

S.O.S. for Synthesis: Quantifying Student Needs for a Mobile Writing Solution

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ABSTRACT

Synthesis writing is increasingly recognised as a core component of academic literacy in higher education, especially for ESL learners who must engage with multiple sources in research-based tasks. However, many continue to struggle with mastering the skill despite its relevance across disciplines. This paper presents the quantitative phase of a needs analysis conducted to inform the design of SEESOAR, a mobile learning solution aimed at enhancing synthesis writing skills among tertiary learners. Synthesis writing is a critical academic skill that requires students to select, organise, and connect information from multiple sources to construct new ideas or arguments. It is widely used in coursework, research papers, and final-year projects, yet many students struggle to master it. A total of 124 first-year degree students at a defence university in Malaysia participated in the study. The instrument was grounded in the needs analysis framework by Dudley-Evans and St John (1998), encompassing four constructs: Target Situation Analysis (TSA), Present Situation Analysis (PSA), Learning Situation Analysis (LSA), and Means Situation Analysis (MSA). The survey consisted of 57 items across five sections and employed a 4-point Likert scale. The collected data were analysed descriptively using SPSS version 23 to identify patterns, trends, and key learner needs. The main finding indicated that students desired scaffolded, interactive, and mobile-based support to address persistent difficulties in synthesis writing. They expressed strong preferences for interactive, engaging learning activities such as games, discussions, and problem-solving tasks. Results also indicated high readiness and enthusiasm for mobile app-based learning. These insights directly informed the development of SEESOAR. This study highlights the importance of data-driven approaches in creating effective and targeted digital learning tools tailored to learners' needs in higher education.

Keywords: Synthesis Writing, Needs Analysis, Mobile-Assisted Language Learning (MALL), Technology-Enhanced Language Learning (TELL), Higher Education.

ABSTRAK

Penulisan sintesis semakin diiktiraf sebagai komponen penting dalam literasi akademik di peringkat pengajian tinggi, terutamanya bagi pelajar ESL yang perlu menggabungkan pelbagai sumber dalam tugas berasaskan penyelidikan. Namun begitu, ramai pelajar masih menghadapi kesukaran untuk menguasai kemahiran ini. Kajian ini membentangkan fasa kuantitatif bagi analisis keperluan yang dijalankan untuk memaklumkan reka bentuk SEESOAR, iaitu satu penyelesaian pembelajaran mudah alih yang bertujuan meningkatkan kemahiran penulisan sintesis dalam kalangan pelajar pengajian tinggi. Penulisan sintesis ialah kemahiran akademik yang penting, yang memerlukan pelajar memilih, menyusun, dan menghubungkan maklumat daripada pelbagai sumber untuk membina hujah atau idea baharu. Kemahiran ini sering digunakan dalam tugas, penulisan ilmiah, dan Projek Tahun Akhir, namun sukar dikuasai oleh pelajar. Seramai 124 pelajar ijazah tahun pertama di sebuah universiti pertahanan di Malaysia telah mengambil bahagian dalam kajian ini. Instrumen kajian berasaskan kerangka analisis keperluan oleh Dudley-Evans dan St John (1998), yang merangkumi empat konstruk utama: Analisis Situasi Sasaran (TSA), Analisis Situasi Semasa (PSA), Analisis Situasi Pembelajaran (LSA), dan Analisis Situasi Kaedah (MSA). Soal selidik terdiri daripada 57 item dan menggunakan skala Likert

4 mata. Data yang dikumpulkan telah dianalisis secara deskriptif menggunakan SPSS versi 23 untuk mengenal pasti corak, kecenderungan, dan keperluan utama pelajar. Dapatan utama menunjukkan bahawa pelajar memerlukan sokongan berasaskan mudah alih yang bersifat interaktif dan berperingkat untuk membantu mengatasi cabaran dalam penulisan sintesis. Mereka menunjukkan keutamaan terhadap aktiviti pembelajaran interaktif dan menyeronokkan seperti permainan, perbincangan, dan penyelesaian masalah. Keputusan turut menunjukkan tahap kesediaan dan minat yang tinggi terhadap pembelajaran melalui aplikasi mudah alih. Dapatan ini secara langsung mempengaruhi reka bentuk SEESOAR. Kajian ini menekankan kepentingan pendekatan berasaskan data dalam membangunkan alat pembelajaran digital yang berkesan dan bersasar bagi memenuhi keperluan pelajar di institusi pengajian tinggi.

Kata kunci: Penulisan Sintesis, Analisis Keperluan, *Mobile-Assisted Language Learning (MALL)*, *Technology-Enhanced Language Learning (TELL)*, Pengajian Tinggi.

1.0 INTRODUCTION

Synthesis writing is a critical academic skill that enables learners to integrate information from multiple sources to construct original arguments or insights. Within the higher education context, this skill is indispensable for producing literature reviews, academic essays, and research reports, which are core components of undergraduate and postgraduate coursework. For English as a Second Language (ESL) learners, particularly those in Malaysian universities, the ability to perform synthesis writing not only reflects academic maturity but also serves as an indicator of language proficiency, critical thinking, and adherence to academic integrity standards.

