

Position Paper: Enhancing the Learning and Mastery of Academic Writing in the Serbian Language Through an AI Tool with Adaptive Scaffolding

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Abstract: Academic writing is a significant challenge for many learners striving for proficiency. Adaptive scaffolding techniques and AI tools in education have proven effective in addressing this challenge and supporting learners in improving their academic writing skills when used correctly. This position paper proposes combining adaptive scaffolding techniques with AI tools in a public university's final year academic writing course to enhance the learning experience and mastery of academic writing skills in Serbian. The proposed plan outlines the course structure and details how the AI-driven adaptive scaffolding techniques will be integrated to support the learning experience, focusing on summative and formative feedback from the AI tool. The proposed plan is a work in progress. It will be implemented in the next iteration of the course for evaluation, taking into account potential counter-arguments and their impact on the tool's development and the student's learning experience and outcomes. This study will analyse our plan's effectiveness in enhancing the learning experience and outcomes. The expected outcome is to assist students in their learning while contributing to the development of AI in education and the Serbian language.


1 INTRODUCTION


Academic writing is a formal kind of writing used in higher education, which contains the writer's evidence-based perspectives on a given subject of interest (Oshima & Hogue, 2007). The academic paper should be written so that the sentences are clear and well-organised, with the primary goal of making the presented arguments understandable to the target audience. Furthermore, academic writing is expected to be objective, precise, and consistent with the terminology within its discipline (Paltridge, 2004).


Academic writing, a key struggle for many learners aiming for proficiency (Mason & Atkin, 2021), has been difficult to master for many students (Sağlamel & Kayaoğlu, 2015). Learners often fail to


reach the expected proficiency level, particularly when lacking prior knowledge or the ability to adapt it to academic requirements (Reiff & Bawarshi, 2011; Soiferman, 2014; Tawalbeh & Al-zuoud, 2013). Scaffolding has proven effective in addressing these challenges by offering structured support, such as guidance in goal-setting, skill development, and self-reflection, to help learners adapt and progress (Lin et al., 2012; Wood et al., 1976; Cotterall & Cohen, 2003; Walqui, 2006).

With the rise of AI in education (AI, AIEd) over the past decade (Chiu et al., 2023), AI tools like Grammarly¹, WordTune², and Paperpal³ have emerged to improve academic writing. These tools analyse English text, suggest enhancements, and detect errors. However, they offer general feedback,

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¹ <https://grammarly.com/>

² <https://www.wordtune.com/>

³ <https://paperpal.com/>

lack personalisation, and provide limited multilingual support. Incorporating scaffolding that adapts to learners' prior knowledge and pace and supports multiple languages can create a tailored approach, enabling diverse learners to progress effectively. Using AI tools for academic writing enhances satisfaction and improves paper quality (Nazari et al., 2021; Malik et al., 2023).

This position paper proposes a plan to enhance learners' academic writing skills in the Serbian language, focusing on strategies to maintain continuous engagement and provide personalised support, with scaffolding applied through a custom AI tool to guide learners progressively and provide tailored support at each stage of their learning. Additionally, this plan would align with one of the key goals of our country's Scientific and Technological Strategy⁴, namely the development of AIED and science. The proposed plan will be tested in an undergraduate academic writing course at a public Serbian university in the last semester of a Software Engineering study program by evaluating predefined research questions (RQs). Some of those RQs are:

- RQ1: Does using an interactive AI academic writing tool with adaptive scaffolding improve student writing quality at the chapter level compared to students who do not use the interactive mode of the tool?
- RQ2: Do student clusters, based on their interaction patterns with an AI academic writing tool with adaptive scaffolding, differ in learning outcomes in an academic writing context?
- RQ3: How do academic writing skills evolve over the semester among student clusters defined by their interaction patterns with an AI academic writing tool with adaptive scaffolding?
- RQ4: Do evaluation results from the AI academic writing tool align with those from human evaluators in formative and summative academic writing assessments?
- RQ5: How do students' perceptions of an AI tool usage for academic writing change before and after participating in a course that integrates this tool?

