

Enhancing Proposal Defense Effectiveness Through Survey-Based Evidence: A Case Study in Project-Based Learning

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ABSTRACT

Proposal defense is a critical postgraduate milestone that functions not only as an academic assessment but also as a potential learning intervention influencing students' confidence, clarity, motivation, and emotional responses. This study examined postgraduate students' perceptions of proposal defense across preparedness, conceptual understanding, presentation confidence, motivation, anxiety, and academic challenge. An exploratory single-case study using a convergent mixed-methods approach was conducted among postgraduate students in a specialized engineering technology programme at Universiti Teknikal Malaysia Melaka (UTeM). Quantitative data were collected through a post-defense 5-point Likert-scale survey, while qualitative reflections were thematically analysed to identify students' experiences and responses to examiner feedback. The findings indicated high perceived preparedness ($M=4.38$, $SD=0.65$), conceptual understanding ($M=4.77$, $SD=0.44$), confidence and self-efficacy ($M=4.77$, $SD=0.60$), and motivation ($M=4.85$, $SD=0.38$). Anxiety and cognitive load were remarkably low ($M=1.54$, $SD=0.78$), while perceived academic challenge remained strong ($M=3.62$, $SD=1.45$). Qualitative findings further indicated that examiner questioning helped students identify methodological gaps, refine research boundaries, and translate critical feedback into actionable improvements. The findings suggest that a well-structured proposal defense can operate as a desirable difficulty, simultaneously challenging students intellectually while strengthening research clarity, self-efficacy, and thesis agency. The study contributes empirical evidence for designing postgraduate proposal defenses as constructive, psychologically supportive, and learning-oriented assessment practices.

Keywords: Proposal defense, postgraduate education, self-efficacy, motivation, desirable difficulty, formative assessment

INTRODUCTION

The proposal defense is a critical postgraduate milestone, functioning not just as an academic checkpoint but as a formative experience shaping students' cognitive clarity, confidence, and motivation toward thesis completion (de Bruin, 2024; McBrayer et al., 2019). It serves as an authentic assessment where students must articulate objectives, justify methodology, and defend decisions under expert scrutiny (Ülker & Ülker, 2022). Yet empirical research on its psychological and learning impacts, particularly preparedness, confidence, and emotional response, remains limited (Council of Graduate Schools & The Jed Foundation, 2021).

Prior studies show structured academic challenges like oral defenses can boost higher-order thinking, self-efficacy, and resilience (Jeanpierre, 2021; Ferguson, 2024), with questioning and critique promoting deeper understanding and professional identity formation (Li et al., 2022). Yet the same process can induce anxiety and cognitive overload, especially when perceived as evaluative rather than developmental (Gin et al., 2023; Council of Graduate Schools & The Jed Foundation, 2021), making the defense a complex event with multidimensional outcomes.

Understanding student perceptions is thus key to improving supervision and assessment design. Preparedness reflects the effectiveness of pre-defense guidance (Ferguson, 2024), while post-defense clarity about objectives and methodology indicates whether the defense functions as a learning intervention rather than a hurdle (McBrayer et al., 2019). Confidence in presenting and defending ideas is also a transferable skill linked to

future academic and professional careers (Jeanpierre, 2021). Motivation and emotional regulation matter too: feeling inspired after the defense can speed thesis progress and reduce attrition, while anxiety and confusion can hinder productivity (McBrayer et al., 2019; Gin et al., 2023). Being challenged by examiners may simultaneously reveal weaknesses and undermine confidence, underscoring the balance needed between rigor and psychological safety (Council of Graduate Schools & The Jed Foundation, 2021).

Existing literature also lacks structured empirical evidence on students' affective and cognitive responses, tending to focus on outcomes or supervisory views over lived student experience (Li et al., 2022), a gap especially notable in technical and applied science disciplines with examiner-driven defenses (Ferguson, 2024).

This study evaluates postgraduate students' perceptions of proposal defense across preparedness, research clarity, presentation confidence, motivation, anxiety, and academic challenge, using a mixed-methods case study approach to offer empirical insight into the defense as both assessment and learning mechanism.

METHODOLOGY

Research Design & Case Context

This study adopted an exploratory single-case study design incorporating a convergent mixed-methods approach. The study was contextualized within a specialized master's degree project-based course at Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan (FTKIP), Universiti Teknikal Malaysia Melaka (UTeM). The course structure requires students to independently conceptualize, design, and execute an industrial or manufacturing technology research project.

