**GPR-103**

**Personalized Pedagogy through a LLM based Recommender System**

**Abstract**

Educational realms are adapting through Artificial Intelligence and generative AI, making it imperative for educators to adopt new technologies in teaching. Pedagogical Design Patterns (PDPs) are key in transferring effective teaching practices from theory to application, yet their widespread use is hindered by limited resources and disjointed publication channels. We propose using Large Language Models (LLM) to provide recommendations on teaching strategies derived from published PDPs, utilizing a local knowledge base and the Retrieval-Augmented Generation framework for context-specific query response. Initial results show a promising accuracy of 0.83, with relevant recommendations to user queries.

**Introduction**

The educational domain is evolving rapidly with the integration of AI and LLMs, prompting educators to seek out innovative technologies and methodologies for teaching. As education becomes more design-oriented, the need for sharing effective educational strategies is crucial. Pedagogical Design Patterns (PDPs) have emerged as a key resource, providing a repository of validated educational strategies. Despite their value, PDPs are often difficult to access due to their dispersion across various sources, challenging educators to stay abreast of the latest, most effective teaching methods.

**Research Question(s)**

How can large language models (LLMs) be utilized to effectively personalize Pedagogical practices for diverse educational contexts and needs?

**Materials and Methods**

To streamline educators’ access to PDPs our methodology integrates a comprehensive knowledge base of PDP with LLM, using the RAG framework for tailored recommendations. We’ve curated 300 evidence-based PDPs, categorized into 11 key areas, each richly metadata-tagged for efficient retrieval. Embedding these into a vector database, we ensure quick access, maintaining relevance and accuracy in the recommender system. Figure 1 highlights the architecture of the system.

The model development follows three main steps:

**Indexing:** transforms PDPs into searchable vectors, segmenting documents for compatibility with embedding models, and storing these in a vector database for rapid retrieval. This step creates the foundation for the system’s semantic understanding and quick access to PDPs (Figure 2).

**Retrieval** involves matching user queries with PDP vectors and assessing semantic similarity to fetch the most relevant PDPs. This stage is crucial for ensuring that the recommendations are closely aligned with the PDPs in the knowledge base and users’ query context.

**Generation** is where the LLM (LaMA 2.13B) is prompted by the retrieved query context and PDPs, crafts bespoke educational strategies. It integrates context with user queries, leveraging the nuanced understanding from PDPs to generate tailored, actionable teaching insights (Figure 3).

A qualitative study with 16 academic professionals assessed the relevance of LLM-generated recommendations to diverse user queries. An 87% relevance approval on a Likert scale points to the model’s potential utility, despite a small data set and the need for broader testing (Figure 4).

**Fig.4 Model Performance Evaluation Result**

**Conclusions**

Our study presents a novel recommender system by integrating the LLaMA2 LLM into its core for generating evidence-based pedagogical practices, with a focus on relevance and research foundation. Utilizing a rich database of PDPs and the RAG framework, the system tailors responses to user queries, confirmed by an 83% accuracy rate and an 87% relevance approval from academic professionals.

Looking forward, we will expand our PDP database and refine the system, particularly addressing any LLM inaccuracies and integrating user feedback into future recommendations. Our aim is to embed the RS in LMS platforms, providing a valuable, community-driven resource to elevate teaching methodologies across the educational landscape.

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**References**