

Refining Research Problem Statements: Evolving from a Four-Stage Framework to AI Integration

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Abstract:- A clear problem statement is crucial for articulating the issue a research study aims to address. However, many students struggle to write effective problem statements despite their significance. This difficulty is exacerbated by a lack of systematic instruction on how to craft a clear problem statement. Thus, this study has two primary objectives: first, to identify the challenges postgraduate students face when writing problem statements, and second, to propose a methodology that offers a structured approach for lecturers to assist postgraduate students in constructing their research problem statements. This research employed a qualitative case study approach, utilizing Beeler's framework to suggest steps for academicians to mentor students through the stages of problem statement writing. Eighteen postgraduate students' problem statements were analyzed, and interviews were conducted to collect data. Students were interviewed about the challenges they faced in writing problem statements, and after a three-month intervention, evaluations from both the students and the lecturer were gathered to assess the framework's impact. The findings categorized the difficulties into three areas: structural issues, sourcing challenges, and language skills deficiencies. Additionally, this study proposed the integration of Artificial Intelligence (AI), addressing the issues of real-time language feedback, terminology and phrasing, citation management, and enhancing the overall clarity and coherence of problem statements. This study offers a comprehensive framework for lecturers and learners, providing practical guidance that not only aids in overcoming the identified difficulties but also enhances the quality and clarity of problem statements in postgraduate dissertations.

Keywords: Artificial Intelligence, Four-stage framework, Problem Statement writing, postgraduate studies.

1. Introduction

Like the saying "the journey of a thousand miles starts with a single step," completing a thesis often begins with defining the research problem. The problem statement serves as the central element to which other sections of the postgraduate thesis connect as it develops (Bryman, 2016). Crafting a problem statement is a complex process that requires multiple decisions influenced by various factors. However, once established, a well-defined problem statement lays the foundation and paves the way for a comprehensive postgraduate thesis. The task of writing a research problem statement in a postgraduate thesis has been extensively studied (Creswell & Poth, 2018; Yin, 2018).

These studies emphasize that writing a research problem statement is challenging and influenced by multiple factors (Bui, 2020). The complexity is heightened by the fact that this task is usually undertaken at the beginning of the journey—a period when most students are adjusting to the new demands of graduate studies or the thesis writing phase (Gardner & Holley, 2011).

2. Motivation and Objectives

The researchers teach an Academic Writing workshop series for postgraduate students at Universiti Utara Malaysia Kuala Lumpur (UUMKL) in which we found the issue in producing good writing of problem statements

is heightening. In the current emphasis on producing more postgraduate researchers, it has been evidenced that the ability to write good pieces of problem statements has become problematic. Our experience as supervisors and Academic Writing workshop series instructors for postgraduate students led us to conclude that postgraduate researchers are unable to synthesize and identify solid research problems to establish a comprehensive problem statement writing. They have low ability in exercising highly cognitive ability works in which they tend to misidentify problem statement writing as critical tasks.

Most UUMKL postgraduate learners have the tendency to compile what they read in a ‘shop-list’ format; a collection of readings with the absence of ‘voice’ or their stance lacking the ‘critical’ element. We believe that the weakness is contributed by the inability to do ‘metacognitive’ consciously.

This scenario becomes common and explicit among postgraduate students which alarms us about the jeopardy of their intellectual competence. The above scenario coincides with many studies suggesting the recurring pattern of errors and concern that drag students down resulted in poor thesis as follows; reliance on low-quality sources, a lack of landmark literature, a lack of current literature, description instead of integration and synthesis, irrelevant or unfocused content, plagiarism and poor referencing (Jansen et al, 2021).

Research that discusses the difficulty of writing a research problem statement is abundant. Kerlinger and Lee (2000), for example, noted that forming the problem statement in a research thesis is the most difficult and important task in writing a thesis. Jacobs (2013) noted that research problems are not lying around waiting to be selected. Instead, the problem needs to be researched and selected based on the interest of the researcher. Jacobs further noted that writing a research problem statement demands skills far behind proficient writing skills.

We found that there is a lack of a systematic or structured procedure that we can use to guide our students hence we believe that if instructors can train and polish these skills in their students, gradually students would be able to synthesize the ideas with intellectual capability. The problem initiated us to adopt a Four-stage Framework, which can serve as a guideline for the purpose.

