



Educational Digital Support Agents | DSA-E

A Specific Class of Tools Integrating Artificial Intelligence (AI) into Teaching and Learning Processes in a Domain-Specific, Data-Sovereign and Target-Oriented Manner

Moritz Dier

Overview of and Challenges with Artificial Intelligence in Education

The integration of Artificial Intelligence (AI) into various areas of life and work, including the education sector, is progressing rapidly. The research, in particular the SWK Impulse Paper (2024), supports this development but at the same time highlights the need for domain-specific AI tools in the education sector. Although general AI systems are helpful (WOLLNY ET AL. 2021; DENG & YU 2023; QUIROZ-MARTINEZ AND OTHERS 2024; SWK 2024), they do not always meet the subject-specific requirements of everyday school life or the educational claim in the sense of education. In contrast, specific AI tools could provide targeted support and deliver more reliable results when trained with high-quality, subject-specific data by focussing on specific learning content and objectives. According to assumptions, this could increase the efficiency of teaching and learning processes without jeopardising the development of important competences such as critical thinking or text production (CHAUDHRY & KAZIM 2022; Xu & OUYANG 2022; SCHLEISS AND OTHERS. 2023; SWK 2024, KMK 2024).

For this reason, the Bayreuth University Vocational School of Technology is developing and testing a specific class of AI tools – the Educational Digital Support Agents (DSA-E) – which meet the challenges described and is intended to support competence development.

Research Question

What basic principles must be taken into account in the development of AI-based tools to support teaching-learning processes in order to adequately address the (specialist) specific requirements as well as the contextual peculiarities of complex teaching-learning scenarios in (vocational) school education courses and at the same time to overcome the limitations of generic AI systems?

Research Design

To answer the research question, criteria for AI-supported teaching-learning tools to support teaching-learning processes are identified in cyclical processes. The derivation of design principles for a systematic implementation is carried out through workshops, expert interviews and the development of practical prototypes, which are tested in real teaching-learning scenarios of vocational education and training.

First Results

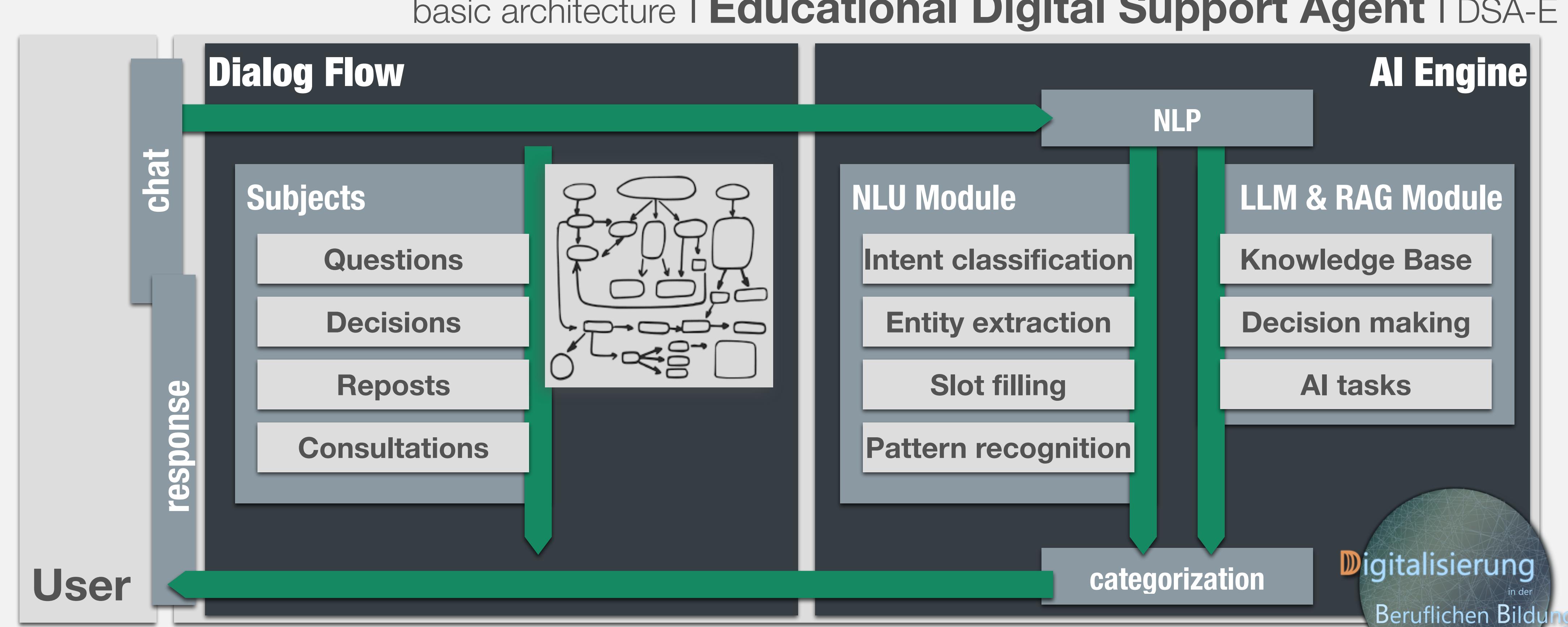
Definition (DIER 2025)

Educational Digital Support Agents (DSA-E) are AI-based, but not purely generative chatbots for individual teaching-learning accompaniment and support, which determine the course of the dialogue, categorize the human statements objectively well-founded and respond to them by means of context-sensitive queries, generate answers on a secure database or initiate topic-specific reflection impulses and are integrated into the overall learning process in a targeted manner.

Workflow Diagram

Unlike standard chatbots, DSA-Es are contextual and pre-defined. The dialogue is topic-specific and follows predetermined paths that are triggered by human statements.

Technically, the DSA-E approach is based on a combination of Natural Language Processing (NLP), Large Language Models (LLM) and Retrieval Augmented Generation (RAG) to provide both generically accurate and up-to-date answers while also controlling the conversation. This hybrid approach combines the strengths of individual technologies to ensure a versatile and powerful interaction.



Current DSA-Es Practice Prototypes in use at The Bayreuth University School of Technology

Literature

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DSA-E for the systematic activation of subjective theories through guided teaching reflection



Use by prospective teachers

DSA-E for the discovery of subjective perspectives in the inter-specialist area of competence



Use by students

DSA-E for the professional deepening of topics in the competence dimension of knowledge



Use by students

