangulation interpretation of findings from semi-structured interviews with both students and educators, along with document analysis, revealed that challenges, including human factors and barriers related to instructional and institutional support, impede the development of critical thinking in the Bachelor's Degree of Interior Architecture program at UiTM Puncak Alam.

This study reveals that human factors, particularly among students and educators in this context, often lead to a confusion between critical thinking and creative thinking, the latter being a vital component of the design thinking process. Students often prioritize creative exploration during the design process, with limited awareness of the critical thinking processes required to interrogate design problems, assess constraints, and defend design decisions. This study also revealed that the lack of collaboration among interior design educators leads to mismatched expectations, disjointed learning outcomes, and insufficient alignment across courses. Although interior design studio learning inherently demands these skills, the disposition and attitude towards critical thinking among students have become obstacles to their development. Consequently, these conditions can hinder critical thinking initiatives and result in educators lacking essential tools and confidence. Similarly, Ennis, R. H. (1987) had previously highlighted the challenges educators face in reaching a consensus on the comprehensive content of critical thinking areas among themselves. This issue is probably impaired by insufficient critical thinking training opportunities, resulting in many educators lacking the essential tools, tactics, or confidence to teach and assess critical thinking effectively. This is because the development of critical and creative

thinking as well as problem-solving skills depends heavily on the mindsets of both educators and students (Suarniati, N. W., Hidayah, N., & Handarini, M. D., 2018).

The study also showed that while critical thinking naturally encourages students to think critically in interior design studio learning, the absence of clear evaluation tools and rubrics makes it hard to get accurate results. The development of critical thinking in students is often inconsistent and superficial as they prioritize assessed elements over implicit expectations. The absence of explicit criteria in assessment rubrics leads to critical thinking being undervalued and unevenly demonstrated, causing students to emphasize technical execution and aesthetics rather than analytical reasoning, justification, and reflective judgment. Reed, J. H. (1998) supports the idea that evaluation remains a significant issue in formulating programs aimed at improving students' critical thinking abilities. The result indicates a curricular mismatch in which critical thinking is presumed to be integrated into studio work, yet is neither formally instructed nor evaluated. Conversely, in the absence of explicit learning objectives and rubrics that emphasize critical thinking skills such as analysis, evaluation, and justification, students and educators may persist in concentrating on superficial results. In improving the evaluation method, Feulner, M. (2020) suggested that discipline-specific critical thinking evaluations provide personalized formative feedback that addresses student requirements while emphasizing the practical application of abilities within a field.

Ultimately, institutional support is crucial in developing these skills in the study context. The findings emphasized limitations like inadequate training in critical thinking, budget constraints, class size, and insufficient learning facilities impede the development of these skills. The lack of formal training programs for educators and students in developing, applying, and assessing critical thinking is a significant barrier to its integration into interior design education. Similarly, a study by Khalid, L., Bucheerei, J., and Issah, M. (2021) discovered that educators possess insufficient foundational knowledge on critical thinking. Time constraints, such as tight semester schedules and heavy teaching loads, undermine the conditions necessary for fostering critical thinking. In the same vein, Reynolds, S. W. (2016) stated that educators are unable to dedicate sufficient time and training to develop critical-thinking activities. These are essential for teaching the mandated curriculum and fulfilling additional duties assigned to them. Thus, the research suggests that the educator-student ratio should

adhere to professional body regulations to ensure students have sufficient time to absorb feedback during critique sessions fully.

In conclusion, the obstacles to fostering critical thinking in interior design programs are systemic and multifaceted, arising from student engagement, educator preparedness, assessment design, and institutional circumstances. Therefore, addressing these barriers requires a holistic strategy that includes curriculum reform, educator training, supportive infrastructure, and a culture that values critical inquiry as a central component of design education.

### **5.2.5 Research Question 5: How is the framework to enhance critical thinking in undergraduate interior design program?**

This study proposed a framework as in Chapter 4.18 aimed at enhancing critical thinking within studio-based interior design education. The framework arises inductively from the data, while being conceptually grounded in constructivist learning theory, critical thinking literature, and studio-based design pedagogy. The framework illustrates the interdependable relationship among four pillars namely pedagogical practices, instructional design, human factors, and institutional supports. Each component of this framework represents an integration of theoretical constructs and empirical evidence. Constructivism and sociocultural theory underpin the emphasis on interaction and scaffolding. While, Facione, P.A (1990) critical thinking skills and dispositions inform the cognitive and attitudinal dimensions; experiential and reflective learning theories explain the studio-based pedagogical processes.

This framework can be adapted to context and is exploratory, unlike theories that aim to explain events universally, or models that often outline specific behaviours or methodologies. As an exploratory qualitative case study, this study requires a framework that integrates many views and contextual factors. The framework illustrates the reality of interior design education in a studio-based learning context and aims to facilitate comprehension and informed pedagogical choices rather than enforce rigid teaching approaches. These results together indicate a systemic misalignment rather than a singular pedagogical problem, hence requiring a comprehensive framework that incorporates pedagogical, instructional, human, and institutional aspects.