Participants and Subgroup Demographics

The participant cohort consisted of 13 postgraduate students ($N=13$), comprising 7 males (53.8%) and 6 females (46.2%). Participants were enrolled across three specialization tracks: Industrial Engineering ($n = 5$, 38.5%), Manufacturing Operations ($n = 5$, 38.5%), and Advanced Materials & Processing ($n = 3$, 23.1%). Regarding research background, 8 candidates (61.5%) transitioned directly from undergraduate studies, while 5 candidates (38.5%) had at least two years of prior industrial experience. This cohort size reflects the full cohort of defense-ready candidates within this specialized postgraduate program for the given presentation cycle, representing the typical class size for this specific academic track.

Proposal Defense Protocol and Panel Composition

To ensure consistency, each defense comprised a standardized 15-minute presentation covering the problem statement, objectives, methodology, and expected outcomes, followed by a 30-minute technical Q&A. Each candidate was assessed by a three-member panel comprising a Session Chair, Principal Examiner, and Internal Examiner. Supervisors attended as silent observers, preserving evaluation integrity while enabling structured post-defense debriefing.

Instrumentation and Data Collection

Data were collected immediately after the defense using a two-part instrument. Section 1 assessed key perceptual constructs using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Section 2 captured qualitative reflections through an open-ended question asking candidates to identify the most critical panel feedback and explain how it would influence subsequent research execution.

Table 1: Survey Instrument Constructs and Items

Construct / Theme	Survey Item	Scale
Preparedness & Readiness	I feel prepared for this proposal defense.	1–5

Conceptual Understanding	After the proposal defense, I have a clearer understanding of my project objectives, methodology, and expected outcomes.	1–5
Confidence & Self-Efficacy	Participation in the proposal defense increased my confidence in presenting and defending my project.	1–5
Motivation & Inspiration	After this proposal defense, I feel more inspired to complete my thesis.	1–5
Anxiety & Cognitive Load	The proposal defense increased my anxiety and confusion regarding my project.	1–5
Academic Challenge	I agree that being challenged helps identify my weaknesses; however, at times it can also make me feel less confident.	1–5

Analytical Approach & Qualitative Coding Scheme

Quantitative data were analyzed using both parametric (Mean, SD) and non-parametric descriptive statistics (Median, Interquartile Range—IQR) to account for the small sample size (N=13). Concurrently, open-ended qualitative responses underwent a systematic three-phase thematic coding protocol, as shown in Table 2.

Table 2: Qualitative Coding Framework for Open-Ended Student Reflections

Primary Theme	Sub-Themes	Illustrative Code Categories
Theme A: Methodological Calibration	Experimental Parameter Refinement	<i>"sample size calculation", "control group inclusion", "equipment limitation awareness"</i>
	Boundary Conditions & Assumptions	
Theme B: Constructive Validation	Psychological Safety	<i>"panel was fair", "encouraging critique", "validating my core idea"</i>
	Re-framing Scrutiny as Support	
Theme C: Desirable Difficulty & Dip	Momentary Destabilization	<i>"realized my gap", "felt challenged on statistics", "shaken at first but clearer now"</i>
	Actionable Redirection	

RESULTS AND DISCUSSION

Quantitative Perceptions and Non-Parametric Summary

Table 3 presents the consolidated statistical summary across all six survey constructs. Given N=13, median and IQR values provide robust measures of central tendency alongside traditional means.

Table 3: Statistical Summary of Student Perceptions (N=13)

Construct / Item	Mean	Standard Deviation	Median	IQR
1. Preparedness & Readiness	4.38	0.65	4.5	1
2. Conceptual Understanding	4.77	0.44	5	0.5
3. Confidence & Self-Efficacy	4.77	0.6	5	0
4. Motivation & Inspiration	4.85	0.38	5	0
5. Anxiety & Cognitive Load	1.54	0.78	1	1
6. Academic Challenge/Desirable Difficulty	3.62	1.45	4	1

Preparedness and Pre-Defense Scaffolding (Item 1)

Figure 1 shows the student self-reported readiness prior to participating in the proposal defense. The results indicate high self-reported readiness (Mean = 4.38, Med = 4.5, SD = 0.65), with 46.2% (N=6) of participants agreeing and another 46.2% (n = 6) strongly agreeing. Only 7.7% (N=1) reported a neutral response. Subgroup analysis revealed that candidates with industrial working experience reported slightly higher baseline preparedness confidence compared to direct bachelor-to-master transitions, likely reflecting prior experience with workplace project presentations. The absence of negative scores highlights the efficacy of pre-defense supervisor meetings. As Lantsoght (2021) noted, structured institutional guidelines and mock briefings cushion candidates against paralyzing performance anxiety.

