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Activating First-Year Students In The Digital Age: Lessons From The Integration Of An AI Learning Assistant In Higher Education

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Research Domains

Digital University and new learning technologies (DU)

Abstract

This study explores the use of HAnS, an AI-based assistant designed to support university students in managing complex digital learning materials. HAnS processes extended lecture recordings and generates comprehension questions at varying difficulty levels to facilitate formative self-assessment. A workshop intervention involving control and experimental groups was implemented in a “Scientific Working” course at a German university of applied sciences.

While task performance did not significantly differ between groups, students using HAnS reported greater engagement and a better grasp of digital learning strategies. Motivation for regular use, however, remained moderate. Qualitative feedback revealed mixed attitudes - students valued AI-driven support but raised concerns about autonomy and critical engagement.

The study suggests that HAnS offers cognitive benefits when embedded in structured learning environments. It highlights the importance of pedagogically sound integration of AI in higher education, emphasising the need for transparency, instructional alignment, and support for student agency in technology-enhanced learning.

Full paper

Context

The transition from secondary to tertiary education is characterised by an increased need for self-regulation, independent study, and the ability to process diverse, often unstructured learning materials (Cameron & Rideout, 2020; Tinto, 2017). For many first-year students, this shift presents a significant challenge. Recent studies highlight that students often struggle with time management, lack of strategic learning behaviours, and

difficulty in navigating digital learning environments (Aziz et al., 2020; Ifenthaler & Yau, 2020).

Higher education institutions are responding to these challenges by exploring how artificial intelligence (AI) can support learners in developing academic and self-regulatory competencies (Abulibdeh et al., 2024; Lai, 2024). AI-based tools have shown potential in enhancing access to content, providing personalised learning paths, and supporting metacognitive engagement - especially when integrated into coherent instructional designs (Yang & Xia, 2023).

Against this backdrop, the HAnS (Hochschul-Assistenzsystem) project investigates how an AI-based assistant embedded in a digital learning platform can support student activation and foster meaningful interaction with lecture materials. The AI-based assistant supports students in processing and structuring extended video lecture content, which often lacks clear segmentation and presents challenges for conceptual integration. An integrated chatbot generates comprehension questions based on the transcript, available at three levels of difficulty, to facilitate formative self-assessment during the learning process.

Research Aims

This study aimed to explore:

- Whether and how the AI assistant HAnS supports first-year students in understanding its function and use cases within higher education learning contexts.
- To what extent HAnS improves students' perceived learning efficiency, motivation, and engagement when using AI tools.
- How students assess the didactic value of AI-supported exercises and reflect on their willingness to adopt such tools regularly.

Methodology

We conducted a workshop-based intervention with first-year students in a "Scientific Working" course at a German university of applied sciences. The workshop focused on knowledge structuring, understanding digital academic environments, and applying HAnS to real course materials. Students were divided into a control group (traditional learning strategies) and an experimental group (HAnS-supported learning). Both groups received three identical tasks based on lecture content. Quantitative data (task performance, five-point Likert-scale evaluations) and qualitative data (discussion inputs, written reflections using the Six Thinking Hats method) were collected.

Findings

Performance results showed no statistically significant differences between groups (89% correct in control vs. 92% in experimental). However, the experimental group demonstrated higher engagement during task execution and expressed a better

understanding of how to navigate and use digital materials. Evaluation responses showed students perceived HAnS as easy to use (mean: 4.30/5) and moderately useful for learning (3.65). However, motivation to use it independently (3.23) and perceptions of learning efficiency (3.03) were more reserved. Regular future use scored even lower (2.73), indicating scepticism about its long-term benefit.

Qualitative reflections highlighted several tensions. Students appreciated AI-based structuring and feedback but questioned whether such tools support genuine academic learning or undermine autonomy. They were particularly critical of the assumption that lecturers might endorse HAnS uncritically, expressing concern that AI might substitute, rather than support, active learning.

Discussion

The results must also be considered considering a methodological limitation: the task design did not produce sufficient discriminative power, as a high proportion of participants in the control group answered the questions correctly. This suggests that the items were too easy overall and thus did not allow a clear differentiation of support effects through HAnS.

Our findings suggest that the primary benefit of HAnS lies not in immediate performance gains but in its capacity to scaffold cognitive and metacognitive learning processes - especially for students struggling with orientation in digital learning spaces. However, digital activation is not merely a technological problem but a pedagogical one. For AI tools to foster deep engagement, they must be embedded in structured, reflective learning contexts that promote agency, critical thinking, and dialogic interaction. Moreover, student scepticism points to the need for transparent communication about the role and limits of AI in learning.

Implications

HAnS demonstrates potential as a supportive mechanism for structuring information and providing accessible entry points into complex learning materials. However, its success depends on careful didactic integration. To activate learners effectively, AI tools must be accompanied by instructional design that fosters meaningful interaction, not passive consumption. Educators and institutions should focus on training students not only in how to use such tools, but also in how to evaluate their output critically and incorporate them responsibly into their study routines.