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Viat-map: A Constructivist, Toulmin-Based Framework for Enhancing EFL Reading Comprehension

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Abstract: This paper introduces Viat-map, a technology-enhanced learning tool designed to improve EFL learners' reading comprehension by guiding them in reconstructing argumentative structures using Toulmin's model. Viat-map's closed-ended, visual interface scaffolds learners through claim, ground, and warrant identification, promoting active engagement and reflection. Experimental results demonstrate that learners using Viat-map significantly outperform those using traditional summarization methods in both immediate and delayed comprehension assessments. Log data analysis further reveals that iterative feedback cycles enhance learners' accuracy, while behavioral profiles show varied engagement patterns linked to learning outcomes. The latest AI-enhanced Viat-map incorporates adaptive learning pathways and gamification, enabling personalized pacing and richer insights into learner processes. Together, these findings highlight Viat-map's potential as a data-informed, defensible platform for fostering critical thinking and argumentation skills in multilingual educational contexts.

Keywords: Toulmin Argument, Constructivism, Viat-map

1. Background & Motivation

Learning how to build strong arguments is essential for academic success, but many EFL learners struggle to connect their claims with logical reasons and evidence. Traditional teaching methods often focus on structure and grammar, without fully helping students understand the reasoning behind their arguments (Andoko, Asmara, et al., 2023). To address this gap, Viat-map was developed as a visual learning tool based on the Toulmin model, guiding learners step-by-step in constructing claims, justifying them with warrants, and integrating supporting evidence.

Viat-map's framework is rooted in constructivist ideas, motivating students to actively engage in interpreting information and contemplating their individual thought processes (Andoko, Amalia, et al., 2023). Initial use in classrooms revealed that students grasped visual mapping more readily compared to conventional text-based teaching methods, which lessened the mental strain and rendered argumentation more accessible. Nevertheless, it quickly emerged that to genuinely foster learning, we required more comprehensive understanding, focusing not only on the final student output but also on their methods of navigating the reasoning journey.

Over the past three years, Viat-map has been tested and refined through a series of empirical studies. These include behavioral clustering to identify learner profiles (Andoko, Lestari, Pramudhita, et al., 2024), gamification to boost engagement and performance (Andoko, Lestari, Ikawati, et al., 2024), AI-enhanced feedback using chatbot prompts (Andoko et al., 2025), and usability evaluations based on the Technology Acceptance Model (Andoko, Amalia, et al., 2023). Together, these findings have contributed to the ongoing development of Viat-map as a data-informed platform aimed at supporting pedagogical goals while aligning with institutional and research standards.

2. VIAT-Map

2.1 Framework

Viat-map is a closed-ended, technology-enhanced learning application designed to help EFL learners reconstruct the claim - ground - warrant structure of a text, following Toulmin's model of argumentation (Figure 1). The tool was built not only to support comprehension but also to guide learners through the reasoning process in a structured, visually intuitive way. In Principle, Viat-map has three main phase, they are:

1. Teacher's Logical Map: In this initial phase, the teacher creates exercises by outlining the main claims presented in a text. For each claim, the teacher provides one correct ground and one correct warrant to support it, along with two incorrect grounds and two incorrect warrants to serve as distractors and increase exercise variability.
2. Learner's Working Space: Next, students engage with the exercises by selecting the correct ground and warrant from the provided options to support each claim. They are required to successfully complete the current exercise before advancing to the next one, ensuring mastery of each step.
3. Overlapping Analysis: This final phase allows teachers to review student performance by examining error patterns. Each answer row displays two numbers: the first indicates how many errors an individual student made, and the second shows how many students made errors in that row. Selecting a row provides detailed information about the specific students and their errors

