

Project Celine Generative AI serving a pedagogical revolution in Africa

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Abstract—The rise of generative Artificial Intelligence (AI) has transformed access to knowledge. However, current solutions remain largely general-purpose, limiting their effectiveness in education where needs are specific. This paper analyzes PROJECT CELINE, a specialized learning assistant. Although tested as a prototype, the ambition is to develop it into a fully autonomous AI assistant. A study conducted with 36 learners reveals widespread adoption, with a satisfaction score of 81.7%. This article demonstrates how PROJECT CELINE bridges the gap between technology and real educational needs to transform school and academic performance across the African continent.

Keywords—Generative AI; AI in Education; Intelligent Tutoring Systems; Educational Technology; African Education; Digital Learning.

I. BACKGROUND TO THE STUDY

Education in Africa faces persistent challenges including overcrowded classrooms and a lack of individualized support. While the rise of generative artificial intelligence offers opportunities, its generalist nature limits its real educational impact.

This study presents PROJECT CELINE. This solution is not defined as a simple chatbot, but as a specialized Artificial Intelligence (AI) assistant. Although its current version is a prototype, our vision is to develop it into a comprehensive educational assistant that supports students, learners, and even professionals throughout their training. Our ambition is to expand this project across Africa to revolutionize the education sector and offer investors a unique opportunity to transform the continent's future.

II. LITERATURE REVIEW

A. Introduction

This literature review is structured around four fundamental pillars to situate Project Celine within the current technological and educational landscape. We first explore the historical evolution of AI to understand its current maturity, before analyzing its role in transforming decision-making processes. Finally, we address the ethical imperatives essential for its adoption, as well as the structural challenges specific to the African context that justify the need for a specialized solution.

B. Evolution and nature of Artificial Intelligence

Artificial intelligence is not a recent phenomenon; its foundations were laid in 1956 by John McCarthy and Marvin Minsky, who defined it as a system capable of learning and reasoning by mimicking human decision-making [1], [2]. After several phases of stagnation, AI has experienced a renaissance through Deep Learning and generative models, becoming a pivotal technology in diverse sectors such as healthcare and finance [1], [2]. It should no longer be viewed as a mere technical tool, but as a new modality for interacting with our environment

and managing affairs [1]. It is within this context that Project Celine is positioned not as a basic chatbot, but as the culmination of this evolution toward specialized AI. Where general models mimic human conversation, this project leverages Deep Learning to structure a strictly pedagogical interaction aligned with the needs of the modern African learner.

C. AI as a Lever for Decisional Transformation

A central argument in current research is that AI acts as a transformative technology capable of revolutionizing decision-making within organizations [3], [4]. In education, this capability translates into improved precision and efficiency. AI allows for the analysis of massive volumes of data to identify patterns that humans alone could not perceive, thereby optimizing performance monitoring [3], [4]. Project Celine enables this by going beyond simply answering questions; it processes interactions to identify recurring bottlenecks for the learner. By transforming each study session into various analyzable data points, the project moves from passive education to precise learning management, offering educators unprecedented visibility into students' actual progress [10].

D. Ethical Imperatives and Reliability

The integration of AI into society raises major challenges regarding trust. For these systems to be accepted, they must imperatively be safe, reliable, and secure [7], [8]. Scientific literature insists on the necessity of guaranteeing the absence of bias, data traceability, and privacy protection particularly for personal data, which must remain inaccessible to unauthorized third parties [7], [8].

E. Conclusion

In summary, the examination of scientific literature highlights a major transition: artificial intelligence is no longer a mere technological curiosity, but a driver of structural transformation. While its historical evolution (B) and its capacity to optimize decision-making (C) are proven, its successful integration relies on a fragile balance between innovation and ethics (D).

However, research analysis highlights a paradox: while educational needs in Africa are dire—marked by overcrowded

classrooms and a shortage of contextualized resources— current AI tools remain too general to respond effectively.

This literature review therefore demonstrates a real gap: there is an urgent need for a tool that is not just another technology, but a solution that finally adapts to the specificities of the African field. In other words, there is an urgent need for a tool that is:

- Technically robust (based on Deep Learning);
- Pedagogically specialized (reduce the lack of individualized support);
- Ethically sovereign (guaranty the data security of African learners).

It is precisely at the intersection of these imperatives that Project Celine is positioned. It is not just about answering questions, but about translating the theoretical promises of AI into a pragmatic solution capable of revolutionizing the educational journey on the continent.

III. METHODOLOGY

The study is based on an empirical quantitative approach. The research relies on a sample of 36 respondents identified as “Early Adopters.” According to Rogers' Diffusion of Innovations theory (2003), these early users play a pivotal role in testing new technologies by providing critical feedback during the launch phase [9]. This focused sample size is justified by the experimental nature of the Project Celine prototype and the study's time constraints. Out of these 36 participants, 55.5% are secondary school pupils (20) and 44.5% are university students (16).

Data collection was conducted via a Google Forms survey, consisting of 15 closed-ended questions and one open-ended question. All variables including Mobile Phone Usage Frequency for Learning (MLF), Ease of Use (EU), Perceived Usefulness (PU), Pedagogical Impact (PI), Future Usage Intention, and Challenges encountered were analyzed to ensure the model's consistency.