In this qualitative case study research, the framework is founded on conceptual generalization rather than statistical analysis. This does not claim to cover all interior

design programs but provides transferable ideas applicable to similar studio-based environments that seek to improve critical thinking as a learning result. The instructional design pillars reflected the study's findings and reflected Bigg's (1996) constructive alignment theory, which revealed misalignment between learning outcomes, teaching strategies, and assessment rubrics between learning outcomes, teaching strategies, and assessment rubrics. The finding of this study discovered that even though critical thinking was implicitly stated in course learning outcomes, it was not explicitly assessed. This lack of evaluation is resulting in superficial student engagement with critical inquiry. This alignment gap problem was highlighted in previous studies on design education, reinforcing the relevance of this pillar beyond the immediate case context.

Curriculum alignment in the interior design program requires the integration of critical thinking into the program's learning outcomes and assessment design. Findings indicate that the interior design program currently employs a partial combination of the immersion and infusion approaches to integrate critical thinking. Behar-Horenstein, L. S., and Niu, L. (2011) identified these approaches as distinct methods for teaching critical thinking skills within various subject areas. The infusion approach explicitly teaches critical thinking principles, while the immersion approach does not, which may leave students unaware that they are developing these skills. The current curriculum articulates only half of the critical thinking skills, with the remainder being implied.

The pedagogical approach pillar is theoretically underpinned by constructivism theory involved experiential learning theory (Kolb, 1984) and reflective practice (Schön, 1983), both of which are central to studio-based and design pedagogy. The framework's pedagogical approach emphasizes experiential, collaborative, and inquiry-based learning. Experiential strategies include real-world exposure, hands-on tasks, reflective dialogue, role-playing, and model making. Additionally, collaborative activities such as debates, group discussions, critique sessions, and industry collaboration encourage critical dialogue. Strategic questioning methods stimulate deeper thinking. Furthermore, according to Pamungkas, S. F., Widiastuti, I., and Suharno (2019), experiential learning is a student-centered approach that transforms experiences into knowledge, designed to support student-centered learning and 21st-century skills. This approach assists students in constructing knowledge and enhancing understanding through hands-on experiences. Similarly, Ab Halim, A. S., et al. (2021) emphasized that teaching and learning should incorporate diverse methods, questioning

techniques, cognitive levels, and activities to promote a high level of knowledge and positive attitudes among students. Findings from document analysis and student portfolios revealed that critical thinking was embedded naturally within the design process stages, such as problem identification, design development, and evaluation. However, it was often implicit and unstructured. As a result, students engaged in design tasks procedurally rather than reflectively, limiting deeper critical inquiry.

The institutional support pillar is inspired by literature on factors that affect the development of critical thinking in higher education. The research by Franklin, E. I., Iwu, C. G., & Dubihlela, J. (2022) revealed that the development of critical thinking is affected by the educator's expertise, societal factors, student characteristics, and the educational system. Institutional support is essential for facilitating educational programs, including investments in training efforts, motivational techniques, and pedagogical approaches. McAdam (2020) has shown that instructors' engagement in professional development for critical thinking markedly improves students' critical thinking abilities. Conversely, practical assistance entails offering resources, time, and funding for experiential learning opportunities, including field trips, guest lectures, and industry engagement. Equitable student-to-lecturer ratios and feasible curricula are also crucial.

Collectively, these four pillars reflect the fact that the proposed framework is an integration of the synthesis of educational theory, design pedagogy literature, and empirical findings from the case study. Basically, the proposed framework does not introduce new constructs but reconceptualizes existing knowledge into a coherent structure that explains how critical thinking can be systematically fostered in undergraduate interior design programs. Consequently, the framework represents a conceptual contribution to the body of knowledge, offering transferable principles applicable to similar studio-based educational contexts.

### **5.3 Research Implication**

This study aims to explore the integration of critical thinking into undergraduate interior design education. It benefits students, educators, curriculum design, and institutional policies. Students especially benefit from this study since it emphasises the value of cultivating more profound analytical and evaluative abilities as opposed to depending only on creativity and conceptual skills.

The importance of critical thinking in interior design is recognised by students. However, their limited exposure has made it difficult for them to apply these skills effectively. Encouraging critical thinking enables students to better defend and support their design choices with reason and facts. Furthermore, this study highlights the need for students to improve their problem-solving skills, which will equip them for real-world situations where design solutions must strike a balance between usability, aesthetics, and user demands. Conversely, students' communication skills will also develop because of the explicit integration of critical thinking into the learning process, giving them greater confidence to articulate and convincingly defend their design concepts.

The study highlights the need for professional development and training for educators to enhance their comprehension of critical thinking pedagogy. Educators understand the worth of critical thinking, but they are unable to successfully integrate these abilities into their lessons due to their lack of training and expertise. According to the study, only a few educators have incorporated constructivist teaching methods, such as Socratic questioning, reflective thinking, experiential learning, and group projects, into their studio-based instruction. Additionally, this approach fosters a more engaging and stimulating learning environment, where students take more ownership of their intellectual development by shifting from passive learning to active involvement.