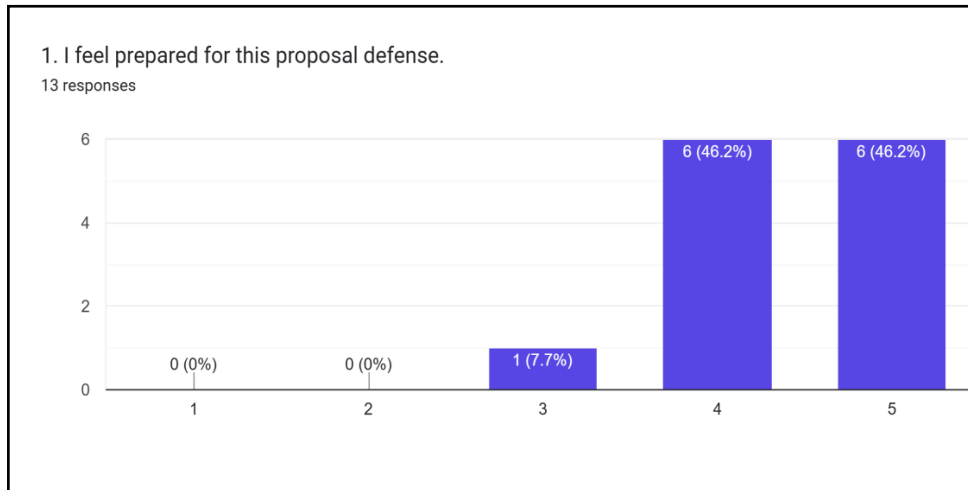


Figure 1: Student self-reported readiness prior to participating in the proposal defense (N=13).

Conceptual Alignment and Methodological Clarity (Item 2)

Figure 2 shows the student feedback on project clarity, covering objectives, methodology, and expected outcomes following the proposal defense. Figure 2 recorded exceptional consensus (Mean = 4.77, Med = 5.0, SD = 0.44), with 76.9% (N=10) strongly agreeing and 23.1% (N=3) agreeing that the defense clarified their research objectives and methodology. Qualitative triangulation revealed that this clarity was directly driven by targeted panel feedback. For instance, Student S04 (Industrial Track) noted how examiner critiques exposed statistical gaps in sampling size, while Student S09 (Materials Track) highlighted how panel suggestions to refine simulation boundary conditions rendered their workload manageable. These findings align with Kircher (2024) and Darling-Hammond et al. (2020), demonstrating that oral defenses serve as powerful cognitive alignment interventions rather than passive gatekeeping exercises.

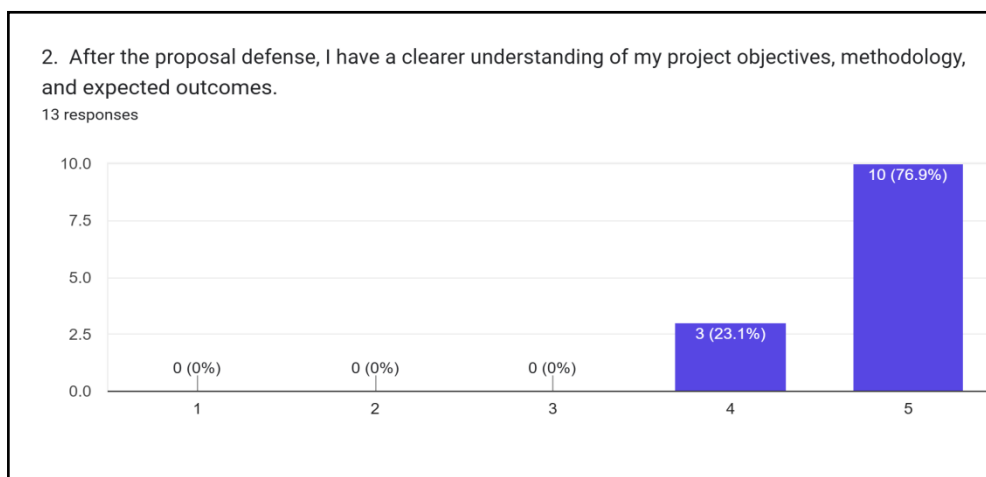


Figure 2: Student feedback on project clarity, covering objectives, methodology, and expected outcomes following the proposal defense (N=13).