Despite its importance, synthesis writing remains one of the most cognitively demanding writing tasks. It requires learners to read, comprehend, evaluate, and organise multiple texts, followed by the integration of ideas into a cohesive, well-structured essay. Research shows that ESL learners frequently encounter difficulties in this area, ranging from source comprehension to paraphrasing and citation conventions (Luo & Kiewra 2019; Van Ockenburg et al. 2019). These challenges are particularly pronounced in military or discipline-specific higher education settings, where academic writing expectations are high but instructional time for writing-focused skill development may be limited. Prior research has also shown discrepancies between students' and teachers' expectations of autonomy in ESL learning at a defence university in Malaysia, suggesting the need for clearer instructional alignment (Abd Rahman et al., 2022).

In response to these challenges, technology-enhanced learning solutions, particularly mobile-assisted language learning (MALL) applications have emerged as promising tools for improving writing instruction. Mobile learning offers flexibility, accessibility, and interactivity, making it well-suited to support writing tasks outside the traditional classroom. In the wake of the COVID-19 pandemic, the adoption of mobile tools has accelerated across institutions, prompting calls for more targeted, data-driven development of mobile instructional modules (Hilli et al. 2019; Crompton & Burke 2018).

This study focuses on SEESOAR, a mobile learning module designed to support the development of synthesis writing skills among first-year degree learners at a defence university in Malaysia. Guided by the needs analysis framework of Dudley-Evans and St John (1998), this study adopts a quantitative approach to investigate learners' perceived importance of synthesis writing, challenges in learning it, preferred learning strategies, and readiness for mobile learning. The findings serve as the empirical foundation for designing and developing a mobile learning tool that aligns with the learners' academic, cognitive, and technological needs.

While previous research has reported lecturers' perspectives on the importance of equipping learners with synthesis writing support through digital tools (Abd Rahman et al., 2023), less is known about students' own views and needs regarding this academic skill. This study aims to fill that gap by quantifying student needs for a mobile writing solution.

The novelty of this study lies in its focus on students' perspectives on synthesis writing needs within a military higher education setting, complementing earlier research from lecturers' viewpoints. This dual-perspective approach offers a more holistic understanding of the instructional gap and directly informs the design of SEESOAR, a mobile learning module tailored to the academic and professional demands of defence university cadets.

2.0 LITERATURE REVIEW

2.1 Synthesis Writing in Higher Education

Synthesis writing is a complex academic skill that involves selecting, organising, and integrating information from multiple sources to produce coherent and original texts (Spivey & King 1989; Luo & Kiewra 2019). In tertiary education, particularly among ESL learners, synthesis writing is essential for demonstrating critical thinking, argumentation, and academic integrity (Jalleh & Mahfoodh 2021; Musaljon et al. 2021). The inability to perform synthesis writing effectively has been linked to plagiarism and weak writing proficiency (Romanowski 2022; Clarke et al. 2023). Mastery of this skill is necessary for tasks such as literature reviews, argumentative essays, and final year projects. However, the cognitive demands of synthesis writing often pose challenges for learners, especially when language proficiency is limited or when students lack familiarity with academic conventions (Van Ockenburg et al. 2019; Vandermeulen et al. 2020).

2.2 Needs Analysis in Language Education

Needs analysis serves as a foundational step in designing learner-centred curricula and instructional materials. In the context of English for Academic Purposes (EAP), needs analysis helps identify learners' goals, challenges, preferences, and readiness (Dudley-Evans & St John 1998). Hutchinson and Waters (1987) stress that effective language instruction must be grounded in an understanding of learners' present and target situations. Conducting a comprehensive needs analysis ensures that instruction is relevant, meaningful, and responsive to actual learner needs. In this study, the four-pronged model of importance, challenges, learning preferences, and readiness serves to systematically inform instructional design.

Needs analyses in ESP and academic writing contexts often emphasize alignment between teacher expectations and learner readiness. At a defence university in Malaysia, lecturers previously identified synthesis writing as a core challenge for cadets and advocated for mobile-assisted interventions (Abd Rahman et al., 2023). This study extends that work by capturing the students' perspective on the same issue.

2.3 Effective Pedagogical Strategies for Teaching Synthesis Writing

Given the complexity of synthesis writing, research highlights the effectiveness of explicit instruction, extensive practice, and corrective feedback as key pedagogical strategies (Barzilai et al. 2018; Ramadhanti et al. 2019; Muamaroh & Pratiwi 2022). Collaborative learning approaches also facilitate the development of synthesis skills by allowing learners to co-construct meaning and reflect critically on content (Musaljon et al. 2021). Additionally, scaffolding through structured tasks, such as summarising, paraphrasing, and mind-mapping,

can support learners in gradually acquiring the higher-order skills needed for synthesis (Luna et al. 2023).