We will evaluate our plans using quantitative and qualitative methods. RQ1 assesses the tool's impact on Serbian chapter-level academic writing. RQ2 and RQ3 identify usage patterns to guide interventions for

better outcomes. RQ4 ensures alignment between tool and human evaluations for reliable feedback. RQ5 enhances students' perception of AI, boosting their learning experience and confidence. These RQs gather explicit student feedback for iterative tool improvement.

This position paper is organised as follows. Chapter 2 reviews existing research on scaffolding strategies and AI tools in academic writing. Chapter 3 examines the specific challenges students face in academic writing, particularly in the Serbian language context. Chapter 4 proposes our solution to this problem. Chapter 5 states the counterarguments to the proposed approach. Chapter 6 concludes the position paper.

2 BACKGROUND WORK

Writing an academic paper is challenging due to factors like structuring arguments, synthesising credible research, and mastering grammar and vocabulary (Malik et al., 2023). Writing anxiety, prior knowledge, and motivational beliefs further complicate the process (Reiff & Bawarshi, 2011; Soiferman, 2014; Tawalbeh & Al-zuoud, 2013; Rahimi & Zhang, 2019). Recent literature addresses these challenges by providing scaffolding, such as feedback and AI tools, to support learners. This chapter will explore both approaches and review the current state of academic writing in Serbian.

2.1 Rise of the Scaffolding Technique in Academic Writing

The term "scaffolding" in education first appeared in the late 20th century. Wood et al. (1976) defined it as a process where adults assist learners with tasks beyond their capacity, allowing them to focus on manageable parts. This process helps complete tasks successfully and can develop learners' competence. Scaffolding became a popular research topic in various fields, including academic writing.

Cotterall and Cohen (2003) proposed a scaffolding framework for academic writing, where learners produced two 1000-word essays, which proved to be demanding. They suggested scaffolding techniques to support task completion, such as linking topics to study themes, providing a paper structure, assisting with text and data, focusing on different

⁴ <https://nitra.gov.rs/images/nauka/Strategija-nauc-tehnol-razvoj-RS-Moc-znanja.pdf>

⁵ <https://www.srbija.gov.rs/tekst/en/149169/strategy-for-the-development-of-artificial-intelligence-in-the-republic-of-serbia-for-the-period-2020-2025.php>

essay components in each session, modeling composition, addressing linguistic aspects, and incorporating feedback. These techniques reduced the learning burden and emphasised the rhetorical context, though no quantitative evaluation was provided.

According to Walqui (2006), scaffolding is considered a contingent, collaborative, and interactive process, with these characteristics being further expanded upon in the educational context. Building on this, the authors defined several instructional scaffolding techniques used when teaching academic paper writing: modelling, bridging, contextualisation, building schema, re-presenting text, and developing metacognition. For the presented techniques to successfully enhance learners' academic writing skills, the authors stated that it is not enough to use them but to highlight their purpose to the learners.

Learners' prior knowledge is crucial for tailoring scaffolding strategies to their needs. Spycher (2017) identified learning stages in academic writing for adaptive scaffolding, including knowledge building, language exploration, guided and independent text construction, and reflection. Spycher (2017) and Piamsai (2020) studied scaffolding's effect on students' writing performance and attitudes toward cognitive, metacognitive, and affective scaffolding. Writing scores improved significantly with scaffolding, compared to pretest results. A 4-point Likert scale showed positive student attitudes toward all forms of scaffolding, enhancing the overall learning experience. Wu and Alrabah (2023) found that rhetorical and adaptive prior knowledge scaffolding were the most impactful techniques.

2.2 Usage and Perception of AI Tools in Academic Writing

AI tools in academic writing have grown significantly in the past five years. In a survey by Chemaya and Martin (2024), students, professors, and postdocs were asked whether AI tools like ChatGPT⁶ and Grammarly should be acknowledged for fixing grammar and rewriting text in academic papers. Most participants agreed that grammar corrections did not need to be acknowledged. However, opinions on text rewriting varied based on prior language knowledge and academic role. Both students and postdocs emphasised the importance of acknowledging AI tools for text modifications, highlighting the

increasing prevalence of these tools in academic writing.