Presentation Confidence, Self-Efficacy, and Subgroup Dynamics (Item 3)

Figure 3 shows the student perceptions regarding the impact of proposal defense participation on presentation and defense confidence. Participation significantly boosted presentation self-efficacy (Mean = 4.77, Med = 5.0, SD = 0.60), with 84.6% (N=11) of candidates strongly agreeing with post-defense confidence gains. Subgroup analysis revealed that female candidates unanimously reported 'Strongly Agree,' noting in qualitative reflections that panel validation actively mitigated imposter feelings. This supports Jeanpierre (2021), confirming that mastery experiences within authentic, supportive assessment environments foster domain-specific self-efficacy.

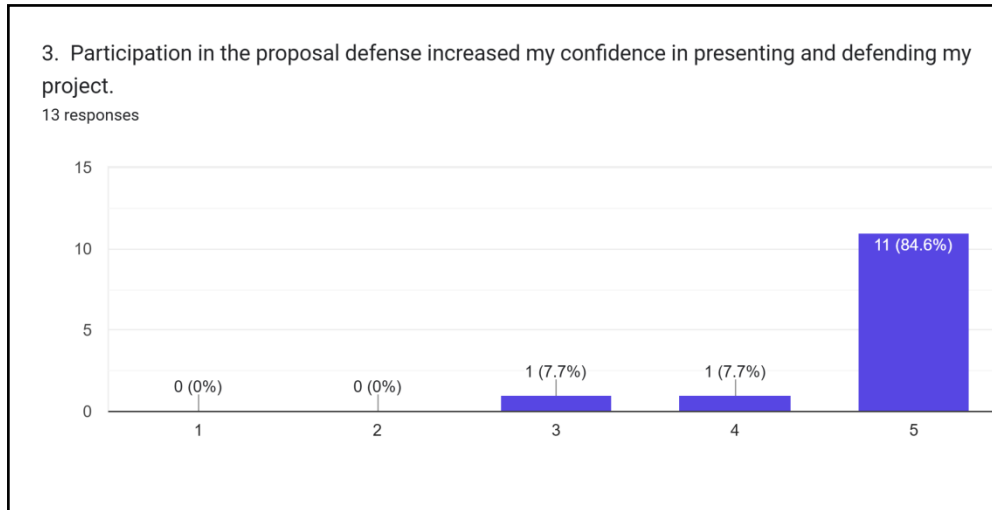


Figure 3: Student perceptions regarding the impact of proposal defense participation on presentation and defense confidence (N=13).

Motivational Reinforcement and Self-Determination (Item 4)

Figure 4 shows student responses regarding post-defense motivation and inspiration to complete their thesis yielded the highest overall rating (Mean = 4.85, Med = 5.0, SD = 0.38), with 84.6% (n = 11) strongly agreeing and 15.4% (n = 2) agreeing that the defense inspired them to complete their thesis. Framed through Self-Determination Theory (Ryan & Deci, 2020), this surge in intrinsic motivation reflects the satisfaction of candidates' needs for competence and relatedness through expert validation and scholarly exchange. As Student S07 reflected: "Instead of attacking my proposal, the examiners brainstormed solutions with me. It felt like a high-level consultation rather than an exam."