2.4 Mobile-Assisted Language Learning (MALL)

The growing integration of technology in education has transformed traditional instructional practices. Mobile-Assisted Language Learning (MALL) has gained traction for its potential to support flexible, personalised, and autonomous learning (Crompton & Burke 2018; Jeong 2022). Studies show that mobile applications enhance motivation, facilitate engagement, and provide learners with opportunities to practise language skills outside the classroom (Mohammed & Ala' Khalid 2018; Shuib et al. 2018). In the post-COVID-19 landscape, mobile learning has become especially relevant, enabling students to access academic content anytime and anywhere (Hilli et al. 2019; Jensen 2022). The incorporation of mobile tools in ESL writing instruction thus offers promising avenues for supporting synthesis writing through multimodal and interactive features.

2.4 Implications for Module Design

Drawing on the ADDIE instructional design model (Analysis, Design, Development, Implementation, Evaluation), instructional design grounded in needs analysis enables the creation of relevant and effective educational interventions. Design and Development Research (DDR) supports this process by integrating empirical evidence and user feedback into iterative development cycles (Richey & Klein 2007). A synthesis writing mobile module informed by learner needs can bridge the gap between pedagogical goals and learner experiences, ultimately enhancing writing proficiency and academic success.

3.0 METHODOLOGY

3.1 Research Design

This study is part of a broader research project that aims to design, develop, and evaluate a mobile learning module for synthesis writing targeted at tertiary-level students. The overall project adopts a mixed-methods approach (Creswell & Guetterman 2021) and is framed within a Type 1 Design and Development Research (DDR) paradigm, which emphasizes the systematic creation and evaluation of educational tools and products (Richey & Klein 2007). DDR involves the iterative design, development, and empirical evaluation of instructional and non-instructional interventions to establish a sound theoretical and practical foundation.

The ADDIE instructional design model consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation is employed as the guiding framework for the research. These phases are aligned with the three main stages of DDR: Phase 1 – Analysis, Phase 2 – Design and Development, and Phase 3 – Implementation and Evaluation.

This paper specifically reports on a portion of Phase 1, which focuses on conducting a needs analysis to inform the development of content tailored to the learning requirements of the target group. To explore tertiary ESL learners' needs in synthesis writing, this study adopts the model proposed by Dudley-Evans & St. John (1998), which offers a comprehensive framework encompassing four key elements: importance, challenges, preferences, and learner readiness.

A cross-sectional survey design was employed, utilizing a quantitative data collection method through a structured questionnaire. The data gathered serve as the empirical basis for the next phases of the research project.

There are four research questions for this research;

1. What do the learners perceive as the importance of mastering synthesis writing for academic success?
2. What challenges do learners face in acquiring synthesis writing skills?
3. What are the learners' preferred strategies and activities for learning synthesis writing?
4. To what extent are learners ready and willing to use mobile applications to support synthesis writing?

3.2 Sample

A total of 124 first-year undergraduate students from a defence university in Malaysia voluntarily participated in the survey. Participants were selected through purposive sampling based on the following predetermined criteria:

1. they were enrolled in the English for Academic Writing course, a core subject at the university
2. they represented various faculties, centres, and academies, including the Faculty of Engineering, Faculty of Defence Medicine & Health, Faculty of Defence Studies & Management, Language Centre, Faculty of Defence Science & Technology, and the Defence Fitness Academy
3. they participated on a voluntary basis.

According to Gay & Diehl (1992), the adequacy of sample size in research depends on the study's purpose and design. For descriptive research, they recommend a sample size equivalent to at least 10% of the total population. Given that the total population of eligible students was approximately 700, the sample size of 124 is considered sufficient for the purposes of this study.

3.3 Research Instrument

The needs analysis survey was designed to investigate and identify and assess learners' needs in mastering synthesis writing. The constructs measured were based on the needs analysis model proposed by Dudley-Evans & St. John (1998), which includes four key components: Target Situation Analysis (TSA) - importance, Present Situation Analysis (PSA) - challenges, Learning Situation Analysis (LSA) - preferences, and Means Situation Analysis (MSA) - learner readiness. The survey comprised 57 items, organized into five sections: demographic background, importance, challenges, preferences, and learner readiness. The items were adapted from Ibrahim (2016) and contextualized to align with the objectives of this study.

A 4-point Likert scale was employed for the survey instrument, ranging from 1 (strongly disagree) to 4 (strongly agree). In this study, a 4-point Likert scale was employed to eliminate the neutral midpoint option, thereby encouraging respondents to indicate a clear stance toward agreement or disagreement. This approach helps reduce central tendency bias and generates more definitive data for analysis (Brown, 2000). All items were carefully adapted to ensure clarity, relevance, and appropriateness for the target learner group.