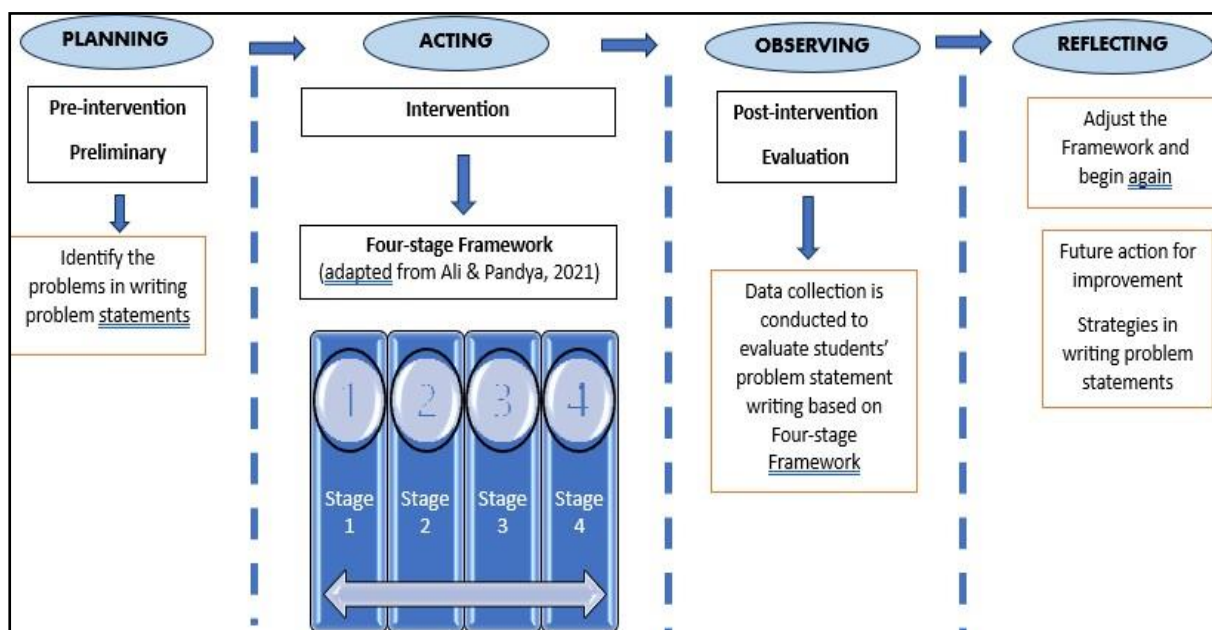


Figure 1. The integration of Four-stage Framework in action research

To date, numerous studies have utilized stage-based models to analyze problem statements. For instance, Ibrahim and Nambiar (2011) explored the challenges ESL postgraduate students in Malaysia face when writing problem statements for their proposals or theses, finding that students struggled with reading and synthesizing previous research. Similarly, Blum and Preiss (2005) proposed a six-step approach for doctoral advisors to guide students in writing problem statements. Overall, the reviewed studies have employed various frameworks to analyze and

structure problem statements. However, the paucity of research using the Four-Stage Framework for problem statement writing motivated the researchers to conduct this study. From a wider perspective, this issue is a national-related agenda, due to most of the postgraduate students' projects are financially funded either by the university or external bodies. The issue prompts a call for raised awareness in many stakeholder groups, including research funders, practitioners, educators, and policy-makers. In our effort to address this issue, we reviewed numerous literatures on this area.

There is potential to tap into the study of how Four-stage Framework facilitates postgraduate learners to write a clear problem statement. Specifically, the objectives of this study are to propose a methodology that offers a structured approach for lecturers to assist postgraduate students in constructing their research problem statements which were identified earlier. This study also explore the lecturer's reflection on the process of Four-stage Framework implementation writing problem statement.

3. Methodology

This research employed an action research design, which refers to a process through which teachers collaboratively evaluate their teaching practice, relate to their theory, share their concept of value, introduce new teaching strategies so that it be more consistent with the educational values they uphold, record and collect their work so that it is readily available and understandable by other teachers, and develop a shared theory of teaching by research practice (Elliot, 1991). It involves four stages of analysis: plan, act, observe, and reflect.

This study adapts the qualitative research method in which the documents, interview transcripts, observation as well as reflection are analyzed as major qualitative research tools. Data was collected from postgraduate students' performance in problem statement writing. An estimated number of 18 postgraduate students who enroll in the UUMKL Academic Writing Workshop series were selected to participate in this study using convenient sampling.

