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Students' Level of Critical Thinking Skills (CTS) in Writing Problem Statement (PS) in Theses

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ABSTRACT

When organising ideas in a thesis, students have to deal with a set of structures to meet its communicative purposes. Numerous attempts have been made to investigate the move structures of the problem statement (PS), which is a section in the introduction chapter of a thesis. However, there is no previous work that accounts for the element of critical thinking skills (CTS) in PS. This study recognises that CTS combined with move structures are necessary for students to write an effective PS. A guideline for writing an effective PS that embodies organised moves and CTS is non-existent. Therefore, this study aims to introduce a Rubric for Assessing Critical Thinking Skills in Problem Statement (RACTSPS) to rate the PS section, taking into account students' CTS guided by the correct moves when writing them. This rubric was developed based on thematic analysis from previously developed models and rubrics. Thirty PS sections were extracted from 30 English-written theses from Universiti Teknologi Malaysia Institutional Repository using the purposive sampling method. The PS samples were then rated using RACTSPS, and the scores were recorded. The scores were then triangulated with the raters' feedback in a focus group interview. The findings reveal that students display an average level of CTS. This is concerning for the university as it reflects the lack of graduates' ability to think critically – a skill much needed in the academic and industry settings. As a result, a guide should be offered to both students and teachers early in the thesis writing process, which this study proposes. The model, the RACTSPS, will create awareness of the CTS level expected to be reflected in the students' thesis.

Keywords: Critical Thinking Skills (CTS), Problem Statement (PS), Thesis Writing, Rubric, Tertiary Students

1.0 INTRODUCTION

A component of a thesis's introduction chapter called problem statement (PS) has always been regarded as a challenging component (Jalilifar *et al.*, 2011). Kerlinger and Lee (2000) stated that, in a doctoral dissertation, forming and writing the problem statement is one of the most difficult and important tasks. This is because a PS must include details of the research, including presentation, exploration, and proof (Nenty, 2009). An excellent research problem provides the potential of producing relevant results (Ellis & Levy, 2008). Hence, researchers need to conceive and define a research problem effectively. Researchers can determine the research questions once they are clear with the problem(s) surrounding their research

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topic. Numerous research has investigated PS but only focused on the move structures of PS (Jalilifar *et al.*, 2011; Coker & Coker, 2012; Nimehchisalem, 2016; Parsa & Tahririan, 2017; Tarvirdizdeh & Nimehchisalem, 2021). It is believed that move structures facilitate students to write the section effectively, targeting particularly its organisation. Nonetheless, this study argues that the current research's coverage is insufficient. CTS should be integrated into the move structures, which will result in producing more quality theses. Cultivating CTS among tertiary students is never an easy task. Besides that, it is challenging to construct a reliable and effective evaluation instrument to measure students' ability in displaying CTS. Thus, this study aims:

- 1. to develop a rubric henceforth called Rubric for Assessing Critical Thinking Skills in Problem Statement (RACTSPS); and
- 2. to use the rubric to identify students' CTS levels in writing PS.

2.0 LITERATURE REVIEW

Before any link can be drawn between critical thinking and writing, their definitions must be established. Writing provides significant benefits in the development of CTS among students (Wade, 1995; Sinaga & Feranie, 2017). During the writing process, students modify their thoughts at any stage of writing. For example, in the pre-planning stage, students sift and organise information before they could integrate them into the writing stage. While in the post-writing stage, students review and revise the draft to arrive at the final product that will be able to show their understanding of the topic. As for critical thinking, Costa and Kallick (2014) define it as a mental process in which, people actively and reiteratively conceptualise, apply, analyse, synthesise, and evaluate information as to find an answer or achieve a conclusion. This shows that mental processes are involved in all of the writing stages require students to demonstrate CTS.