From a curriculum design perspective, the findings suggest that critical thinking is implicitly integrated into the instructional design, design process, and teaching strategies but lacks explicit representation in course learning outcomes and assessments. To ensure a more structured approach, critical thinking should be explicitly embedded in course content, project briefs, and assessment rubrics. Revising studio project briefs to include more complex problem-solving tasks will encourage students to analyse, question, and evaluate their design choices critically. Additionally, assessment criteria should clearly define critical thinking components to ensure that students' analytical abilities are systematically measured.

At the institutional level, the study reinforces the need for stronger support in promoting critical thinking through faculty training, research funding, and curriculum reforms. Institutional barriers such as limited resources, time constraints, and a lack of structured support hinder the development of critical thinking in interior design education. Furthermore, institutions should invest in interdisciplinary collaborations, incorporating insights from psychology, philosophy, and education to develop a more

comprehensive approach to design pedagogy. Additionally, systematic assessment tools should be introduced to measure students' critical thinking skills accurately, ensuring that their ability to reason, evaluate, and synthesize information is effectively tracked and improved.

Overall, this study bridges the gap between creativity and critical analysis in interior design education, ensuring that future designers are innovative, strategic thinkers, problem solvers, and effective decision-makers. By providing a structured framework, this study offers valuable guidance to educators and institutions seeking to enhance the quality of interior design education and produce well-rounded, critically engaged professionals. The framework integrates theory with empirical data, offering a systematic perspective that may be adopted, tested, or enhanced in various interior design and design-related educational contexts.

#### **5.4 Contribution of knowledge**

This study contributes to the theoretical understanding of how Facione,P.A (1990) model of critical thinking can be contextualized within studio-based interior design program. By mapping the six critical thinking skills such as interpretation, analysis, evaluation, inference, explanation, and self-regulation onto the design process, this study offers a novel interpretation of how cognitive development occurs in spatial and visual learning environments. It advances the theory of critical thinking by demonstrating how these skills manifest through visual reasoning, design decision-making, and iterative reflection in student design portfolios.

This study introduces a multi-method qualitative approach to assessing critical thinking in design education, combining in-depth interviews with educators and students, focus groups, and document analysis of student portfolios. The use of Facione,P.A(1990) framework as an analytical lens for interpreting design artefacts (such as portfolios) represents an innovative method for assessing higher order thinking in visual disciplines. The integration of visual data with textual analysis contributes to the methodological discourse on research in design education.

Additionally, this study offers a practical framework to enhance the integration of critical thinking within undergraduate interior design curricula. The proposed framework provides educators and curriculum developers with clear indicators for embedding critical thinking skills in teaching strategies, studio critiques, assessment

tasks, and learning outcomes. Furthermore, this study highlights specific gaps such as limited emphasis on self-regulation and evaluation in current pedagogical practices, offering actionable recommendations to improve teaching and learning strategies in design studios.

This study enhances knowledge by providing a framework for improving the integration of critical thinking into the interior design program, therefore bridging the gap between theory and practice. The study emphasizes the need for structured frameworks, institutional support, and effective teaching strategies to enhance critical thinking integration.

## **5.5 Areas for Further Research**

The study focuses on the importance of critical thinking in interior design education, focusing on its level and progression. Hence, future research could develop assessment tools to evaluate students' critical thinking skills, track their evolution throughout their academic journey, and explore the relationship between critical thinking and design performance. Comparing the integration of critical thinking in public and private universities could highlight best practices and differences in pedagogical approaches. A standardized rubric could be designed to define and assess critical thinking in interior design project evaluations.

Interdisciplinary collaborations with fields like psychology, education, and philosophy could enhance critical thinking pedagogy in interior design education. Conversely, institutional support, such as faculty training programmes, funding, policy changes, and resource allocation, could contribute to a more structured and effective integration of critical thinking in the interior design programme. Additionally, constructivist teaching strategies, such as experiential learning, collaborative learning, reflective practice, and Socratic questioning, can foster critical thinking within the design process.

Notably, barriers to critical thinking development in interior design education, such as students' attitudes, educator knowledge gaps, and institutional constraints, could be addressed through targeted interventions. Comparing critical thinking in interior design education versus other design disciplines can identify transferable strategies and best practices.

## **5.6 Recommendation**

This study emphasizes the importance of integrating critical thinking into interior design education. It suggests a structured framework to encourage students to engage in analytical, evaluative, and problem-solving tasks. Educators should be trained to teach and assess critical thinking skills, as they often lack understanding due to a lack of training. Constructivist teaching approaches, such as experiential learning, collaborative learning, reflective learning, and Socratic questioning, are supported by the study. However, educators should have more knowledge of this to increase the students' involvement in the interior design studio.

Institutions should allocate resources for critical thinking workshops, mentorship programmes, and assessment tools that evaluate critical thinking in students' design projects. Furthermore, assessment design and rubrics should be improved to measure students' analytical, logical, and evaluative skills. Students should be encouraged to engage in self-directed learning, interdisciplinary collaboration, and critical discussions to enhance their analytical capabilities. Additionally, the study serves as a foundation for developing a structured framework that integrates critical thinking into interior design education, providing clear guidelines on instructional design, curriculum structure, teaching methods, and assessment practices that prioritize conceptual creativity and critical analysis. Hence, this will help to bridge the gap in exposure and practice for students in interior design education.