Nazari et al. (2021) designed a course that used AI tools to enhance academic writing skills and knowledge. By comparing results between students who had access to Grammarly and those who did not, they confirmed that AI tools could improve students' academic writing skills. The study also showed that AI tools enhanced the learning experience, positively impacting self-efficacy, engagement, and academic emotion. The benefits of using Grammarly were likely due to its ability to facilitate self-correction, enabling users to refine their writing before submitting it for final evaluation.

Some of the findings reported by Malik et al. (2023) align with those of Nazari et al. (2021), further confirming that AI tools enhance students' writing proficiency. However, many students raised concerns about the potential negative impact of AI tool usage on creativity and critical thinking, as well as the rise of misinformation and inaccuracies in research papers. The study emphasises that AI tools should support, rather than replace, writers' creativity. It is important to note that this study did not consider students' prior knowledge when surveying them on AI tool usage in academic writing.

2.3 AI Support for Academic Writing in Serbian Language

Although there has been limited support for leveraging AI to enhance academic writing in the Serbian language, some progress has been made in developing linguistic tools. These tools mainly provide advancements in grammar correction, spell-checking, and morphological analysis, which could serve as a foundational stepping stone for future development of AI-powered solutions to support learning academic writing in Serbian.

One such tool (*anSpellChecker*) was developed by (Ostrogonac et al. 2012) to assist with corrections in audio-to-text transcription. Each word was searched for in an accentual-morphological lexicon. If a match was found, the output included potential base forms of the word and grammatical information such as case, number, gender, and word category. Otherwise, the word was flagged as incorrect.

BERTić (Ljubešić & Lauc, 2021), a transformer-based architecture, was trained on extensive datasets from Bosnian, Croatian, Montenegrin, and Serbian text. It has been successfully applied to tasks such as part-of-speech tagging, named entity recognition, and

⁶ <https://chatgpt.com/>

commonsense reasoning, achieving higher results than state-of-the-art models. Because transformer models offer flexibility in fine-tuning and prompting for specific purposes, researchers and educators may use them to enhance academic writing (Weng, 2024).

Empirical studies on using AI tools for academic writing in Serbian are currently lacking, presenting a critical research gap. Addressing this gap could advance support for academic writing in low-resource languages and contribute to developing more accessible AI tools. However, studies highlighted the significant limitations of AI-driven tools when applied to low-resource languages, where tasks such as translation and annotation often fell short of human-level performance (Jadhav et al., 2024; Lankford et al., 2023). The lack of specialized AI resources for such languages remains a major barrier to improving academic writing capabilities.

3 PROBLEM STATEMENT

The primary objective of our course is to equip students with the necessary academic writing skills. Mastering these skills enhances critical thinking and the ability to articulate complex ideas (Tahira & Haider, 2019). Furthermore, academic writing helps students develop communication skills crucial for academic and career success (Gupta et al., 2022).

Research has shown that students often struggle to master academic writing skills (Mason & Atkin, 2021). This issue is particularly pronounced among engineering and technical students, who face additional challenges due to their strong focus on technical expertise at the expense of writing skills and their limited exposure to academic writing standards. Consequently, many engineering and technical students perceive writing as a secondary task, further complicating their ability to produce clear and well-organised academic papers (Rosales et al., 2012; Colwell et al., 2011).

These challenges were evident in earlier versions of our academic writing course within a software engineering program, highlighting its suitability for our initiative to enhance students' writing skills through AI-based tools and adaptive scaffolding techniques. Additionally, integrating AI into education and science is a key objective of Serbia's Scientific and Technological Strategy, making our initiative timely and aligned with national priorities. By addressing these challenges, we aim to improve students' academic writing abilities, support their educational growth, and contribute to broader strategic goals.

We plan to conduct an empirical study to evaluate the effectiveness of enhancing students' learning experience and academic writing skills in a Serbian public university's final-year course by incorporating adaptive AI-driven scaffolding techniques. The initiative will be implemented within the "Software Engineering and Information Technology" undergraduate program, specifically targeting the "Oral and Written Communication Skills in Technical Disciplines" course, which currently has around 80 students. Efforts are underway to include this course in an additional study program, increasing the total number of participants to 200. This chapter outlines the course context, its structure, and students' dissatisfaction with the course.