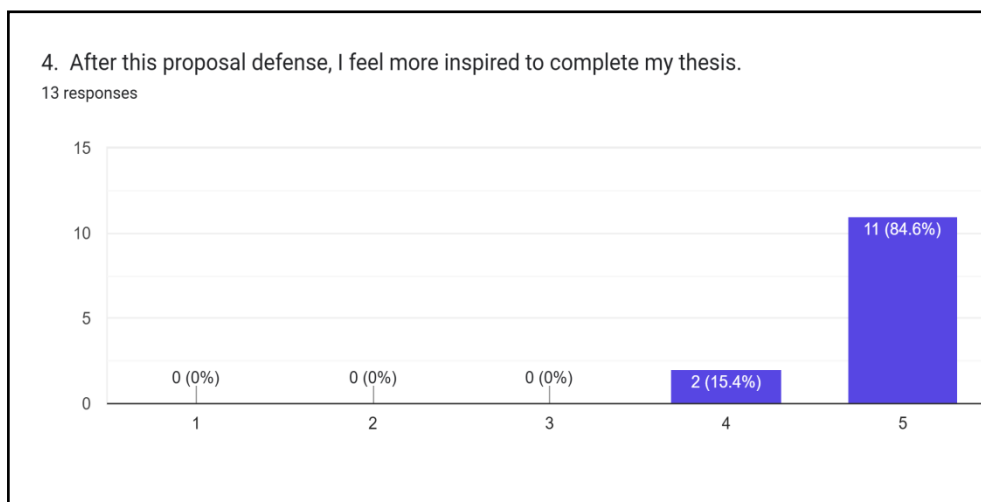


Figure 4: Student responses regarding post-defense motivation and inspiration to complete their thesis (N=13).

Mitigation of Anxiety and Psychological Safety (Item 5)

Figure 5 shows the student feedback regarding anxiety and confusion post-proposal defense. The results indicate post-defense anxiety and confusion were remarkably low (Mean = 1.54, Med = 1.0, SD = 0.78, IQR = 1.00), with 61.5% (N=8) strongly disagreeing and 23.1% (N=3) disagreeing that the defense increased anxiety or confusion. Applying Cognitive Appraisal Theory (Gomes et al., 2024), candidates appraised panel questioning as a manageable "challenge" rather than a "threat." The presence of a session chair ensuring equitable airtime and respectful questioning established psychological safety, preventing cognitive overload (Gin et al., 2023).

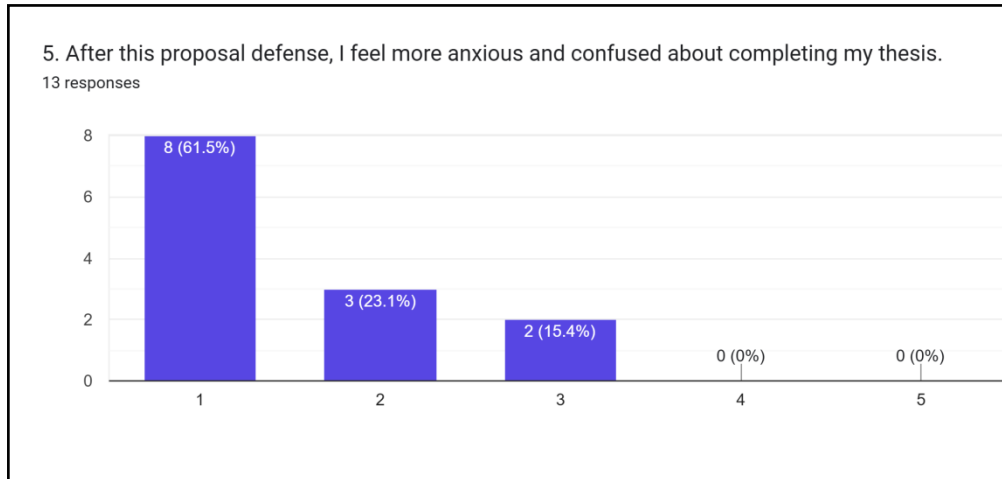


Figure 5: Student feedback regarding anxiety and confusion post-proposal defense (N=13).

The Dual Nature of Academic Challenge: Desirable Difficulty (Item 6)

Figure 6 shows the student responses on the duality of academic challenges in highlighting weaknesses while potentially affecting personal confidence. Item 6 captured the tension between intellectual challenge and confidence. A clear majority of 69.2% (N=9) agreed with the statement, with 30.8% (N=4) selecting Score 4 and 38.5% (N=5) selecting Score 5, indicating that panel questioning helped identify critical research gaps despite potentially reducing confidence. Conversely, 15.4% (N=2) selected Score 2, while 7.7% (N=1) selected Score 3, reflecting individual differences in emotional resilience. This dual response aligns with Bjork and Bjork's (2011) concept of "desirable difficulty," whereby cognitive struggle during rigorous questioning encourages candidates to retrieve, reframe, and consolidate knowledge.