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## **APPENDICES**

# APPENDIX A

## Letter of Approval from Ethics Committee

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UNIVERSITI  
TEKNOLOGI  
MARA

Pejabat  
Timbalan Naib Canselor  
(Penyelidikan dan Inovasi)

Reference : 600-TNCP1 (S/1/6)  
Our reference : REC/08/2022 (PG/IR/180)  
Date : 12 August 2022

Dr Nur Maizura binti Ahmad Noorhani  
(Norhayati binti Kassim – 2021828728)  
Faculty of Architecture, Planning & Surveying  
UITM Perak Branch  
Seri Iskandar Campus  
32610 Seri Iskandar  
PERAK

Dear Dr Nur Maizura,

**APPROVAL LETTER - UITM RESEARCH ETHICS COMMITTEE**

Thank you for submitting your research proposal to the Research Ethics Committee (REC). After considering your application, the Committee approved your proposal titled "Incorporating the Critical Thinking Skill in The Malaysia Interior Design Education. Case Study: Universiti Teknologi MARA" at Jabatan SeniBina Dalaman, Universiti Teknologi MARA Puncak Alam and Seri Iskandar Campus.

Details of the approval are as follows:


Ref. number:	REC/08/2022 (PG/IR/180)
Approval Period:	12 August 2022 until 30 June 2024
Authorised personnel:	1. Dr Nur Maizura binti Ahmad Noorhani 2. Norhayati binti Kassim

The UITM Research Ethics Committee operates in accordance to the ICH Good Clinical Practice Guidelines, Malaysian Good Clinical Practice Guidelines and the Declaration of Helsinki. The approval of this project is conditional upon your continuing compliance with these guidelines and declaration.

We draw to your attention the requirement that a report on this research, must be submitted every 12 months from the date of the approval or on the completion of the project, whichever occurs first. Failure to submit reports will result in withdrawal of consent for the project to proceed. Amendments, if any, to the study documents are to be submitted to the REC for approval.

If you require further information, please contact the REC Secretariat at 03-55448069/03-55442794 or email at recsecretariat@uitm.edu.my.



Yours sincerely,



**EMERITUS PROFESSOR DATO' DR RAYMOND AZMAN ALI**  
Chairman  
UITM Research Ethics Committee

c.c.: Dean, Faculty of Architecture, Planning & Surveying, UITM

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# APPENDIX B

## Participant Information Sheet Provided by Ethics Committee

REG 4/2Qi9/B)Rev. 2 (2020)

Research Ethics Committee  
Research Management Centre  
Universiti Teknologi MARA  
4D45Q SHAH ALAM  
Tel: 03 - 5544-B069, Fax: 03 - 5544-2096/2767



### Participant Information Sheet

#### Research Title

*EXPLORING THE INTEGRATION OF CRITICAL THINKING SKILLS IN INTERIOR ARCHITECTURE PROGRAMME*

#### Introduction of Research

*The Malaysian Qualifications Framework (MQF) takes the initiative to develop critical thinking skills among higher education students through the integration of critical thinking in the higher education curriculum. This is no exception for the interior design program curriculum. However, the implications and the effectiveness of its integration in interior design programs in Malaysia has not been documented. .*

#### Purpose of Research

*Therefore this research attempt to explore the integration of these skills in current curriculum and practices including lecturers and students' perception, understanding and awareness on these skills as well as to examine the integration of these skills in current curriculum and syllabus content including project briefing. The aim of this research is to develop the framework that could be use in enhancing these skills in interior design educations.*

#### Research Procedure

*This study is a qualitative research which involving mutti method qualitative methodology. The data will be collected through face to face interview involving the interior design educators, focus group interview involving interior design students, document analysis on the course content and project briefing as- wet! as the implementation of critical thinking skill in classroom will be observed through the classroom observation.*

#### Participation in Research

Your participation in this research is entirety voluntary. You may refuse to take part in the study or you may withdraw yourself from participation in the research at any time without penalty. As for your i nformadon, the interview session wi ll i nclude video recording for the purpose of data analysis.

#### Benefit of Research

Information obtained from this research will benefit the individuals, researchers, institution and community for the advancement of knowledge and future practice.

#### Research Risk

*This research is not expected to pose any potential risks*

#### Confidentiality

Your information will be kept confidential by the investigators and will not be made public unless disclosure is required by law.

By signing this consent form, you will authcfize (he review of records, analysis and use of the data arising from this research.

If you have any question about this research or your rights, please contact Norhayati Btiti Kassim at 012-939 9241.

## APPENDIX C

### Letter Request for Permission to Conducted the Study at CSIA

Norhayati Binti Kassim  
No.17, Persiaran Puncak Iskandar 2B/20  
32610 Seri Iskandar, Perak  
Malaysia

Tun Mohd Irfan Mohd Suria  
Coordinator of Studies for Interior Architecture  
College of Built Environment (CBE)  
Kompleks Tahir Majid  
Universiti Teknologi MARA  
40450 Shah Alam, Selangor Darul Ehsan  
MALAYSIA

Date: 31 October 2023

Dear Dr,

#### **APPLICATION FOR CONDUCTING PHD RESEARCH AT CENTRE OF STUDIES INTERIOR ARCHITECTURE (CSIA)**

I am PhD students Doctor of Philosophy In Built Environment (AP 991) Universiti Teknologi MARA, Shah Alam. My PhD research entitled "EXPLORING THE INTEGRATION OF CRITICAL THINKING SKILLS IN INTERIOR ARCHITECTURE PROGRAMME". For my research, I am employing the Interior Architecture Department at Universiti Teknologi MARA (UiTM) Shah Alam as a case study.