According to Tahira and Haider (2019) and Pramonojati *et al.* (2020), the ability to demonstrate these CTS is vital for quality academic writing. Past research has proven that a strong link exists between CTS and quality academic writing (Wade, 1995; Pryke, Rose & Whatmore, 2003; Sinaga & Feranie, 2017; Rahmat *et al.*, 2020; and Kayaalp *et al.*, 2020). The exhibited writing skills of learners should reflect the processes they go through while thinking critically. Haase (2010) categorises five abilities that display CTS in writing. The categories are:

- 1. conceptualising information: students are said to have this ability when they are able to develop an idea from a concept.
- 2. applying information: students apply this ability at the beginning stage of writing. In order to be engaged with the topic, students would need to read around the issue and embed the information in their writing.
- 3. analysing information: some students are not able to analyse what they have read. They simply use the information in their writing and do not think of its relevance to their writing.
- 4. synthesising information: students will use this ability to gather and merge information from different sources to use in their writing.
- 5. evaluating information: students will use this skill to assess information and weak arguments will be discarded.

Based on the CTS listed above, Rahmat *et al.* (2020) created a relationship with the writing process that Flower and Hayes (1981) said would take place in the working memory. The relationship starts at the planning stages when conceptualising and applying information happens. Then, during the writing-up process which Flower and Hayes (1981) termed as translating, students are expected to analyse and synthesise information. Finally, during the reviewing process, students are expected to evaluate information critically.

Not only is CTS important in an academic setting, but also relevant to workplace situations. Nur Ashiquin *et al.* (2018) investigated the industries' requirements and expectations of graduates and reported that the capacity to think critically is one of the factors highly valued when hiring graduates. This finding reveals that critical thinking plays a part in determining the standard of graduates needed by the industries. Employers have increased demand for graduates' writing abilities due to the increasing level of competition among qualified applicants and the changing needs for knowledge and abilities needed in the workplace (Attan *et al.*, 2018). In most organisations, 'Satisfactory' (Level 4) is currently the minimum desirable level (ibid, 2018) among the six levels of proficiency proposed by the researchers. The six levels are as follows:

- 1. Level 6: Highly Effective
- 2. Level 5: Effective
- 3. Level 4: Satisfactory
- 4. Level 3: Functional
- 5. Level 2: Limited
- 6. Level 1: Extremely Limited

The 'Satisfactory' level is considered to be above average in writing. Therefore, students need to achieve the following levels in writing to get a better chance of securing employment: 'Satisfactory', 'Effective', or 'Highly Effective'. This statement is confirmed by Siti Hamin *et al.* (2008) that students, even with necessary qualifications, are unemployed due to their weak writing skills.

Due to the importance of CTS in academic and workplace settings, it is addressed in writing assessment and is one of the important constructs in the rubric for writing skills at tertiary levels. The Centre for Teaching, Learning, and Technology (CTLT), the General Education Program, and the Writing Program of Washington State University collaborated in 1996 to create a critical thinking rubric with reference to past research and practices. The rubric has seven critical thinking key areas covered by Kelly-Riley *et al.* (2001) as follows:

- 1. Identifying the issue
- 2. Establishing a distinct point of view of the problem
- 3. Recognising other viewpoints
- 4. Identifying the context
- 5. Identifying and evaluating evidence
- 6. Recognising the depiction of a problem's essential assumptions, whether implicit or explicit.
- 7. Assessing the implications and possible conclusions

This rubric intends to assess students' CTS while also assists instructors in facilitating students in improving their skills. Instructors use it to reflect and improve their curriculum to ensure that students master the required CTS.

Joan Grenier-Winther introduced a rubric for writing and assessing research papers which can be referred to in Kelly-Riley *et al.* (2001, p. 18). This rubric contains the components of a research paper and the CTS needed for each component based on a scale from 1 (Developing) to 5 (Developed). There are six components in the rubric as summarised in Table 1.

Table 1 Components of the rubric for writing and assessing research papers (Kelly-Riley et al., 2001)

Components	CTS
Introduction	Identifies a thesis and expresses a debatable viewpoint on it
Resources	Backs up own opinion with evidence from textual sources
Body	Constructs a logical, well-thought-out argument in favour of the thesis
Context	Analyses the problem in its context
Conclusion	Identifies and evaluates findings, implications, cultivates a critical perspective
Mechanics	Uses correct grammar, and appropriate word choice, punctuation, and spelling, as well as well-
	structured sentence and paragraph

CTS is even more essential in an extended research document like a thesis. The one section in a thesis that demonstrates the importance of CTS more than any other section is the PS. This section highlights the relevance of the research (Nenty, 2009) and answers the question, "What are you doing?" (Metoyer-Duran & Hernon, 1994). It is the driving force behind the whole document because any study can only get off to a good start if it begins with an undeniably clear description of the problem. Although the PS section is the key aspect of every research project, only a few studies have been conducted to investigate the implementation of CTS in PS (Ibrahim & Nambiar, 2011). This implies that CTS is not being given enough attention in PS.