3.1 Course Structure

The main objective of the earlier course iterations was a writing task aiming to develop and assess students' writing skills. The writing task involved writing a technical paper in which students selected a topic of interest from the software engineering field. The structure of the paper was predefined and included:

- problem definition – defines essential concepts for understanding the problem, highlights its societal importance, and outlines the expected solution behaviour and target user groups;
- theoretical background - defines key concepts, derives systems' requirements, and discusses possible solutions;
- solution – provides an in-depth explanation of the solution;
- solution validation – explains the validation process and measurements and the expected outcomes, ensuring the reproducibility of the validation procedure; presents and discusses the results of the experiments, highlighting the solution's strengths, limitations, and applicable contexts.

Following Kirschner and Van Merriënboer (2008), students were offered a structured course that guided them through the incremental writing of their technical papers. The writing task was broken into smaller sections, allowing students to improve their work without feeling overwhelmed (Wischgoll, 2017). Each section corresponded to a different chapter, with strict deadlines for submission. At the start of each chapter, lectures communicated standards for both content and style, covering technical aspects like working in Word and LaTeX. These lectures ensured that students were familiar

with both practical elements (e.g., paper structure, referencing) and conceptual elements (e.g., critical thinking, argumentation) of academic writing.

Before each chapter's deadline, students were allowed one submission to receive formative feedback from the teaching assistants (TAs). They had strict deadlines for both requesting and receiving this feedback. To encourage participation, a small number of points – counted towards the final grade – were awarded for obtaining feedback. However, students could not access their feedback immediately and had to wait for it to be provided.

Rubrics related to the general writing style and each chapter's content were defined to limit grading subjectivity. Three independent evaluators (TAs) evaluated the papers, each marking a portion.

3.2 the Main Area of Student Dissatisfaction

After the course ended, students voluntarily completed an anonymous questionnaire to share their perceptions of the course. Additionally, TAs were interviewed to gather their views on the feedback and grading processes.

The timeliness of feedback was a significant concern for the TAs, who expressed that the time constraints and pressure often affected its quality. Students expressed dissatisfaction with the three evaluators' inconsistent revision and marking process. Despite the use of predefined rubrics, the inherent subjectivity of human grading posed a significant challenge. This finding aligns with existing research, emphasising the prevalence of grading inconsistencies in large classes with multiple evaluators, often resulting in inconsistent grade assignments (Haines, 2021; Hounsell, 1995). Inconsistent feedback on academic work can negatively impact students' motivation and performance. It may also discourage them from engaging in similar tasks in the future (Wisniewski et al., 2020; Gnepp et al., 2020). Consistent, timely, and personalised feedback should be given to improve the course, as it would likely increase student motivation and encourage greater engagement with the learning process.

4 PROPOSED SOLUTIONS

The incorporation of AI tools in the learning process of academic writing has not only been positively received by students but has also led to improved outcomes in the final evaluation of academic papers.

These tools offer immediate feedback about the written text, which helps students refine their work iteratively (Nazari et al., 2021; Malik et al., 2023; de Diego et al., 2021). Additionally, the tool will provide consistent feedback and evaluation, as it will be trained to apply the same rubrics when delivering summative feedback.

Applying adaptive scaffolding during the learning process of academic writing has proven to be an effective strategy for supporting students. This technique considers learners' prior knowledge and learning trajectories, providing support that meets each learner's needs (Spycher, 2017; Wu & Alrabah, 2023).

This chapter proposes a plan for integrating adaptive scaffolding techniques into developing a custom AI tool to enhance the students' learning experience and academic writing. Figure 1 presents an envisioned course structure based on this plan.