3.4 Validity and Reliability

The questionnaire was reviewed and refined based on feedback from two experts in Teaching English as a Second Language, a senior language instructor and a senior lecturer, to ensure face and content validity. A pilot study was then conducted with 32 purposively selected participants to assess the instrument's reliability and clarity, in line with recommendations for a minimum sample size of 30 for pilot testing (Conroy 2021; Yurdugül 2008).

To establish internal consistency, Cronbach's Alpha was calculated for the four constructs based on Dudley-Evans & St. John's (1998) model. The values obtained were high and acceptable: importance ($\alpha = 0.94$), challenges ($\alpha = 0.95$), preferences ($\alpha = 0.93$), and learner readiness ($\alpha = 0.90$), exceeding the threshold for reliability (Brown 2000). These results confirm that the instrument was both reliable and valid, allowing the findings from the analysis phase to be considered generalizable (Creswell 2012).

3.5 Data Collection and Analysis

The researchers coordinated with English language instructors at the centre to facilitate data collection. Google Form links to the needs analysis questionnaire and consent form were shared with the instructors, who then administered them to the students.

Descriptive statistics, including frequency, percentage, mean, and standard deviation, were generated using SPSS Version 23 to analyse the data. The findings are reported based on the mean and standard deviation to reflect learners' needs.

4.0 RESULTS

4.1 Demographic Information

A total of 124 first-year degree learners from the defence university responded to the questionnaire. Of these, 60.5% ($n = 75$) were male and 39.5% ($n = 49$) were female. The majority of respondents were from the Faculty of Defence Studies & Management (46.8%, $n = 58$), followed by the Faculty of Defence Science & Technology (17.8%, $n = 22$), the Faculty of Defence Medicine & Health (10.5%, $n = 13$), the Language Centre (9.7%, $n = 12$), the Defence Fitness Academy (8.0%, $n = 10$), and the Faculty of Engineering (7.3%, $n = 9$).

Learners reported varying levels of English language proficiency based on their MUET (Malaysian University English Test) band scores. Most participants were in Band 4 (32.3%, $n = 40$), followed by Band 3 (22.6%, $n = 28$), Band 2 (16.9%, $n = 21$), Band 3.5 (16.1%, $n = 20$), Band 4.5 (8.9%, $n = 11$), Band 2.5 (1.6%, $n = 2$), Band 5 (0.8%, $n = 1$), and Band 1 (0.8%, $n = 1$).

4.2 Importance of Synthesis Writing

The first section of the needs analysis questionnaire focused on target situation analysis, which explored the importance of learning synthesis writing. This construct consisted of two sub-sections: (1) the perceived importance of synthesis writing, and (2) the key skills considered important in synthesis writing. The first sub-section included four items, and the descriptive statistics for these items are presented in Table 1.

Table 1 Importance of Synthesis Writing

A. The importance of synthesis writing	Mean	S.D.
1. I need to learn synthesis writing to recognise and identify cases of plagiarism	3.71	0.47
2. I need to learn synthesis writing to understand and interpret texts from different sources	3.71	0.47
3. I need to learn synthesis writing to understand academic writing styles in essay writings	3.63	0.53
4. I need to learn synthesis writing to complete my written assignments	3.69	0.50

5. I need to learn synthesis writing as preparation for my Final Year Project (FYP) write-up	3.67	0.50
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As shown in Table 1, most learners recognised that learning synthesis writing is important for identifying cases of plagiarism ($M = 3.71$, $SD = 0.47$). Similarly, they acknowledged the need to learn synthesis writing to understand and interpret texts from various sources ($M = 3.71$, $SD = 0.47$), and to familiarise themselves with academic writing styles in essay writing ($M = 3.65$, $SD = 0.53$). Learners also agreed that synthesis writing skills are necessary for completing written assignments ($M = 3.69$, $SD = 0.50$) and preparing for their Final Year Project (FYP) write-up ($M = 3.67$, $SD = 0.50$).

The next sub-section focused on the important skills in synthesis writing as perceived by the learners. This part included ten items, and the descriptive statistics are presented in Table 2.

Table 2 Important Skills in Synthesis Writing

A. Important skills in synthesis writing	Mean	S.D.
6. The ability to use direct quotations correctly is important in synthesis writing	3.71	0.51
7. The ability to summarize information correctly is important in synthesis writing	3.71	0.50
8. The ability to paraphrase information correctly is important in synthesis writing	3.63	0.47
9. The ability to synthesize information correctly is important in synthesis writing	3.69	0.50
10. The ability to analyze information correctly is important in synthesis writing	3.67	0.48
11. The ability to use in-text citation correctly is important in synthesis writing	3.66	0.54
12. The ability to use referencing correctly is important in synthesis writing	3.69	0.50
13. The ability to select important points from different sources is important in synthesis writing	3.71	0.46
14. The ability to organize selected points from different sources is important in synthesis writing	3.67	0.47
15. The ability to connect information from different sources to construct a new essay is important in synthesis writing	3.71	0.46

Based on the results presented in Table 2, all the listed skills in synthesis writing were perceived as important by the learners. They agreed that the ability to use direct quotations ($M = 3.71$, $SD = 0.51$), summarise information ($M = 3.71$, $SD = 0.50$), paraphrase information ($M = 3.63$, $SD = 0.47$), synthesise information ($M = 3.71$, $SD = 0.50$), analyse information ($M = 3.67$, $SD = 0.48$), apply in-text citations ($M = 3.66$, $SD = 0.54$), and use proper referencing ($M = 3.69$, $SD = 0.50$) were essential in mastering synthesis writing.