To add to this, previous studies have highlighted that students' main challenges when writing PS for a thesis was that they lack understanding in selecting relevant literature reviews and sources related to certain themes (Qasem & Zayid, 2019). Applying and synthesising information as one of the CTS outlined by Haase (2010) proved to be challenging (Pramonojati *et al.*, 2020). Creswell (2014) and Lipson (2018) added that another challenge was to conceptualise information from earlier literature in order to establish and validate current issues to be addressed in the PS. Pramonojati *et al.* (2020) added that students were struggling to show individuality in academic writing which is an important component of CTS. Yiu (2009) stated that students are expected to communicate using an academic voice in the thesis to ensure the originality of ideas. Students should be persuasive in positioning their research problems in the introduction chapter to maintain readers' interest in the research topic. Therefore, it is undeniable that CTS in PS plays a significant role in the thesis development.

To acknowledge the struggles of writing a PS, Swales (1990) developed a general model that outlines the rhetorical movements relevant to the introduction section of a thesis that consists of a PS. The model, Create-A-Research-Space (CARS), highlights that writers need to make several moves and steps when constructing a well-organised introduction chapter of a thesis. However, certain steps of the moves are optional. Figure 1 outlines the moves and steps.

Figure 1 The Swales' (1990, p. 141) CARS model

Nimehchisalem *et al.*, (2016) later propose more specific sections for PS based on the CARS model as shown in Table 2 below.

Table 2	The PS	Sections	as taken	from 1	Nimenchis	alem et	al., (20	16)

PS Section
Section 1: Representing a problem
Section 2: Identifying the gap
Section 3: Achieving the objective in a way that is advantageous

Table 2 shows how an academic issue should first be presented as a problem or claim. Next, the gap should be recognised, and finally, clearly defined objectives to be achieved and how it would benefit the population should be identified. To the best of the researchers' knowledge, there is no existing rubric that can measure CTS in PS. Hence, the researchers find developing a rubric to assess CTS in PS by combining the Critical Thinking rubric by Grenier-Winther (2001), the CARS Model by Swales (1990) and PS Sections by Nimehchisalem *et al.*, (2016) relevant.

3.0 METHOD

This study employs both quantitative and qualitative approaches to collect and analyse the data. A rubric was used as a tool to rate the students' CTS in PS writing. Thirty English-written theses were retrieved from Universiti Teknologi Malaysia Institutional Repository. The platform offers limited access to the thesis collection that covers Chapter 1, including PS. To analyse the PS, they were extracted and compiled into a file. In addition, since the researchers did not want language competency to affect the evaluation of

CTS, they only chose theses written by English major students who obtained MUET Band 4 and above, indicating that the students are independent users of English. The researchers utilised a random purposive sampling procedure to identify the theses.

3.1 Self-developed Critical Thinking Rubric

The rubric, RACTSPS (refer to Appendix A), was developed based on three sources: (1) Grenier-Winther's (2001) Critical Thinking rubric utilised in the Writing Program at Washington State University, (2) The Swales' (1990) CARS model, and (3) Nimehchisalem *et al.*'s (2016) PS sections. After analysing the three sources thematically, a list of CTS (themes) and subskills (subthemes) required to write PS was proposed as follows:

