

## PERSONALIZED EDUCATION IN DISTANCE LEARNING USING GENERATIVE AI SOLUTIONS

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The post-COVID world and the ongoing war in Ukraine once again highlighted the strengths but also stressed the demands for distance education, transforming how students and teachers interact with each other. We know that a powerful combination of AI-powered solutions and a professional, competent user will result in improving productivity and quality by up to 40% in some studies [1].

Large Language Models (LLMs) in the form of commercial services (such as ChatGPT from OpenAI, Google Bard/Gemini from Google, and Claude from Anthropic) with pay-as-you-go subscription plans are already offering integration support with their set of comprehensive APIs. What started as "chatbots" that imitate human speech has evolved over the last couple of years into image generation, image recognition, and other video/audio representations.

Of course, LLMs are not a "silver bullet" for all issues that plague the distance education process. They are not truly Artificial Intelligence in the form of Artificial General Intelligence, capable of producing new ideas or new senses – similar to the results of human creativity. China, India, and the US are the leading countries researching AI in the area of online learning and distance education [2], just looking for ways to enhance current processes with a new toolset.

When it comes to «learning something new», thus obtaining new knowledge from a trusted source – either a teacher, a book, a dictionary, or a scientific article – the form in which that new knowledge is presented matters. Adapting the presentation to the level of the student's understanding is key to successfully introducing new concepts.

Right now, teachers, involved in distance education, are forced to create large test sets in order to create a unique experience for each individual, and this is a tremendous challenge and workload. Using LLMs is one of the obvious approaches, but this is a grey area with many obstacles on the way. One of many (along with so-called «hallucinations» of LLM responses, that require fact-checking, especially for exact sciences) is inability to produce adapted tests or texts for a specific student «out of the box», as LLM will be lacking a critical

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part of this complex task – context. LLM knows nothing about the student, previous assessments, unable to identify areas for improvement and so on.

In order to successfully tackle this problem, so-called «prompt engineering» will be handy, that will transform a generic prompt, created by the teacher, for a specific student level of knowledge – thus making each prompt unique. An intermediary agent, *the Adapter*, should be introduced to the LMS ecosystem. Adapter should have access to sensitive data (depersonalized, if possible).

*Context aggregation* for the Adapter is a crucial part: collecting student performance metrics across subjects, and processing teacher feedback, notes, and annotations. It is vital to address possible assessment patterns and track student performance across the learning curve. This will require some changes for the current LMS, as unified reports should be developed and presented in condensed form (as API pricing will depend on the number of words).

The Adapter transforms generic teacher prompts through a multi-stage process:

Generic Prompt → Context Injection → Difficulty Calibration → Knowledge Gap Focus → Adapted (Individual) Prompt.

When a teacher initiates a test generation request, the Adapter:

- Retrieves the student’s learning profile
- Analyses recent performance indicators
- Identifies knowledge gaps and areas requiring special attention
- Adjusts prompt with context-based output
- Sends adapted prompt to LLM & process response.

In conclusion, the Adapter combines large-scale data aggregation with dynamic prompt adaptation to make a learning experience more personalized and tailored to the needs of each individual student. The result of this will be not only optimized efficiency on the part of LLM-based tools but also actionable insights for teachers, which makes it a key component in modernizing distance learning systems.

### References:

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