Therefore, I am seeking your authorization to conduct an interview session with lecturers currently involved in teaching the interior design studio. The purpose is to gather their insights regarding the integration of critical thinking skills in studio-based learning. Additionally, I kindly request access to relevant documents such as course content, project briefs, rubrics, and any materials specifically associated with the semester 08 batch. These materials would significantly contribute to my research on this topic.

If you have any queries regarding my studies, please contact me and I would be glad to provide you further information in detail.

As a token of appreciation for the department's invaluable assistance, I would like to offer a copy of my completed thesis upon its culmination. This thesis represents the culmination of my academic journey and would not have been possible without the department's support and facilitation.

My utmost appreciation for your consideration and cooperation in advance.

Thank you

Kind regards,

  
Norhayati Kassim

PhD students  
Universiti Teknologi MARA, Shah Alam  
2021829728  
012- 939 9241

# APPENDIX D

## Consent Form of Ethics Approval

REC 4/ 2019/BI Rev. 2 (2020)

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### Consent Form<sup>1</sup>

---

To become a participant in the research, you or your legal guardian are required to sign this Consent Form.

I herewith confirm that I have met the requirement of age and am capable of acting on behalf of myself / as<sup>2</sup> a legal guardian as follows:

1. I understand the nature and scope of the research being undertaken.
2. I have read and understood all the terms and conditions of my participation in the research.
3. All my questions relating to this research and my participation therein have been answered to my satisfaction.
4. I voluntarily agree to take part in this research, to follow the study procedures and to provide all necessary information to the investigators as requested.
5. I may at any time choose to withdraw from this research without giving any reason.
6. I have received a copy of the Participant Information Sheet and Consent Form.
7. Except for damages resulting from negligent or malicious conduct of the researcher(s), I hereby release and discharge UTM and all participating researchers from all liability associated with, arising out of, or related to my participation. I agree to hold them harmless from any harm or loss that may be incurred by me due to my participation in the research.

Name of Participant/Legally authorized representative (LAR) 



Name of Participant/Legally authorized representative (LAR)

Signature

I.C No 

Date 17 November 2023

Name of Consent Taker

Signature

I.C No

Date

APPENDIX E  
Introduction Letter to Educator's Participants

INEODVCTOKY LETTER

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## APPENDIX F

### Introduction Letter to Student Participants

#### INTRODUCTORY LETTER (FOCUS GROUP PARTICIPANT)

I am doctoral student at Universiti Teknologi MARA, Shah Alam, under the Doctorate of Philosophy in Built Environment (AP 991) program. I am currently engaged in a research project titled: Exploring the Integration of Critical Thinking Skills within the Interior Architecture program.

The aim of this study is to examine the current practice of incorporating critical thinking skills within the Interior Architecture program, case study: Center of Studies in Interior Architecture at UiTM Shah Alam

Participating in this study does not pose any anticipated risks, and there is no mandatory obligation to take part. However, if you do choose to participate, you are free to withdraw at any time without facing any consequences. To withdraw from the study, kindly contact me via email or phone to indicate your decision.

Your involvement in the study involves video-recording of the discussion and participation in a focus group interview. Transcriptions of these recordings will be provided to you for verification of accuracy. Your participation will be handled with complete confidentiality, and in the event of any research publication, your name will not be disclosed or utilized, ensuring the confidentiality of your results.

Your participation may not direct benefits for you; however, the outcomes of your involvement may offer teacher educators an improved understanding of critical thinking skills in interior architecture studio learning. Should you have any inquiries regarding the research study, please do not hesitate to contact me at [hayati84@uitm.edu.my](mailto:hayati84@uitm.edu.my).

If you agree to participate in this study, please fill in the consent form attached in Whatsapp group and return to me.

Thank you,

Regards,

Noorhayati Kawim  
2021829728  
PhD in Built Environment (AP 991)  
Universiti Teknologi MARA (UiTM) Shah Alam

## APPENDIX G

### Interview Protocol for Educators' Participant

INTERVIEW PROTOCOL  
Interior Design Lecturer

Please answer the question; honestly. keeping in mind that your name will not be mentioned in the study.

*Silahkan menjawab pertanyaan ini dengan jujur dan mengemukakan pendapat Anda:*

<b>Name:</b>	
<b>Year of experience in ID:</b>	
<b>Year of experience in CT:</b>	
<b>Position:</b>	

1. How do you define the term 'critical thinking' (CT) skills?
2. How is the CT in the context of interior architecture education?
3. In your opinion, how important is CT in interior architecture education?
4. As a lecturer in ID studio especially, how do you encourage students to think critically?
5. What are the examples of teaching methods that you used to encourage students' CT in interior design projects?
6. In your opinion as a student, what do you think students should do to enhance their CT skills?
7. Have you encountered any challenge in teaching CTs in your teaching?
8. What recommendations do you have for improving CT in interior architecture education?
9. Do you receive training or support in teaching CT?