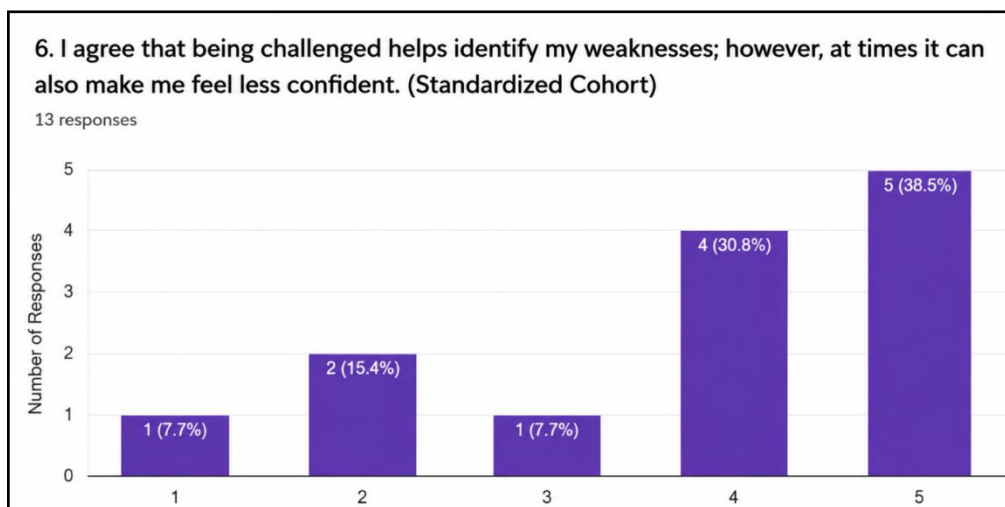


Figure 6: Student responses on the duality of academic challenges in highlighting weaknesses versus impacting personal confidence (N=13).

Integrated Mixed-Methods Joint Display

To explicitly link quantitative ratings with qualitative insights, Table 4 presents a mixed-methods joint display.

Table 4: Joint Display Integrating Quantitative Metrics and Pedagogical Insights

Quantitative Construct	Statistical Metric	Illustrative Qualitative Quote	Integrated Pedagogical Insight
Preparedness & Readiness	Mean = 4.38	<i>Proposal defense helps me regain confidence after being away from academic presentations and serves as useful initial training before the viva. (S01)</i>	Supervisor scaffolding establishes a foundation of psychological safety prior to defense.
	SD = 0.65		
	Med = 4.5,		
	IQR = 1.00		
Conceptual Understanding	Mean = 4.77	<i>The feedback from the panel helped me identify my weaknesses, particularly in theory and practical experience. (S02)</i>	Defense acts as a cognitive alignment tool that prevents scope creep and clarifies execution steps.
	(SD = 0.44)		
	Med = 5.0,		
	IQR = 0.50		
Academic Challenge	Mean = 3.62	<i>The pre-viva helped me identify important factors that I had overlooked when considering my project, particularly those affecting its efficiency. (S03)</i>	Rigorous questioning creates a 'desirable difficulty' that promotes deeper knowledge consolidation.
	(SD = 1.45)		
	Med = 4.0,		
	IQR = 2.00		

While this study provides rich, contextualized empirical insights, several methodological constraints must be acknowledged. First, the small sample size (N=13), restricted to a single cohort within a specialized engineering technology faculty, limits statistical power and broader generalizability. Second, the cross-sectional post-test design captured immediate post-defense perceptions, necessitating longitudinal tracking to determine whether gains in confidence and motivation persist throughout thesis execution. Finally, the reliance on self-reported data means findings were not directly correlated with objective academic performance metrics, such as final thesis grades or time-to-degree completion.

CONCLUSION

This study demonstrates that postgraduate proposal defense can function not only as formal assessment but also as a meaningful learning intervention that strengthens research clarity, confidence, and motivation. Despite the small, context-specific sample, mixed-methods findings indicate high preparedness, improved conceptual and methodological clarity, enhanced presentation self-efficacy, and strong post-defense motivation, with low reported anxiety. Qualitative reflections further show that rigorous examiner questioning can reveal methodological weaknesses while guiding actionable improvements. This supports the concept of desirable difficulty, whereby intellectual challenge within a psychologically safe and constructive environment promotes deeper cognitive alignment and thesis agency. The findings highlight the value of pre-defense scaffolding, constructive examiner engagement, and post-defense debriefing in transforming proposal defense from a gatekeeping exercise into a developmental learning experience. Future research should adopt longitudinal, multi-institutional designs and objective thesis progression measures to determine whether these immediate benefits translate into sustained research performance and timely completion.

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Author Contributions

Hadzley Abu Bakar: Conceptualization, Data Collection, Project Administration, Siti Rahmah Shamsuri, Umi Hayati Ahmad: Visualization, Kamal Musa: Technical Support

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