Table 1. Four-stage Framework (adapted from Ali & Pandya, 2021)

| Adjustment Stage | Suggestions for writing | Questions to ask |
|------------------|-------------------------------|---|
| Stage 1 | Phrasing the problem | <ul style="list-style-type: none"> • What is the cause and what is the effect in the statement? • Where can you find the research in the problem statement? • How viable is the research problem statement (what are your time and resource constraints)? |
| Stage 2 | Findings keyword to elaborate | <ul style="list-style-type: none"> • What are the keywords in the problem statement? • Are the keywords explained or elaborated on sufficiently in the statement? • Do you have supporting literature to back that this is a problem that can be researched? |
| Stage 3 | The PEEL approach | <ul style="list-style-type: none"> • Are there naked paragraphs in your problem statement? • Are you connecting the problem statement with research? • Are you following writing conventions and APA in your statement of research problem? |
| Stage 4 | Putting it all together | <ul style="list-style-type: none"> • Do you have supporting data for a research-worthy problem? • How is the problem statement connected to other sections in the dissertation? • Is the problem statement finalized in terms of writing conventions, viability, and researchworthiness? |

Table 1 presents the proposed four distinct stages that guide the postgraduate students to write their research problem statement. The framework is adapted from Ali and Pandya (2021) as we share the same background of postgraduate students which is business study. The questions list from original framework was slightly modified to fit the purpose of this study.

Beeler's Framework (Beeler, 1991) has been extensively utilized to describe the adjustment process of graduate students. The data collection method and procedure involve a few phases as illustrated in Figure 1. The first phase is the pre-intervention stage i.e. before the Four-stage Framework is introduced in the workshops. Students'

writing, interviews, and reflections are analyzed to identify the problems they face in problem statement writing. In the second phase, the intervention is introduced. Students were trained to write problem statements using the Four-stage Framework. Here, the researcher and students worked collaboratively to assess the student's ability to think critically in presenting the problem statements. The instructor's feedback will be collected to identify the impact of the intervention made. The continuous training will be conducted for three months. The final phase is the post-intervention stage in which the evaluation is made of the students' learning experiences and performance.

4. Findings

A. Challenges in PS Writing

Based on the data analysis, the challenges faced by the postgraduate students in writing problem statement can be categorised into 3 themes, which are structure, language and sources. Figure 2 provide a mapping of the research findings by the postgraduate students.

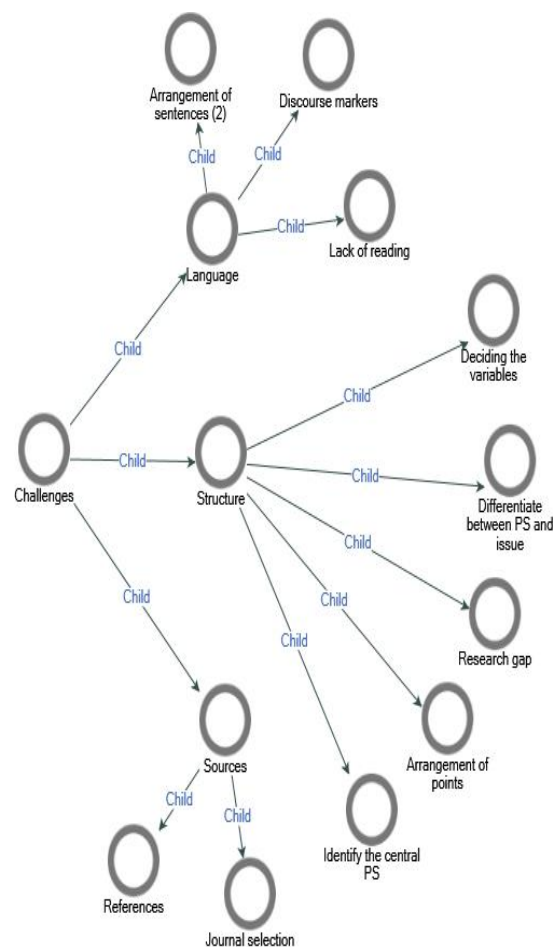


Figure 2. The map of challenges faced by postgraduate students in writing Problem Statement

Based on the data analysis, postgraduate students' challenges in writing problem statements can be categorized into three primary themes: structure, language, and sources. Figure 2 provides a detailed mapping of these findings. The predominant challenge lies within the structural component, which encompasses five specific difficulties. In contrast, language and sources present three and two challenges, respectively. Among the ten challenges illustrated in Figure 2, the two most significant are challenges in identifying the main problem, affecting 80.6% of students, difficulties in selecting appropriate journals, faced by 79% of students, and challenges in highlighting the central problem using appropriate language, encountered by 59% of students. These issues underscore the critical need for systematic support in various aspects of problem statement writing.

