EduNaija AI Tutor: A Multi-Agent Retrieval-Augmented Generation System for Nigerian Curriculum Education

Israel Odeajo
WorldQuant University
isrealodeajo@gmail.com

Edifon Jimmy
University of Benin
edifonemmanuel14@gmail.com

Abstract

Equitable access to quality education remains a critical challenge in Nigeria, where millions of students prepare annually for standardized examinations (WAEC, NECO, JAMB) with limited access to personalized tutoring. This research presents **EduNaija AI Tutor**, a multi-agent Retrieval-Augmented Generation (RAG) system designed to democratize educational support aligned with Nigerian curricula. The system integrates conversational AI with document-based question answering, automated assessment generation, and multilingual support for English, Yoruba, Hausa, and Igbo. Using LangChain for agent orchestration and FAISS for vector retrieval, the system enables students to interact with educational content through natural language queries while maintaining cultural relevance. Preliminary evaluation demonstrates the system's capability to provide curriculum-aligned explanations and generate practice assessments.

1 Introduction

Despite rising enrollment in secondary and tertiary education, access to quality educational support in Nigeria remains highly unequal. Each year, over two million candidates register for the Joint Admissions and Jamb (JAMB) examination (Joint Admissions and Matriculation Board, 2023; West African Examinations Council, 2022). However, structured tutoring is disproportionately concentrated in urban centers (UNESCO, 2023).

Private tutoring typically costs between ¤5,000 and ¤50,000 per month, presenting a significant financial barrier (World Bank, 2022). While Large Language Models (LLMs) offer scalable solutions, generic models often lack strict adherence to local syllabi (Adelani et al., 2022). We introduce **EduNaija AI Tutor**, a localized systems framework engineered to solve the lack of curriculum-aligned, multilingual tutoring for Nigerian national exams.

2 Background and Related Work

2.1 AI in Education

Intelligent Tutoring Systems (ITS) have evolved from rule-based systems to LLM-powered tutors (Woolf, 2010). While tools like Khanmigo (Khan Academy, 2023) utilize LLMs, they are predominantly designed for Western curricula, leaving a gap in systems aligned with African examination structures like WAEC.

2.2 Retrieval-Augmented Generation (RAG)

LLMs often suffer from hallucination. RAG addresses this by grounding responses in authoritative documents (Lewis et al., 2020). While applied in scientific domains (Liu et al., 2025), its application to African national curricula remains underexplored.

3 Methodology

3.1 System Architecture

The system employs a hierarchical multi-agent architecture. The main orchestrator acts as the central hub, classifying user intent and routing queries to specialized agents.

3.2 Data Processing Pipeline

To ensure relevance, the system allows users to upload specific study materials. Text is extracted via PyMuPDF and split using `RecursiveCharacterTextSplitter` (size=1024, overlap=100). Chunks are embedded using OpenAI's `text-embedding-ada-002` and stored in FAISS.

4 Evaluation and Results

4.1 Evaluation Setup

We recruited $N = 50$ professional evaluators across three departments to assess the system (Table 1).

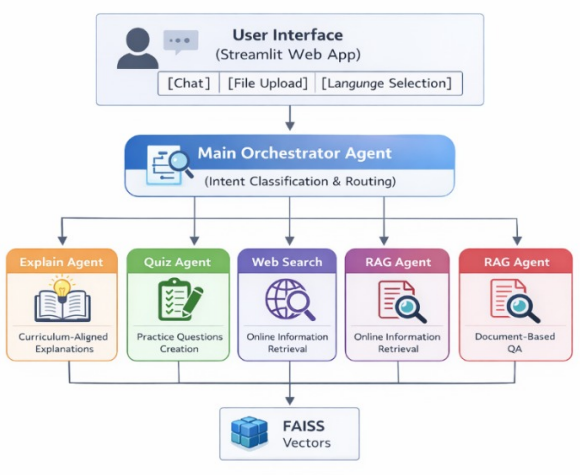

Figure 1: EduNaija Multi-Agent Architecture routing intent to specialized tools.