Notably, all learners unanimously agreed on the importance of three specific skills: the ability to select key points from different sources ($M = 3.71$, $SD = 0.46$), organise selected points effectively ($M = 3.67$, $SD = 0.47$), and connect information from multiple sources to construct a cohesive essay ($M = 3.71$, $SD = 0.46$). These were identified as the most crucial skills required for synthesis writing.

4.3 Problems in Learning Synthesis Writing

The next section of the needs analysis questionnaire focused on the present situation analysis, which explored the challenges learners faced in learning synthesis writing. This construct comprised ten items, and the descriptive statistics for each item are presented in Table 3.

Table 3 Problems in Learning Synthesis Writing

Problems in learning synthesis writing	Mean	S.D.
1. I find it challenging/difficult to use direct quotations	2.91	0.73
2. I find it challenging/difficult to summarize information from different sources	2.90	0.77
3. I find it challenging/difficult to paraphrase information from different sources	2.83	0.83
4. I find it challenging/difficult to synthesise information from different sources	3.06	0.76
5. I find it challenging/difficult to analyze information from different sources	2.90	0.79
6. I find it challenging/difficult to use in-text citation format (APA style)	2.86	0.85
7. I find it challenging/difficult to use proper referencing format (APA style)	2.86	0.82
8. I find it challenging/difficult to select important points from different sources	2.93	0.78
9. I find it challenging/difficult to organize points selected from different sources	3.02	0.73
10. I find it challenging/difficult to connect information from different sources to construct a new essay	3.02	0.78

Based on the results in Table 3, the most challenging aspect of learning synthesis writing was the ability to synthesise information ($M = 3.06$, $SD = 0.76$). This was followed by difficulties in organising selected points from different sources ($M = 3.02$, $SD = 0.73$) and connecting information from multiple sources to construct a coherent essay ($M = 3.02$, $SD = 0.78$). Learners also reported challenges in using direct quotations ($M = 2.91$, $SD = 0.73$), summarising information ($M = 2.90$, $SD = 0.77$), selecting important points ($M = 2.93$, $SD = 0.78$), and applying referencing conventions ($M = 2.86$, $SD = 0.82$). Additional difficulties included analysing information ($M = 2.90$, $SD = 0.79$), using in-text citations ($M = 2.86$, $SD = 0.85$), and paraphrasing information ($M = 2.83$, $SD = 0.83$).

4.4 Strategies in Learning Synthesis Writing

The third section of the questionnaire focused on the learning situation analysis, which explored learners' strategies in learning synthesis writing. This construct provides valuable input for the design and development of the mobile app module. It consisted of two parts: (1) preferred learning activities and (2) learning preferences. There were 13 items in total, and the descriptive findings related to learners' preferred learning activities are presented in Table 4.

Table 4 Preferred Activities

A. Activities preferred	Mean	S.D.
1. I like to watch video recordings	3.15	0.92
2. I like to have discussions with friends/teachers	3.52	0.58
3. I like to do matching items activities	3.55	0.64
4. I like to do gap-filling activities	3.30	0.75
5. I like open-ended questions	2.99	0.89
6. I like multiple-choice questions	3.56	0.64
7. I like True/False questions	3.50	0.66
8. I like to do mind-mapping and/or use graphic organizers	3.31	0.77
9. I like to use clustering method or activities that involve in exploring relationships between ideas	3.32	0.67
10. I like to do peer evaluation activities	3.36	0.76
11. I like to do self-evaluation activities	3.30	0.71
12. I like to do collaborative activities (group work)	3.32	0.77
13. I like to do essay drafting or outlining activities	3.23	0.74

Based on the results in Table 4, learners showed a strong preference for interactive and structured learning activities. The most preferred activity was discussion ($M = 3.52$, $SD = 0.58$), followed closely by matching items ($M = 3.55$, $SD = 0.64$), multiple-choice questions ($M = 3.56$, $SD = 0.64$), and true/false questions ($M = 3.50$, $SD = 0.66$). Other activities learners favoured included peer evaluation ($M = 3.36$, $SD = 0.76$), collaborative work ($M = 3.32$, $SD = 0.77$), mind-mapping ($M = 3.31$, $SD = 0.77$), clustering methods involving idea relationships ($M = 3.32$, $SD = 0.67$), and self-evaluation ($M = 3.30$, $SD = 0.71$). Learners also responded positively to essay drafting ($M = 3.23$, $SD = 0.77$), gap-filling tasks ($M = 3.30$, $SD = 0.75$), and video recordings ($M = 3.15$, $SD = 0.92$). Open-ended questions were the least preferred ($M = 2.99$, $SD = 0.89$).