4.1 Creation and Structure of the Tool

Students can interact with the tool in two modes: interactive and evaluation. In interactive mode, students can submit work-in-progress papers for analysis based on predefined criteria. The tool will provide tailored, instant, formative feedback for immediate use, helping students enhance their work. Additionally, students can ask for help on specific issues, allowing for targeted guidance. The tool also updates the learner model by analysing interactions and identifying difficulties, ensuring feedback is personalised based on prior knowledge and tool interactions. This approach has been positively received and linked to improved evaluation outcomes (Spycher, 2017; Wu & Alrabah, 2023).

The evaluation mode entails providing formative and summative feedback by marking the final versions of the papers' chapters using predefined rubrics. Even though human intervention will be needed to validate tools' output when assigning the final grade, the idea is to make the marking process less complex for TAs and more consistent. Doing so reduces the risk of students feeling demotivated and dropping their performance throughout the course (Wisniewski et al., 2020; Gnepp et al., 2020). The main difference between interactive and evaluation modes lies in their purpose: interactive mode focuses on providing formative feedback during the writing process while enabling direct interaction with students, whereas evaluation mode provides both formative and summative feedback on final submissions using predefined rubrics.

The learner model, a core component of the AI tool, is central to tracking and analysing student progress, personalising the tool's feedback mechanism. It collects data from both interactive and evaluation modes to adapt the interactive experience based on students' challenges and work patterns, providing a more tailored approach. For instance, if students repeatedly use similar phrasing in their writing, the learner model will recognise this and, in future interactions, guide students to diversify their vocabulary and sentence structures. By offering abstract rules and personalised feedback, the tool helps students understand how to improve and why specific changes enhance their writing. This deeper understanding accelerates learning as students internalise principles and need fewer concrete examples over time. The learner model ensures an effective and engaging learning experience by continuously tracking progress. The tool creation process will consist of two parts. Firstly, the tool will be trained before the beginning of the course. This phase will focus on feeding the tool with the foundational knowledge of academic writing, such as language grammar and paper structure. The second phase of developing the tool will focus on adapting it to meet the individual needs of each student throughout the course duration. This personalisation will consider their initial knowledge, assessed through a pretest, and their learning pace throughout the semester, all of which will be fed to the learner model.

4.2 New Course Learning Design

Figure 1 presents the updated course structure. Initially, students will complete a pretest to assess their prior knowledge of academic writing. The pretest will include tasks designed to assess students' ability to evaluate a given text, focusing on whether it follows a specific structure, complies with proper grammar, and maintains an appropriate style. These tasks aim to measure students' initial awareness of key academic writing principles and provide a baseline for personalised guidance through the tool.

The course will follow an iterative flow, with each iteration focusing on one of the four paper chapters previously described in section 3.1. Each iteration starts with an in-face lecture that gives the students instructions on completing the following section of their academic paper. Students are then split into two groups: an experiment group that uses the interactive mode and the control group that does not use it. We switch these groups in each iteration, ensuring students write two chapters using each mode. This way, we can evaluate whether our intervention enhances the quality of the resulting chapters. Furthermore, this approach allows students to form opinions about the tools' effectiveness. After completion, both groups' chapters are evaluated using the tools' evaluation mode. In contrast to the interaction mode, all students can use the evaluation mode multiple times for each paper's section.