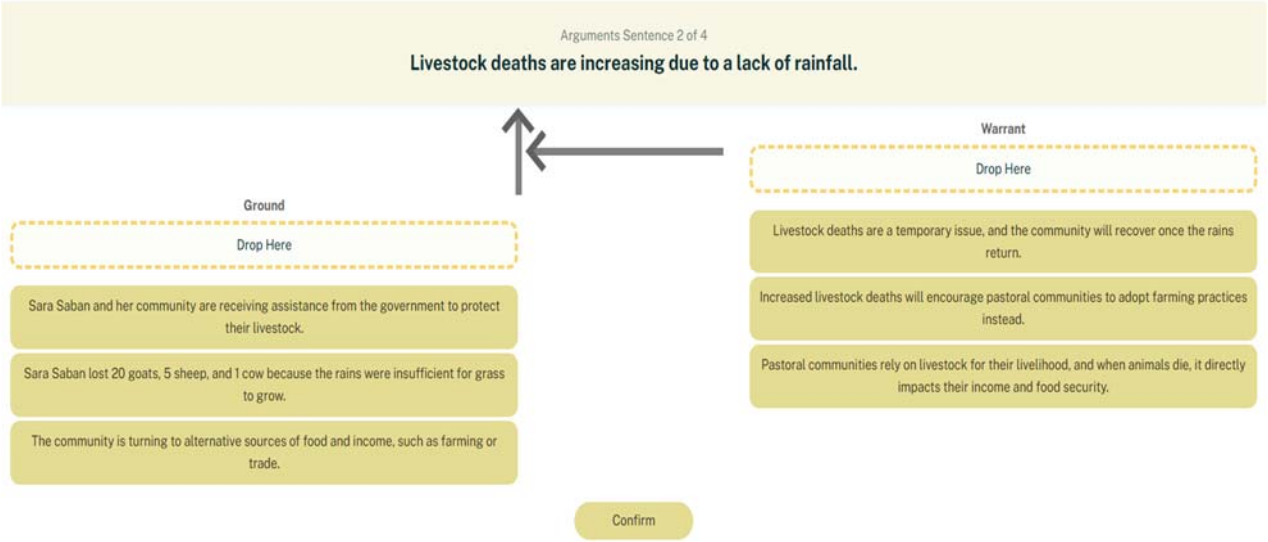

Figure 1. Viat-maps student's working space

2.2 Toulmin-Based Reasoning

The main core of Viat-map is the Toulmin framework, which breaks down arguments into components such as claim, ground, and warrant (Toulmin, 2003). In practice, learners use Viat-map to identify these elements within a reading passage and organize them into a visual map. This process encourages deeper engagement with the text and helps learners uncover the logic that connects evidence to conclusions something that is often implicit and easily overlooked in traditional instruction (Andoko, Asmara, et al., 2023).

2.3 Constructivist Design

Viat-map's learning flow is intentionally iterative. Learners make selections, receive feedback, and revise their reasoning as they progress. This design reflects constructivist principles, where knowledge is actively built through interaction and reflection (Jonassen, 1999). Rather than passively absorbing information, students are invited to test their understanding and refine it in real time. In classroom trials, this approach has shown promise in helping learners internalize argumentative logic more effectively.