## APPENDIX H

### Interview Protocol for Students' Participants

#### INTERVIEW PROTOCOL (STUDENTS)

Name (Optional):

Academic Year-Level:

Gender:

Major:

Work; experience occupation:

How have you been studying interior design:

Interview protocol (Student):

1. Apakah kami akan ada di rumah; dalam ID? Jika ya, kenapa?
2. Apakah pernah jika "jika" di rumah? Jika tidak, mengapa?
5. Adakah anda menggunakan CT dalam membuat projek ID? Bolehkah anda jelaskan?
4. Setelah insidien anda di semester "4" hitungan. apakah kasihan anda? Jika ya, bagaimana?
5. Apakah hal yang anda hadapi? Jika ada, bagaimana anda mengatasinya?
- 5. Apakah anda pernah dapat membantu anda berfikir? Jika ya, bagaimana?
7. Bolehkah anda berfikir? Jika ya, bagaimana?

# APPENDIX I

## Peer Review of Thesis Validation

### Validate Thesis

**Topic: Investigating The Integration of Critical Thinking into Undergraduate Interior Design Education**

Date 20 Nov 2024

#### Chapter 1.

##### *Problem Statement*

The problem statement is somewhat lengthy and could benefit from tighter structuring. For instance, the sentences could be reorganized to avoid repetition (e.g., the lack of critical thinking is mentioned multiple times).

Further Justification of Need for a Framework, While the statement mentions that critical thinking is missing and requires better integration, it would be beneficial to briefly justify why a framework is the best solution.

Consistency in Terminology: Use consistent terms when describing critical thinking. For example, avoid switching between "critical thinking," "analytical," and "logical" unless clearly distinguished.

##### *Research Question and Research Objective*

###### Research Question (i) and Objective (i):

The research question asks how lecturers perceive the integration of critical thinking, while the objective focuses on examining educators' understanding and application of critical thinking concepts. The alignment is present but could be better phrased to reflect the educators' "perceptions," which is the focus of the question. Nice if u modify the objective to explicitly address educators' "perceptions" rather than just their "understanding."

###### Research Question (ii) and Objective (ii):

The question asks how critical thinking skills are integrated into education and the associated challenges, but the objective only focuses on demonstrating critical thinking in education. The "challenges" aspect is not addressed in the objective. Revise the objective to include an analysis of the challenges to ensure full alignment with the question.

## **APPENDIX J**

### **Sample Interview Transcription**

#### LECTURER INTERVIEW TRANSCRIPTION

PARTICIPANT : IDL 13  
DATE: 24 NOV 2023  
TIME: 11.00-11.45 AM  
METHOD: ONLINE GMEET

Researcher:

Okey so first question ....how do you define the terms critical thinking skill? I mean that tak ada contact in ID... the terms kritikal thinking skill itself..

Respondent:

Okey ..ti think...kalau CT tu i boleh define dia as aa. .able to synthesize., meaning whatever observation yang dia dapat ke...atau apa apa things yang dia find... Tak kisahlah dalam design ke atau apa.. Kalau dia able to synthesiz dalam dia punya findings, meaning...dia ada that kind of CT lah .i means CT tu datang dah situ. Nak I elaborate lagi ke?

Researcher: Aaa.. boleh jjga,, boleh juga kalau you rasa nak elaborate lagi.

Respondent: Contohnya macam... okey.... Kalau dalam education konteks... selalu kita bagi... Start with a question kan...sometimes students dia tak boleh nak understand why dia certain brief tu diberi....contoh dia just follow order..macam...okey kena buat ni... kena buat ni kena buat ni,,, tapi we ask balik question, macam okey...what can you conclude from the finding yang you dapat? Not,,not all students boleh jawab, So student saya boleh jawab tu lah yang ada kritikal... dia able to analyze not just dia observe dia analyze and dia boleh synthsize.maknyanya dari situ...apa yang dia boleh conclude kan... daripada finding dia lah. So I think dalam I punya opinion kalau nak cakap nak define CTtu is...is bila someone able to synthesize whatever findings dia ada la.

Researcher: Okey... okey so how about kritikal thinking is in ID punya konteks pula?

Respondent:

Okey...kalau macam ID punya contact I think nak bercakap kritikal tu dia ada different stages atau different categories lah ..ermm.kita macam selalu start with site observation dulu kan... site studies. So... I think side studies ni dia lebih kepada kritikal on observation.So... someone thatb be able to observe. Maknanya kita boleh tengok contoh kalau dalam stage site analisis, sama ada dia kritikal is dia boleh observe and dia boleh synthesize. Kalau stage yang seterusnya pula macam concept interpretation. Dalam stage concept interpretation, if we want to inject the CT dalam tu, kita tengok kepada dia punya interpretation itself, either it's literal ataupun dia pandai untuk justify by whatever things yang dimasukkan dalam design dalam tu lah. I think....Kalau secara core nya dalam konteks ID, I boleh nampak dalam dua aspek lah satu observation of the side itself. Kedua, is konsep interpretation of... of the project.