Department	Count	Key Subjects Evaluated
Science	20	Mathematics, Physics, Chemistry, Biology
Commercial	15	Economics, Accounting, Commerce
Art	15	Lit-in-English, Government, Christian Religious Studies
Total	**50**	

Table 1: Demographics of the 50 evaluators across major academic departments.

4.2 Multilingual Performance

Table 2 summarizes the aggregate scores based on language accuracy and syllabus alignment.

Criteria	Yoruba	Igbo	Hausa
Language Accuracy	8.0	7.0	7.0
Edu. Info Accuracy	8.0	6.0	8.0
Doc. Handling	7.0	6.0	8.0
Output Structure	8.0	6.0	9.0
Normalized (%)	**77.5%**	**62.5%**	**80.0%**

Table 2: Expert evaluation summary showing performance across languages.

5 Conclusion

EduNaija demonstrates that Multi-Agent RAG systems can effectively bridge the educational gap in Nigeria. Future work will focus on fine-tuning open-source models on native African educational corpora to reduce dependency on translation.

Limitations

A primary limitation is the reliance on translation. Deep nuances in Yoruba or Igbo may be lost during the translation to English for reasoning.

Ethical Considerations

There is a risk that students may rely solely on the AI. We explicitly label the tool as a supplement, not a replacement for schooling.

References

David Ifeoluwa Adelani, Graham Neubig, Sebastian Ruder, Shruti Rijhwani, Michael Beukman, Chester Palen-Michel, Constantine Lignos, Jesujoba Alabi, Shamsuddeen Hassan Muhammad, Peter Nabende, and Cheikh M. B. Dione. 2022. MasakhaNER 2.0: Africa-centric transfer learning for named entity recognition. In *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP)*, pages 4488–4508.

Joint Admissions and Matriculation Board. 2023. Annual registration statistics and examination report. Technical report, JAMB, Abuja, Nigeria.

Khan Academy. 2023. Khanmigo: AI-powered teaching assistant and tutor. Online resource.

Patrick Lewis, Ethan Perez, Aleksandra Piktus, Fabio Petroni, Vladimir Karpukhin, Naman Goyal, Heinrich Küttler, Mike Lewis, Wen-tau Yih, Tim Rocktäschel, Sebastian Riedel, and Douwe Kiela. 2020. Retrieval-augmented generation for knowledge-intensive NLP tasks. In *Advances in Neural Information Processing Systems (NeurIPS)*, volume 33, pages 9459–9474.

S. Liu and 1 others. 2025. Improving large language model applications in biomedicine with retrieval-augmented generation: A systematic review, meta-analysis, and clinical development guidelines. *Journal of the American Medical Informatics Association (JAMIA)*.

UNESCO. 2023. Global education monitoring report: Technology in education. Technical report, UNESCO, Paris, France.

West African Examinations Council. 2022. Waec syllabus and regulations for west african senior school certificate examination. Technical report, WAEC, Lagos, Nigeria.

Beverly Park Woolf. 2010. *Building Intelligent Interactive Tutors*. Morgan Kaufmann.

World Bank. 2022. Nigeria poverty assessment 2022: A better future for all nigerians. Technical report, The World Bank Group.

A System Interface

The EduNaija interface is designed for accessibility across various devices. As shown in Figure 2, students can interact via a chat-based interface that supports document uploads and language selection.

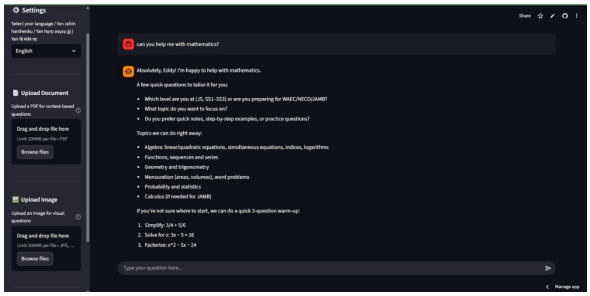

Figure 2: Main chat interface showing language selection and document upload panel.

B Reproducibility

To facilitate future research, we have made our work open-source. The complete source code and implementation notebooks are available at: https://github.com/Eddy-Emmanuel/EduNaija-LLM.