2.4 Previous Findings

- **Experimental studies**: EFL students using Viat-map significantly outperformed those using summarization in post-test comprehension (Andoko, Asmara, et al., 2023).
  In an experimental study involving EFL students, those who used Viat-map to reconstruct Toulmin arguments demonstrated significantly better reading comprehension than peers who practiced conventional summarization. The Viat-map group outperformed the control group on post-test scores, with an average of 6.97 compared to 5.86 for summarization users, indicating a meaningful advantage in processing argumentative texts. Moreover, this group showed better retention after one week, as evidenced by higher delayed test scores, suggesting that Viat-map supports not only immediate comprehension but also longer-term memory. Within-group comparisons further revealed that learners using Viat-map made significant gains from pre-test to post-test, whereas the summarization group showed no notable improvement. These findings highlight how the structured, closed-ended design of Viat-map encourages deeper cognitive engagement by guiding learners to explicitly analyze the logical connections between claims, grounds, and warrants, rather than simply summarizing content superficially.
- **Log data analysis**: Iterative feedback cycles improved accuracy in claim-ground-warrant matching (Andoko et al., 2022; Andoko, Lestari, Pramudhita, et al., 2024).
  Log data collected from Viat-map usage revealed that iterative feedback cycles played a key role in improving learners' accuracy when matching claims, grounds, and warrants. In earlier studies (Andoko et al., 2022), students who engaged repeatedly with the feedback mechanism showed gradual refinement in their reasoning selections, suggesting that the system's closed-ended design encouraged deliberate reflection rather than guesswork. More recent analysis (Andoko, Lestari, Pramudhita, et al., 2024) examined step-by-step behavior and time-on-task patterns, identifying distinct learner profiles based on interaction patterns. Learners who took more steps but received targeted feedback tended to achieve higher post-test scores, indicating that accuracy was not merely a function of speed but of meaningful engagement with the reasoning process. These findings support the idea that structured, iterative interaction combined with immediate feedback can foster deeper cognitive processing in argumentation tasks.
- **Engagement effects**: Toulmin-based reconstruction promoted deeper interaction with text structure (Andoko, Lestari, Ikawati, et al., 2024).
  It has been shown that using the Toulmin method to rebuild arguments in Viat-map helps students get more involved with how texts are put together. Because the tool makes students find and arrange claims, Ground, and Warrant, it helps them do more than just read without thinking and pushes them to really engage with the text. This way of doing things helps students think analytically, since they always have to judge how the different parts of an argument connect and explain why they made the choices they made. The way Viat-map looks and lets you play around with it helps keep students interested by showing abstract logical links in a way they can see and change, which helps them learn how arguments are structured and makes them understand things better overall.
- **Current**: AI-enhanced Viat-map (Andoko et al., 2025).
  This study investigates the impact of integrating an AI-powered chatbot into Viat-Map, a learning platform based on Toulmin's Argumentation Model, to enhance English as a Foreign Language (EFL) students' reading comprehension. Conducted with 16 university students, the research used a pre-test and post-test design to measure comprehension gains after interaction with the AI-enhanced system. The chatbot provided strategic prompts and reflective questions to guide learners in constructing arguments, supporting deeper engagement with the claim, ground, and warrant components of texts. Results showed a significant improvement in comprehension, with a positive correlation between active interaction steps and learning gains, highlighting that meaningful engagement not just time spent drives success. This study underscores the potential of combining structured argument mapping with AI-driven personalized support to foster critical thinking and improve reading skills in diverse educational contexts.

2.5 Expected ECW Outcomes

- Refine theoretical positioning within TEL, argumentation, and AI driven adaptive learning.
- Build partnerships for cross institutional validation.
- Gain feedback on scaling for diverse educational contexts.

3. Conclusion

This study has explored the design, implementation, and empirical evolution of Viat-map as a technology-enhanced learning tool for supporting argumentation in EFL reading comprehension. Grounded in Toulmin's model and constructivist learning theory, Viat-map offers a structured, visual approach that helps learners unpack the logic behind textual claims. Through its closed-ended design, iterative feedback, and scaffolded progression, the tool encourages deeper engagement with reasoning while managing cognitive load.

Over the past three years, a series of classroom trials and analytical studies have contributed to refining Viat-map's pedagogical impact. Findings from behavioral clustering, gamification, source connection, and AI-enhanced feedback suggest that learners benefit not only from the structure of the tool but also from its ability to adapt to diverse learning profiles. Usability evaluations further confirm that Viat-map is accessible and well-received in classroom settings.

While these results are promising, Viat-map remains a work in progress. Future development will focus on expanding adaptive feedback mechanisms, integrating multimodal analytics, and aligning with broader TEL frameworks. Ultimately, Viat-map aims to serve not just as a classroom application, but as a defensible, data-informed platform for fostering critical thinking and argument literacy in multilingual learning environments

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