- 1. Identify/summarise the issue/problem/gap and state an arguable opinion about it.
 - a. Identify a significant gap in the literature.
 - b. Introduce the gap/thesis well that lays out the thesis, and the sequence of what follows clearly that explains why the gap is important.
- 2. Support opinion based on evidence from experience and other textual supports.
 - a. Provide suitable and adequate support to prove the thesis and the existence of the gap.
 - b. Logically organise ideas.
 - c. Efficiently integrate the textual supports and clearly connect them to the thesis.
 - d. Use cohesion strategies like transitional words and phrases to show the connection between the thesis, gap, and evidence.
- 3. Formulate logic arguments to support the issue/problem/gap.
 - a. Understand the issue/ problem/gap well.
 - b. Identify and explain the variations of the issue and its intricacies.
 - c. Assert that the issue/problem/gap remained unanswered.
 - d. Highlight the relevance of the source information.
- 4. Analyse the issue/problem/gap in its relevant context.
 - a. Analyse the issue/problem/gap with a clear sense of the study's scope.
 - b. Argue that the issue/problem/gap is worth answering.
- 5. Identify and assess conclusions, implications, and consequences; develop a critically aware perspective.
 - a. Go beyond summarising the issue/problem/gap/restating the thesis.
 - b. Persuade readers with relevant arguments that the issue can be resolved in some way.
 - c. Show stance clearly on the highlighted issue.

3.2 Quantitative Content Analysis

In the first part of the analysis, 30 PS samples were examined using a top-down approach similar to Swales' (1990) move structure evaluation model. The study's 15 sub-skills of critical thinking were used as predetermined themes. Before transforming the themes into the self-developed rubric, the statements demonstrating CTS were thoroughly analysed and coded. After coding, the rubric was used to rate the CTS in the PS samples. Three researchers were assigned 10 samples each to be rated. They rated the

students' CTS based on five categories: 1 - Excellent; 2 - Very Good; 3 - Good; 4 - Fair; 5 - Poor. The rating results were submitted to three inter-raters for reliability checks. Once agreed, the mean of the entire score was calculated.

3.3 Qualitative Analysis

In the second part of the analysis, the raters were called to participate in a recorded focused group interview. The purpose of the interview was to discuss the raters' decision on the scores awarded to the selected PS. The recording was transcribed and coded to identify specific reasons for each of their decisions made on the scoring. The information obtained was then used to triangulate data coming from multiple sources (assessment and interview).

4.0 RESULTS AND DISCUSSION

The results of the CTS analysis of PS extracted from 30 theses are discussed in this section. Figure 1 depicts the overall level of the CTS from the 30 PS samples:

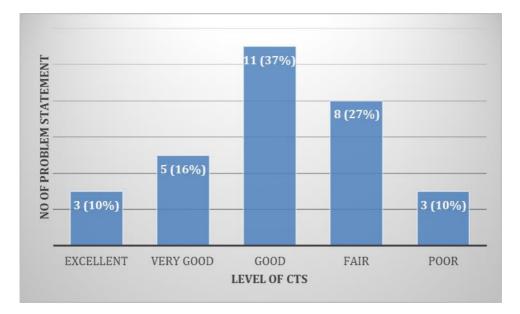


Figure 2 Level of CTS among tertiary students in their PS writing section

Figure 2 shows that the majority (37%) of the PSs were rated as 'Good', followed by 27% rated as 'Fair'. The least levels reported were 'Excellent' and 'Poor', at 10% respectively. It is possible to say that the students have an average level of CTS, which means that the PS was neither excellently nor terribly written. This is worrying as the writing ability of students, which includes critical thinking, should at least

be at a 'Satisfactory' level (average and above) for them to have a higher chance of employment as emphasised by Attan *et al.* (2018). However, the PS collected in this study did not reach the expected level. They were rated as average and below.

There are five components of PS as follows: Introduction of the issue/problem/gap, resources, body, context, and conclusion. Table 3 shows the CTS level of PS components.

Table 3 Level of CTS in five PS components

Critical Thinking Sub-skills	Mean
COMPONENT 1: INTRODUCTION OF THE ISSUE/PROBLEM/GAP	
• Identify a significant gap from the literature.	
• Introduce the gap/thesis well that lays out the thesis, and the sequence of what follows clearly that	3
explains why the gap is important.	
COMPONENT 2: RESOURCES	
• Provide suitable and adequate support to prove the thesis and the existence of the gap.	
• Logically organise ideas.	
• Efficiently integrate the textual supports and clearly connect them to the thesis.	4
• Use cohesion strategies like transitional words and phrases to show the connection between the	
thesis, gap, and evidence.	
COMPONENT 3: BODY	
• Understand the issue/ problem/gap well.	
• Identify and explain the variations of the issue and its intricacies.	4
• Assert that the issue/problem/gap remains unanswered	4
Highlight the relevance of the source information.	
COMPONENT 4: CONTEXT	
• Analyse the issue/problem/gap with a clear sense of the study's scope	3
• Argue that the issue/problem/gap is worth answering	
COMPONENT 5: CONCLUSION	
• Go beyond summarising the issue/problem/gap/restating the thesis.	
• Persuade readers with relevant arguments that the issue can be resolved in some way.	4
• Show stance clearly on the highlighted issue.	