The following sub-section explores learners' preferences for how synthesis writing should be taught. The descriptive statistics for this section, which consists of eight items, are presented in Table 5.

Table 5 Learning Preferences

B. Learning preferences	Mean	S.D.
1. I prefer to learn through memorizing information	3.25	0.73
2. I prefer to learn through problem solving	3.46	0.55
3. I prefer to learn through getting information on my own	3.24	0.69
4. I prefer to learn through copying from a text or note-taking	3.22	0.73
5. I prefer to learn through audio-visual aids	3.23	0.77
6. I prefer to learn through games	3.44	0.71
7. I prefer to learn through completing projects	3.39	0.73
8. I prefer to learn by doing self-testing	3.31	0.73

Based on the findings in Table 5, the top three preferred learning approaches among learners were problem-solving ($M = 3.46$, $SD = 0.55$), completing projects ($M = 3.39$, $SD = 0.73$), and learning through games ($M = 3.44$, $SD = 0.71$). Learners also expressed a preference for

independent learning, such as obtaining information on their own ($M = 3.24$, $SD = 0.69$), as well as self-testing ($M = 3.31$, $SD = 0.73$). Other preferred strategies included memorisation ($M = 3.25$, $SD = 0.73$), note-taking ($M = 3.22$, $SD = 0.73$), and the use of audio-visual aids ($M = 3.23$, $SD = 0.77$).

4.5 Mobile Learning Readiness

The final section of the questionnaire focused on learners' mobile learning readiness, corresponding to the means situation analysis. This section aimed to explore learners' access to and familiarity with mobile technology for academic purposes. The descriptive findings for this construct are presented in Table 6.

Table 6 Mobile Learning Readiness

Mobile learning readiness	Mean	S.D.
1. I am ready to learn synthesis writing through a mobile device	3.40	0.62
2. I am ready to learn synthesis writing using a mobile application	3.39	0.59
3. I have appropriate skills to learn using a mobile application	3.41	0.58
4. I think learning is more fun through a mobile application	3.36	0.67
5. I will use the learning materials if they are in the form of a mobile application	3.36	0.63
6. I am ready to face challenges in learning synthesis writing through a mobile application	3.35	0.61
7. I am ready to download learning materials from the Internet	3.48	0.57

Based on the findings in Table 6, learners demonstrated a high level of readiness to engage with mobile learning for synthesis writing. They expressed willingness to learn through mobile devices ($M = 3.40$, $SD = 0.62$), particularly via a mobile application ($M = 3.39$, $SD = 0.59$). Learners also indicated that they possessed the necessary skills to use a mobile app for learning ($M = 3.41$, $SD = 0.58$), and found the experience more engaging and enjoyable ($M = 3.36$, $SD = 0.67$). In addition, they were open to using learning materials in app format ($M = 3.36$, $SD = 0.63$), ready to face challenges associated with mobile-assisted learning ($M = 3.35$, $SD = 0.61$), and prepared to download materials from the internet to support their learning ($M = 3.48$, $SD = 0.57$).

5.0 DISCUSSION

5.1 Importance of Synthesis Writing

The findings from the needs analysis questionnaire at the defence university underscore the learners' acknowledgement of the importance of proficiency in synthesis writing. As posited by Dudley-Evans and St. John (Abd Rahman *et al.* 2023), emphasising the relevance of synthesis writing fosters increased motivation and facilitates deeper engagement with academic tasks. The significance perceived by learners can be viewed through two dimensions: the importance of learning synthesis writing and the acquisition of synthesis-related skills.

Firstly, regarding the significance of synthesis writing, learners indicated its essential role in various aspects such as preventing plagiarism ($M = 3.71$, $SD = 0.47$), interpreting information from multiple sources ($M = 3.71$, $SD = 0.47$), and adhering to academic writing conventions ($M = 3.65$, $SD = 0.53$). These findings are corroborated by research demonstrating that weak writing skills often lead to inadvertent plagiarism, consequently jeopardising academic integrity (Miron

et al. 2022). Moreover, effective synthesis writing is crucial not only for academic success but also for fostering original, high-quality academic work in higher education frameworks (Vandermeulen et al. 2022).

Secondly, learners recognised the significance of acquiring specific synthesis-related skills, including selecting key points from various sources ($M = 3.71$, $SD = 0.46$), organising these elements systematically ($M = 3.67$, $SD = 0.47$), and integrating information to construct coherent essays ($M = 3.71$, $SD = 0.46$). This recognition aligns with prior research (Jalleh & Mahfoodh 2021; Musaljon et al. 2021; Abd Rahman et al. 2023), who stress the role of synthesis writing in nurturing analytical thinking and constructing evidence-based arguments. The complexity of synthesis writing is further emphasised by the cognitive writing model developed by Hayes and Flower, which identifies multiple-text comprehension as a critical planning process that significantly increases cognitive load for students (Abd Rahman et al. 2023).