# APPENDIX K

## Evidence of Peer Debriefing Process

**Research Question 4: How to enhance the integration of critical thinking into interior design course?**

**Comments 14** Q Y ...

---

Add a comment

... Reply to this comment. You can only reply to comments on this page.

**Zulkarnain Hazim**  
Aug 21  
*Underlined Text*

**Reply**

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**Page 8**

**Zulkarnain Hazim**  
Aug 21  
*Add word yang missing satam*

**Reply**

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**Page 13**

**Zulkarnain Hazim**  
Aug 21

Depeler untuk RQ4 sudah. Jumo, ada missing pep. Jawabur dan Indigo urak RQ7, 253 rampok follow the sequence dan boleh ditamam. Ipe bisa masuk ke RQ4 Indigo. rambak macam. Jumo abh remara narignye. Theme dan sub theme dari RQ4-RQ3? Kalau boleh diupdate kan? Indigo untuk jaldian framework ni dimana prosesnya? ak borosa olcar dari.

Reply or use @ to invite others

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# APPENDIX L

## Evidence of Documentation Participants Data

LIST OF PALAM LECTURER: ☆ 📄

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**LECTURER PARTICIPANTS DATA**

ID	Name of lecturer	COD E	Date & Time Interview	Method	Teaching Experiences (years)	Industry Experiences (years)	Areas of Expertise (years)	Link Transcription	Link Translated data
1	[REDACTED]	IDE 01	23 October 2023 4:00 pm	F2F (U11M Office)	15	15	3D Architecture, Graphic Design	[REDACTED] Google Drive	[REDACTED] <a href="#">https://www.google.com/document/d/1S2.../edit?usp=sharing</a>
2	[REDACTED]	IDE 02	24 October 2023 11:00 am	F2F (U11M Office)	28	32	TV Island Architecture	[REDACTED] Google Drive	[REDACTED] <a href="#">https://www.google.com/document/d/1S2.../edit?usp=sharing</a>
3	[REDACTED]	IDE 03	23 October 2023 12:00 pm	F2F (U11M Office)	21	2	ID	[REDACTED] Google Drive	[REDACTED] <a href="#">https://www.google.com/document/d/1S2.../edit?usp=sharing</a>
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# APPENDIX M

## Sample of Field Note Taken During Interview Session

- ^ lecturer. in ID studio especially, how do you encourage students to think critical is."

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5. \\\hat art the examples of teaching method\*, that \ou used to encourage students using ( I s in interior design projects?-

~Z<±\_\* .....\_● \_'''\_\* ' !

6. As a Student, what do you think students should do to enhance their ( I s

Am . v. Wi ^ ^

J

Have you encountered any challenges in encouraging ("Is in sour teaching'!

kv-V< ft V<l \* '\*v, W-s

- X, What recommendations do you have for enhancing ( I s in interior architecture education? , ,

J^<~ ' D\*\_M l \* • ' ..... i \*

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- V. Do you receive training or support in fostering (Ts?

# APPENDIX N

## Sample of Expert Invitation Letter



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TEKNOLOGI  
MARA

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Tarikh 1447H v ^ j 9  
3D Disembef 2025

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\*

*KuOfyyah of Architecture and Environmental Design (KAED),  
Unraetsiti Islam Antarabangsa Malaysia  
531 DO Jin GtHnbak  
Kuala Lumpur*

Puan,

PELANTIKAN SEBAGAI PEHILAI PAKAR (EXPERT REVIEWER) BAGI PROGRAM PENYELIDIKAN

NAMAPELAJAR	HORHAYATI BINTI KASSIM
NO. MATRIK	2021829728
PROGRAM	AP991 DOCTOR OF PHILOSOPHY IBUILT ENVIROHMEHTj
PENYELIAUTAMA	DR N UR M AIZURA BINTI I AH M AD N 00 R H ANI
TAJUK KAJISELIDIK	A FORMULATION OF CRITICAL THIHKINC FRAMEWORK IN UNDERGRADUA TE INTERIOR DESIGN PROGRAM: A CASE SWDYOF UHWERSm TEKNOLOGIMARA (U1TM)

•enrjan segala hofmaUiya, perkara teraebut adalah d lujuk.

2. Adalah dimaklumkan bahawa Fakulti Alam B ha. Un iuersiti TeknDlogi MARA yUFTM). dengan sukacitanya melantik Puan ^ebagai Penilai Pakar (*Expert Reviewer*) bagi menilai penyelidikan pelajar. Penilaian ini bErtujuan untuk m&ndapadcan pandangan dan maklum ba a& pakar hiar berkaitan kua ti serta sumbangan penyElid kan yang dibksanakan.

3. Pihak fakulti amat menghaigai kepakaran dan kDmitmen pihak puan dalam membefikan oandangan yang krjnsuaktif dan membina tertiadap penyelidikan pelajar ini dem i mening katkan lagi prestasi dan kecerreriangan fakulti.

Kerjasama dan jasa baik puan sangat di iiragai dan didahului dengan ucapan Derima kasli.

Sekian.