Table 3 shows the level of CTS in each PS component is either 'Good' or 'Fair'. The mean of the first component namely 'Introduction of the issue/problem/gap' was 3, which is equivalent to 'Good'. Raters noted that students managed to find the gap in the literature as well as introduced it at the beginning of the PS. However, many students did not elaborate on the gaps or problems identified in the literature that were considered important for the study. This could be due to a common challenge of conceptualising information from earlier literature in establishing and validating current issues as highlighted by Creswell (2014) and Lipson (2018). According to Nenty (2009), starting with an undeniably clear description of the problem offers authors a significant reason to get off to a good start in their writing. Enquiring about certain aspects of the topic and defining the problem are examples of critical thinking activities (Wade, 1995) that some of the students in this research could not demonstrate in the first part of their PS.

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The second component is 'Resources' where students are expected to provide appropriate evidence to support the proposed gap, organise ideas logically, synthesise evidence from sources, and use linkers to connect ideas. In other words, students would need to read around the issue and embed the information in their writing (Haase, 2010). The raters awarded a score of 4 on average to this component which is equivalent to 'Fair'. The mean score indicates that the majority of the students could not provide sufficient evidence from other sources to support the gap and problem identified at the beginning of the PS. The problem in the PS must be proven and supported by evidence from earlier research before it can be considered a well-grounded problem (Creswell, 2014). If the students did not manage to write this part thoroughly, the overall sub-skills in that particular component could be affected. Being able to examine and provide evidence in the PS shows that students are able to critically weigh and evaluate existing arguments and claims around the issue pertaining to the inquiry made in the PS (Wade, 1995). This step is crucial to show a link to the next component, 'Body' which is a section that emphasises the seriousness of the problem.

Component 3 of the PS, 'Body', expects students to be able to emphasise the severity and seriousness of the problem in the thesis by providing evidence to strengthen the case. The mean rating of Component 3 was 4, which is equivalent to 'Fair'. The raters found that the students were either disregarding the opportunity to mention the extent of the issue or oblivious of the necessity of providing evidence to illustrate the extent of the problem. According to Lipson (2018), one of the issues faced by students when writing a thesis is a lack of knowledge about the substance of thesis writing. When a thesis is missing its substance, the value of arguments put forward by students is arguable. The absence of substance is believed to stem from the lack of information analysis ability as emphasised by Haase (2010). The students would not be able to highlight the importance of the problem if they fail to recognise and sort the information when strengthening the study context. As writing is a means of communicating ideas (Alidmat & Ayassrah, 2017), emphasising evidence in writing will assist students in persuading readers of the importance of the problem to the field of study.

The fourth component namely 'Context' deals with students analysing the issue by having a clear sense of the study scope and also arguing that the problem is worth answering. When students skip this move, readers will lose the sense of importance and urgency towards the problem. Having the ability to contextualise the problem in the thesis would give a sense of persuasive power to the writing (Bennett, 2016). In his research, Haase (2010) found that some students were not able to analyse what they have read. They simply used the information in their writing and did not think of its relevance to their writing. However, the mean level of this component in this research was 3, which is equivalent to 'Good'. The raters noted that most students could point out the scope of the study though not necessarily able to put a clear emphasis on the worthiness of the study.

Component 5 namely 'Conclusion' is the component where the students need to go beyond summarising, helping the readers to feel a sense of closure and asserting their own position. This component is necessary for helping the students to highlight their academic voice (Yiu, 2009) that represents individuality in their research (Pramonojati *et al.*, 2020). Having an academic voice reveals the maturity of the students as researchers and reflects their confidence in their writing. However, the raters found most of the students to be at level 4, which is equivalent to 'Fair'. They perceived the students' conclusions to be lacking in confidence thus resulting in a lack of individuality in their PS. A study done by Pramonojati *et al.* (2020) also yielded a similar finding where it was found that students struggled to show their individuality in academic writing which is an important component of CTS.