Moreover, learners' recognition of these skills indicates a metacognitive awareness that can inform the development of targeted instructional interventions (Ramadhanti et al. 2019). As highlighted by the questionnaire findings, there exists a pronounced awareness of the cognitive demands associated with synthesis writing, which leads to the necessity for adaptable pedagogies that provide learners with the requisite support for mastery (Teng & Wang 2022). For instance, introducing technologies such as mobile app modules to facilitate synthesis writing could bridge the gap between educational practices and learner needs, particularly in the context of a rapidly evolving academic environment post-COVID-19 (Abd Rahman et al., 2023).

In conclusion, the insights drawn from the needs analysis reflect both the academic necessity and cognitive challenges of synthesis writing as perceived by learners. Their awareness of key competencies and the associated difficulties reveal a fundamental basis for developing targeted educational strategies that align with the expectations of university-level academic writing.

5.2 Problems in Learning Synthesis Writing

The questionnaire findings indicate that learners face significant challenges in mastering synthesis writing, particularly when tackling higher-order cognitive tasks. The difficulties most prominently reported include synthesizing information from multiple sources ($M = 3.06$, $SD = 0.76$), organizing selected points coherently ($M = 3.02$, $SD = 0.73$), and connecting ideas to construct cohesive essays ($M = 3.02$, $SD = 0.78$). These results suggest that learners struggle with the fundamental processes necessary for producing synthesized academic texts, a finding that aligns with the literature which delineates synthesis writing as a cognitively demanding activity. This process requires engaging in complex operations such as selecting, organizing, and integrating information from various texts (Vandermeulen et al. 2022; Castells et al. 2022).

According to the cognitive writing model developed by Hayes and Flower, tasks involving synthesis writing intensify cognitive load, particularly during the planning and translation phases, highlighting the intricacies of the writing process and how it can be overwhelming for learners, especially as they attempt to coordinate multiple sources of information in their writing (Luo & Kiewra 2019). Additionally, the challenges can be further exacerbated by limited language proficiency among ESL learners, who may find it particularly difficult to navigate the nuances of synthesis writing (Jiang & Kalyuga 2022). In contexts like Malaysian higher education, where written assignments and examinations constitute a central component of assessments, mastering synthesis writing becomes a crucial determinant of academic success (Vandermeulen et al. 2022).

To address these challenges faced by students in synthesis writing, it is imperative to provide structured support that focuses on foundational and integrative writing skills. Such interventions may include targeted instruction in selecting relevant texts, organising information effectively, and logically linking ideas across multiple sources (Rahmat 2023). Furthermore, employing pedagogical strategies that reduce cognitive load can facilitate better engagement and comprehension among learners (Jiang & Kalyuga 2022). For instance, strategies that incorporate chunking information or utilising cognitive load theory principles can help learners manage the complexity of synthesis tasks more effectively (Putri *et al.* 2024;

Overall, the findings underscore the necessity for educational institutions to develop tailored instructional approaches that not only address the skills needed for synthesis writing but also consider the cognitive demands placed on students during the writing process. This dual focus on skill acquisition and cognitive load management can enhance learners' proficiency in synthesis writing, thereby contributing to their overall academic performance.

5.3 Strategies in Learning Synthesis Writing

Findings from the needs analysis questionnaire revealed that learners showed a clear preference for interactive and engaging learning strategies to support their acquisition of synthesis writing skills. Among the preferred activities were discussions ($M = 3.52$, $SD = 0.58$) and problem-solving tasks ($M = 3.46$, $SD = 0.55$), both of which align with student-centred, active learning principles. These preferences suggest that learners are inclined towards methods that involve active engagement, collaboration, and critical thinking, key components for mastering complex academic skills such as synthesis writing.

Learners also expressed interest in a variety of structured tasks, including multiple-choice questions, matching items, true/false exercises, and collaborative work. This variety reflects their need for diverse, scaffolded opportunities to practise the foundational skills involved in synthesis writing, such as identifying, organising, and integrating information across texts. These preferences are consistent with research emphasising the importance of instructional approaches that combine explicit guidance, collaborative tasks, and ongoing practice (Barzilai *et al.* 2018; Ramadhanti *et al.* 2019; Van Ockenburg *et al.* 2019).

Furthermore, preferences for self-testing, memorisation, and audiovisual aids (e.g., videos and games) highlight the need for a multimodal and flexible approach in instructional delivery. These findings are supported by Jeong (2022), who notes that digital tools, such as educational apps and gamified platforms, can enhance learner motivation and engagement, particularly in language learning contexts.