•-ij\* .,j)t .lt-ji  
"MALAYSIA MADANI"  
"BERKHIDMAT UNTUK HEGARA"

Saya yang menjala"kan arranah,



•R. FARRAH ZUHAI RA BINTI ISMAIL  
KonndinalDr Program Penyelidikan

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# APPENDIX O

## Sample of Expert Feedback on Framework Validation

  to me ▾ Sat, Jan 18, 9:24 AM (7 days ago) ☆ ↶ ⋮

Assalamualaikum WRT,

Dear Ms. Norhayati Kassim,

Thank you for the invitation to serve as an Expert Reviewer for the research entitled "A Formulation of Critical Thinking Framework in Undergraduate Interior Design Program: A Case Study of Universiti Teknologi MARA (UiTM)". I appreciate the opportunity to review the proposed framework, particularly in relation to **Research Question 5 and Research Objective 5**, which focus on fostering critical thinking in undergraduate interior design education. My feedback for the framework is best represented in the EXPERT VALIDATION STATEMENT below:

---

**EXPERT VALIDATION STATEMENT**

I have reviewed **Chapter 1 (Introduction)** and the proposed framework entitled "A Framework to Foster Critical Thinking in Undergraduate Interior Design Program", developed in response to **Research Question 5 and Research Objective 5** of the study "A Formulation of Critical Thinking Framework in Undergraduate Interior Design Program: A Case Study of Universiti Teknologi MARA (UiTM)".


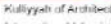
Based on my review, I find that the proposed framework is **conceptually sound, theoretically grounded, and appropriate** to address the stated research objective. The framework is clearly anchored in Flavell's (1990) Critical Thinking model and systematically organised around four interconnected pillars namely **Human Factors (Students and Educators), Instructional Design, Pedagogical Approach, and Institutional Support** in which collectively reflect the empirical findings of the study.

The framework demonstrates strong alignment with the research problem, qualitative findings, and the contextual realities of undergraduate interior design education. It provides a coherent and structured approach to fostering critical thinking that integrates individual, pedagogical, curricular, and institutional dimensions. Importantly, the framework avoids a fragmented or skills-only interpretation of critical thinking and instead positions it as a developed, contextual, and socially mediated process, which is appropriate for studio-based design education.

In my professional judgement, the framework represents a **valid and meaningful doctoral-level contribution** and is suitable to be accepted as the outcome of Research Objective 5. Any suggested refinements are minor in nature and do not affect the overall validity or robustness of the framework.

**Improvement Suggestions:**

- Consider clarifying the practical implementation pathway of the framework to support its application at program and course levels.
- Consider further explicating the interactions among the four pillars to reinforce the framework's systemic coherence.
- Minor refinement of terminology consistency may enhance overall clarity and readability.

Validated by   
  
Kulliyah of Architecture and Environmental Design (KAED)  
International Islamic University Malaysia

## AUTHOR'S PROFILE



Norhayati Kassim obtained Bachelor of Interior Architecture (Hons.) in 2011 from, MSc in Built Environment (2016) from Universiti Teknologi MARA (UiTM) Shah Alam. Currently in the journey of Doctoral of Philosophy (Built Environment) started 2021 at Universiti Teknologi MARA (UiTM) Shah Alam as well. Currently she is working as lecturer at Department of Interior Design at UiTM Perak. Presently, she serves as a lecturer in the Department of Interior Design at UiTM Perak, where her responsibilities are primarily centred on the development and documentation of the interior design curriculum.

### **LIST OF PUBLICATION:**

Kassim, N., Noorhani, N. M. A., Sulaiman, N. L., Ghadi, I. N. M., & Abidin, Z. Z.

(2025). Barriers to Fostering the Critical Thinking Skills in Interior Design Education: An Empirical Study of Interior Design Lecturers' Perception. *Built Environment Journal*, 22(2).

Kassim, N., Maizura, N., & Noorhani, A. (2024). Students Perception and Experiences on the Integration of Critical Thinking into Interior Design Education. *International Journal of Academic Research in Progressive Education and Development*, 73(3), 5168-5181. <https://doi.org/10.6007/IJARPED/v13-i3/22407>

Kassim, N., Ahmad Noorhani, N. M., & Hazim, Z. (2024). Integration of Critical Thinking in Interior Design Education: Investigating the Educators' Perception and Challenges. *International Journal of Academic Research in Business and*

*Social Sciences*, 14(9), 2507-2523. <https://doi.org/10.6007/ijarbss/v14-i9/22492>

- Kassim, N., Ahmadd Noorhani, N. M., Abd Aziz, M. N., & Mustafa Kamal, N. F. I. (2023). Thematic review on teaching approach in fostering the CT skills in architectural education. In *e-Proceeding of the 3rd International Conference on Education and Language for Students and Adult Learners (ELSA 2023)* (pp. 100-111).
- Kassim, N., Ahmad Noorhani, N. M., & Md Sakip, S. R. (2022). Contributing factors of critical thinking skills acquisition in sustainability of higher education: a systematic review. In *1st International of e-Conference on Green and Safe Cities 2022* (pp. 146-160).
- Kassim, N., Noorhani, N. M. A., & Mustapha, A. A. (2021). Thematic review on the critical thinking in architectural education. In *1st IAEEEC Webinar Conference* (pp. 1-11).