Based on the analysis of these challenges, this study proposes a Four-Stage Framework (*see Table 1*) as a solution to assist learners in writing more effective problem statements. This framework aims to address the identified difficulties and provide structured guidance for both students and educators, thereby enhancing the overall quality and clarity of research proposals.

B. Postgraduate Students-lecturer's reflection

Through a combination of interviews and document analysis, this study critically evaluates the implementation of the Four-Stage Framework during its intervention phase, examining reflections from both postgraduate learners and lecturers. Figure 3 depicts the reflective model employed in this study, elucidating the diverse insights and perspectives derived from student participants and academic personnel alike.

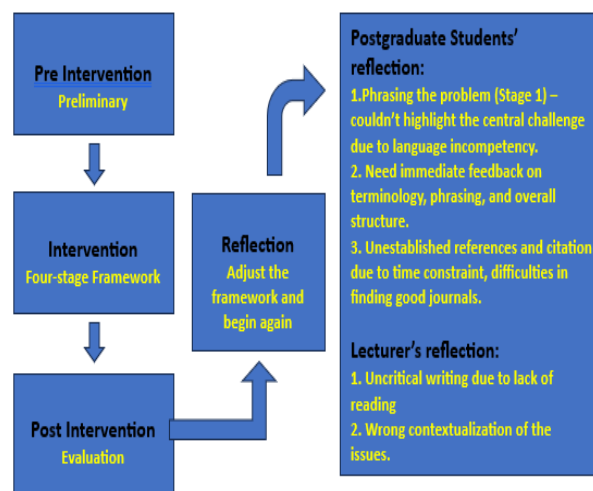


Figure 3. Postgraduate Students and lecturer's Reflection on the Four-stage Framework

Postgraduate students at UUMKL, Malaysia, who are working adult learners, face significant challenges in formulating problem statements, especially in Stage 1 of the Four-Stage Framework. Language competency issues, particularly for non-native English speakers, hinder their ability to articulate research challenges clearly (Smith, 2019). These students emphasize the critical need for timely feedback on terminology, phrasing, and structure to refine their problem statements effectively, crucial for overcoming delays in research progress (Flowerdew, 2021).

Another major challenge is the difficulty in sourcing and citing relevant literature within their problem statements, exacerbated by time constraints. Additionally, lecturers highlight concerns over uncritical writing practices among these learners, often linked to inadequate engagement with existing literature and theoretical frameworks (Pecorari, 2018).

Addressing these challenges, the integration of Artificial Intelligence (AI) offers a promising solution. AI-powered tools can provide real-time language feedback, suggest improvements in terminology and phrasing, automate citation management, and enhance the overall clarity and coherence of problem statements.

5. Discussion

This study makes a significant contribution to the field of academic writing and research methodology by proposing an advanced framework for problem statement writing that integrates artificial intelligence (AI) into the existing Four-Stage Framework adapted from Ali & Pandya (2021). The proposed framework not only retains the systematic and structured approach of the original framework but also leverages AI to enhance the flexibility, efficiency, and effectiveness of problem statement development, particularly for working adult learners. Figure 4 illustrates this comprehensive framework, integrating suggestions for Artificial Intelligence support throughout the study.