The complex nature of synthesis writing, requiring the integration of reading and writing, multiple-text comprehension, and high-level reasoning, necessitates instructional strategies that are both structured and learner-responsive (Luo & Kiewra 2019). The learners' preferences for problem-solving, collaboration, and independent exploration reinforce the value of learner-centred design principles in developing effective synthesis writing interventions.

In summary, the results underscore the importance of incorporating active, engaging, and multimodal learning strategies into synthesis writing instruction. These strategies not only align with learner preferences but also with established pedagogical frameworks that support skill development in academic writing among ESL learners at the tertiary level.

5.4 Mobile Learning Readiness

The questionnaire findings revealed that learners demonstrated a high level of readiness to integrate mobile applications into their synthesis writing learning experience. This readiness reflects broader shifts in education, especially following the COVID-19 pandemic, which accelerated the transition toward digital and hybrid learning environments (Hilli et al. 2019). Learners expressed confidence in their ability to use mobile apps for learning ($M = 3.41$, $SD = 0.58$), recognised the convenience of accessing synthesis writing materials through mobile platforms ($M = 3.40$, $SD = 0.62$), and showed positive attitudes toward mobile-assisted learning as a more engaging and flexible alternative ($M = 3.36$, $SD = 0.67$).

This readiness aligns with global educational trends that promote digital competence and lifelong learning (Jensen 2022). Mobile applications have increasingly been adopted in higher education for their ability to support second language learning, enhance student motivation, and foster autonomous learning (Crompton & Burke 2018; Mohammed & Ala' Khalid 2018; Elaish et al. 2019). The flexibility offered by mobile devices, allowing students to access and revisit materials at their own pace to address the growing demand for accessible and personalised learning experiences (Melor et al. 2012; Harwati 2018).

The constructs of "convenience" and "accessibility" stood out in the learners' responses, reflecting their appreciation of mobile learning's ability to transcend time and space limitations. These findings resonate with existing studies, which consistently highlight the transformative potential of mobile applications in improving teaching and learning processes (Shuib et al. 2018; Jeong 2022). By empowering learners to engage with academic content anytime and anywhere, mobile apps help cultivate self-directed learning habits, an essential component of academic success and lifelong learning.

Interestingly, the students' preferences for scaffolded, mobile-based support mirror earlier findings from lecturers, who also emphasized the need for structured, digital tools to address synthesis writing deficiencies (Abd Rahman et al., 2023). This alignment reinforces the validity of developing SEESOAR for this learner population.

In sum, the findings indicate that learners are both prepared and motivated to engage with mobile learning as part of their synthesis writing instruction. Their readiness highlights the value of integrating mobile-assisted tools into the curriculum, not only to enhance writing skills, but also to equip learners with the digital competencies needed for success in the 21st-century learning landscape.

6.0 CONCLUSION

This study aimed to identify the needs of first-year learners at a defence university in Malaysia in relation to synthesis writing, using a structured needs analysis framework encompassing four key components: importance, challenges, learning strategies, and mobile learning readiness. The findings revealed that learners recognised synthesis writing as a vital academic skill, particularly for preventing plagiarism, interpreting multiple texts, and meeting university writing requirements. They also placed high importance on acquiring key synthesis skills such as selecting, organising, and integrating information from various sources.

However, learners also reported considerable challenges in mastering synthesis writing, especially in synthesising, organising, and connecting information—tasks that require advanced cognitive and linguistic skills. These challenges signal the need for structured instructional support and scaffolded learning materials.

In terms of preferred learning strategies, learners showed strong inclinations toward interactive and active learning approaches, including discussions, problem-solving, and collaborative tasks. They also expressed a desire for multimodal and engaging activities, such as quizzes, self-evaluation, and audiovisual tools, reflecting a preference for flexible and learner-centred approaches to instruction.

Notably, the learners demonstrated a high level of readiness to engage with mobile learning platforms. They showed confidence in using mobile applications for academic purposes and acknowledged the benefits of flexibility, accessibility, and convenience offered by mobile-assisted learning. This readiness supports the integration of mobile technology into writing instruction and provides a strong justification for the development of a synthesis writing mobile app.

Overall, the findings provide a data-driven foundation for the design and development of a mobile learning module tailored to learners' cognitive, linguistic, and technological needs. By addressing the identified gaps and aligning with learner preferences, the proposed mobile app can serve as a meaningful tool to support and enhance synthesis writing skills in a digitally enriched learning environment.

Building on the findings of this needs analysis, the next phase of the research will focus on the development of a functional prototype of the SEESOAR mobile learning module. This prototype will undergo iterative user testing with the target learner group to assess its usability, pedagogical effectiveness, and impact on synthesis writing performance. Feedback from these trials will guide further refinements to the module's content, interface, and instructional strategies before broader implementation. In the longer term, the research will explore the integration of SEESOAR into existing academic writing courses and evaluate its scalability across other higher education contexts, particularly within discipline-specific English for Academic Purposes (EAP) programmes.

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