This study found that the reflection of CTS in PS writing among tertiary students is at a satisfactory level since the majority of students were rated 'Good'. Yet, a significant number of students obtained just a 'Fair' level of CTS in certain PS components. This is a concerning situation for the university's reputation as the production of a thesis is the pinnacle of the students' academic study and critical in displaying the graduates' quality. Since the levels of CTS in the theses are at 'Good' and 'Fair' levels, CTS must be taught explicitly before students commence their research process. The outcomes of this study also demonstrated that the CARS model suggested by Swales (1990) has been successfully employed to analyse the PS sections.

5.0 CONCLUSION

Considering every aspect, producing consistent and balanced arguments over a long stretch of text is indeed difficult. This becomes more problematic when students read minimally. This study sees the importance of students doing extensive reading on their research topic to produce critical writing. If students fail to train themselves to read extensively, it is impossible for them to exhibit CTS in their writing. Thus, it becomes more challenging for them to write critically. As underlined by Paul and Elder (2010), critical thinking requires students to analyse and evaluate ideas with an intention to improve the ability to express their thoughts. In academic writing, specifically in PS, critical thinking is a process of filling in the gaps and answering questions that can bring significance to the field of study.

Overall, this study proposes a rubric that can serve as a guideline in the teaching and learning of thesis writing, particularly for the PS section. This rubric is useful for instructors to determine which skills should be taught in writing PS. Ample practises should be given to students to learn the strategies needed to think critically in their writings. As Moeti, Mgawi, and Moalosi (2017) proposed, cultivating the critical thinking habit should start with the teaching of specific strategies. Sinaga and Feranie (2017) also reveal that there is a linear correlation between the quality of writing and CTS when working with content. Therefore, both the content and language proficiency lecturers need to provide instructions and practices that emphasise aspects of content mastery and quality writing to promote critical thinking.

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APPENDIX

APPENDIX A: Rubric for Assessing Critical Thinking Skills in Writing the Statement of Problem Thesis ID = _____

Statement of Problem Component	Critical Thinking Skill	Critical Thinking Subskills	Excell ent	Very good	Good	Fair	Poor
Introduction of the	Identify / summarise the	• Identify a significant gap from the literature.	1	2	3	4	5
m/Gap ar	issue/problem/gap and state an arguable opinion about it.	 Introduce the gap/thesis well that lays out the thesis, and the sequence of what follows enough that explains why the gap is important. 	1	2	3	4	5
Resources	Support own opinion based on evidence from	 Provide suitable and adequate support to prove the thesis and the existence of the gap. 	1	2	3	4	5
	experience and other	 Logically organise ideas. 	1	2	3	4	5
	textual supports.	• Efficiently integrate the textual supports and clearly connect them to the thesis.	1	2	3	4	5
		 Use cohesion strategies like transitional words and phrases to show the connection between the thesis, gap, and evidence. 	1	2	3	4	5
Body	Formulate logic arguments to support the issue/problem/gap.	 Understand the issue/ problem/gap well. 	1	2	3	4	5
		 Identify and explain the variations of the issue and its intricacies. 	1	2	3	4	5
		 Assert that the issue/problem/gap remains unanswered 	1	2	3	4	5
		• Highlight the relevance of the source information.	1	2	3	4	5
Context	Analyse the issue/problem/gap in its relevant context.	• Analyse the issue/problem/gap with a clear sense of the study's scope	1	2	3	4	5
		 Argue that the issue/problem/gap is worth answering 	1	2	3	4	5
Conclusion	Identify and assess conclusions, implications, and consequences; develop critically aware perspective	• Go beyond summarising the issue/problem/gap/restating the thesis.	1	2	3	4	5
		Persuade readers with relevant	1	2	3	4	5
		arguments that the issue can be resolved in some way.	1	2	3	4	5
		 Show stance clearly on the highlighted issue. 	1	2	3	4	5
		Mean					