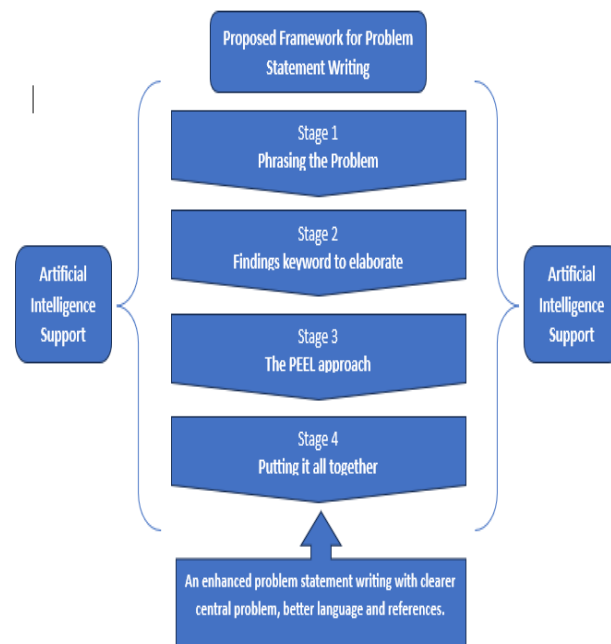


Figure 4. A Proposed Framework for Problem Statement Writing

The original Four-Stage Framework provides a clear, step-by-step methodology for identifying, formulating, and refining research problems. However, our study identifies key limitations in this framework, particularly its rigidity and the challenges faced by working adult learners who require more adaptive and personalized support. The integration of AI addresses these limitations in several ways:

- A. *Enhanced Problem Identification:* AI tools assist in the initial stage by analyzing large datasets and identifying emerging research gaps more efficiently than manual methods. This advancement allows researchers to pinpoint relevant and timely issues more accurately. Previous studies have shown that AI can significantly expedite the identification of research gaps (Li et al., 2020; Wang & Wong, 2021).
- B. *Streamlined Literature Review and Contextualization:* AI-driven literature review tools such as Writefull and Scholarcy expedite the process of sourcing and synthesizing relevant literature. These tools provide comprehensive summaries and highlight key debates, enabling researchers to contextualize their problem statements within the broader academic discourse more effectively. Research by Xing et al. (2019) supports the effectiveness of AI in automating literature reviews, reducing time and increasing accuracy.
- C. *Improved Problem Formulation:* Natural language processing (NLP) algorithms offer real-time feedback on the clarity, coherence, and precision of problem statements. AI tools can suggest improvements in terminology and phrasing, ensuring that the problem statements are well-articulated and researchable. Studies by Devlin et al. (2019) demonstrate the capabilities of NLP in enhancing text quality and coherence.
- D. *Efficient Validation and Refinement:* AI-powered platforms facilitate the iterative process of refining problem statements by providing automated feedback and suggestions. Tools like Grammarly and Turnitin help in enhancing the linguistic quality and originality of the problem statements, respectively. Research by Smith et al. (2020) indicates that AI-driven feedback tools can significantly improve the quality of academic writing.

The integration of AI into the Four-Stage Framework has profound implications for academic practice, particularly for postgraduate students and working adult learners. By offering personalized and adaptive support, AI enables these learners to overcome the constraints of the traditional framework. The enhanced framework ensures that problem statements are not only well-defined and coherent but also reflective of the complex, real-world issues that working professionals often encounter.

Furthermore, the use of AI tools democratizes access to high-quality research support, making it feasible for learners from diverse backgrounds and with varying levels of research experience to develop robust problem statements. This advancement has the potential to improve the overall quality of academic research and foster a more inclusive and equitable research environment. This finding corresponds to the studies by Williams and Beam (2019) and Bryant et al. (2021) who highlighted the role of AI in increasing accessibility and equity in educational settings. improve the quality of academic writing.

6. Conclusion

In conclusion, the proposed AI-integrated framework represents a significant advancement in the methodology of problem statement writing. By addressing the limitations of the traditional Four-Stage Framework and leveraging the capabilities of AI, this study provides a robust and adaptive approach that enhances the efficiency and effectiveness of developing well-defined research problems. This contribution not only improves academic practice but also supports the diverse needs of postgraduate students and working adult learners, ultimately fostering a more dynamic and inclusive research landscape.

Looking ahead, lecturers would benefit from a follow-up study to further explore and validate the long-term impacts of AI integration not just in problem statement writing, but also across broader aspects of the research process. This includes hypothesis formulation, data analysis, academic writing proficiency, and overall research methodology. Such a study would extend beyond initial framework validation to assess how AI-enhanced methodologies influence these critical areas in various academic disciplines and learner demographics. Moreover, the follow-up study aims to refine the AI-integrated framework based on lecturer feedback and to develop comprehensive guidelines and training modules. By continuing to evolve and optimize these methodologies, lecturers can better support postgraduate learners and enhance the overall quality and inclusivity of research practices in higher education.

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