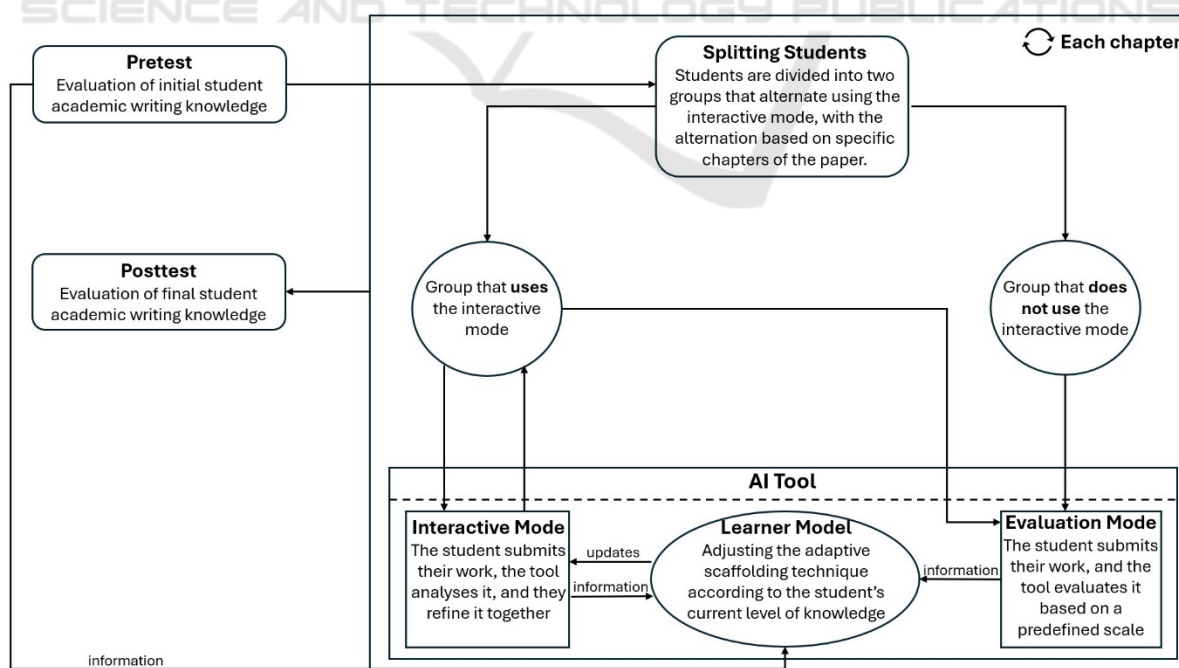


Figure 1 - Course structure.

TAs will assign final marks to paper chapters, using the tool's evaluation output as a reference while verifying its accuracy. The posttest will mirror the pretest structure, enabling us to assess whether the tool has significantly improved students' academic writing skills. The tool's effectiveness will be evaluated by answering a set of research questions, some of which were outlined in Section 1. Additionally, students will complete a questionnaire on their perception of using the AI tool and adaptive scaffolding to improve their academic writing skills.

5 COUNTERARGUMENTS

While we plan to create a tool to encourage students to engage actively in dialogue with AI, we are mindful of the potential risks associated with its usage. Overreliance on AI in academic writing has been argued to diminish students' critical thinking (Lin, 2023), potentially leading to less engagement with lecture materials and a shallower understanding of the content. Another concern is feedback misinterpretation, where students might misunderstand the suggestions provided, leading to unintentional errors.

Ethical concerns about AI usage in academic writing are widely discussed, with learners raising issues related to authorship, originality, and integrity. The rise of AI-generated content has also contributed to misinformation in research, often due to inadequate verification by researchers. These challenges highlight the need for stricter guidelines and accountability in AI-assisted academic work (Malik et al., 2023; Chemaya & Martin, 2024).

From a technical perspective, creating an AI-based educational tool is complex due to resource constraints and implementation challenges. High-quality, unbiased datasets are essential for training while developing user-friendly software and securing sufficient computing power can be costly. Real-time AI feedback also requires efficient processing capabilities. These challenges necessitate strong financial and technical support from the university (Eden et al., 2024).

6 CONCLUSIONS

Learning academic writing remains challenging for many, particularly those striving for proficiency. Support for the Serbian language in academic writing is still limited. However, adaptive scaffolding

techniques and the integration of AIED have generally been well-received by learners, with positive perceptions and favorable outcomes reported. A custom AI tool using adaptive scaffolding will be developed and integrated into our university's course with a redesigned flow to address these challenges. By providing instant feedback through interactions with the AI tool, students will improve their self-efficacy and engagement in academic writing, making it easier to master. The AI tool will also address frustrations related to marking subjectivity. The proposed plan has the potential to significantly enhance the academic writing learning experience, encouraging students to engage more with similar tasks in the future. It also aligns with Serbia's scientific and technological goals of integrating AIED, providing greater support for academic writing in Serbian. The answers to the proposed research questions will further refine current strategies to improve the academic writing learning process.

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