For the purpose of descriptive statistical analysis, ordinal responses were converted into numerical values using a four-point scale. For mobile learning frequency, the categories “Rarely,” “Sometimes,” “Often,” and “Very Often” were coded from 1 to 4. Similarly, perceived usefulness, ease of use, and pedagogical impact responses were coded from the least positive to the most positive category. Descriptive statistics including frequencies, percentages, mean scores, and standard deviations were computed to provide additional insight into participant perceptions and experiences with Project Celine.

IV. RESULTS

A. Introduction

This section presents the analysis of the data collected from the 36 “Early Adopters.” It explores the integration of the tool into learners' digital habits, perceived usefulness, ease of use, and the project's actual pedagogical impact. These results validate the relevance of Project Celine as a lever for educational transformation.

The overall descriptive statistics for the principal evaluation dimensions are presented in Table I.

TABLE I. DESCRIPTIVE STATISTICS OF KEY EVALUATION DIMENSIONS

Variable	Mean Score (4-point Scale)	Standard Deviation
MLF	3.25	0.77
PU	3.28	0.57
EU	3.19	0.63
PI	3.69	0.68

The mean scores indicate a consistently positive perception of Project Celine across all evaluated dimensions. The relatively low standard deviations suggest a high level of agreement among respondents regarding the usefulness, accessibility, and educational value of the platform.

B. Adoption and Digital Habits

The results show that the majority of respondents regularly use their phones for learning, with a strong concentration of responses indicating they “often” and “very often.” Indeed, 42% of respondents chose “very often,” 44% “often,” 11% “sometimes,” and 3% “rarely.” This demonstrates that mobile environment (e.g. phone, tablet) is a relevant strategic channel for the solution deployment.

The frequency with which respondents use mobile devices for learning is presented in Fig. 1.

Using a four-point frequency scale, the average mobile learning frequency score was 3.25 (SD = 0.77). This result indicates that respondents generally use mobile devices frequently for educational purposes, confirming the suitability of mobile-based educational solutions.

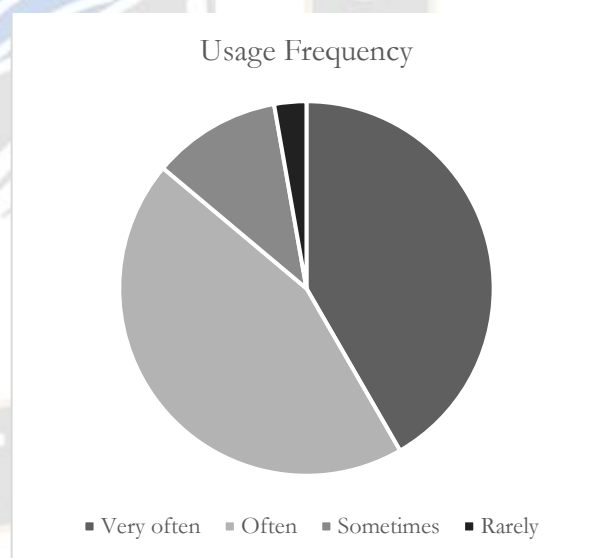


Figure 1. Usage frequency

C. Perceived Usefulness

Analysis of the ratings given to CELINE reveals the following: 12 respondents (33%) found Project Celine very useful, 22 respondents (61%) found it useful, and 2 respondents (6%) found it somewhat useful. These results indicate that the

overall perception of the chatbot is positive to very positive and that the majority of users consider the tool useful for their studies.

The perceived usefulness ratings assigned by respondents are summarized in Fig. 2.

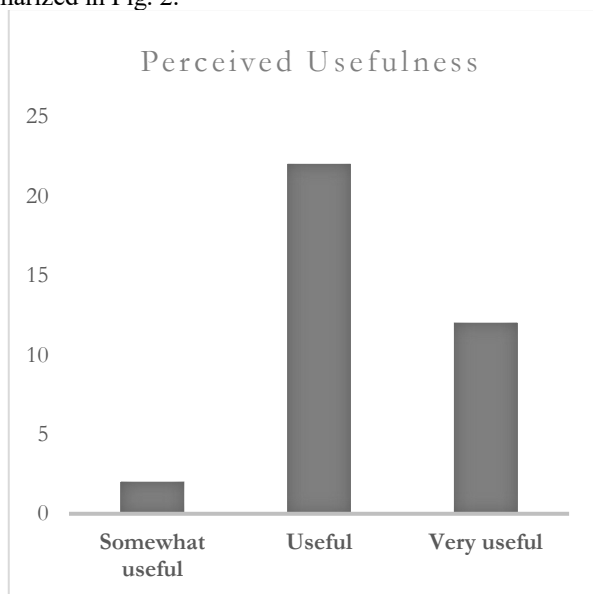


Figure 2. Perceived Usefulness

The perceived usefulness dimension achieved a mean score of 3.28 out of 4 (SD = 0.57), indicating a strong positive evaluation of the platform's ability to support learning activities.

However, two respondents found the application not useful due to minor technical issues they encountered while testing the Project Celine prototype. These imperfections will be quickly resolved as soon as the necessary resources become available.

D. Ease of Use

Accessibility is one of the project's primary strengths. 95% of participants find the interface intuitive. Participants were also asked to evaluate the ease of use of Project Celine. The results are presented in Fig. 3.

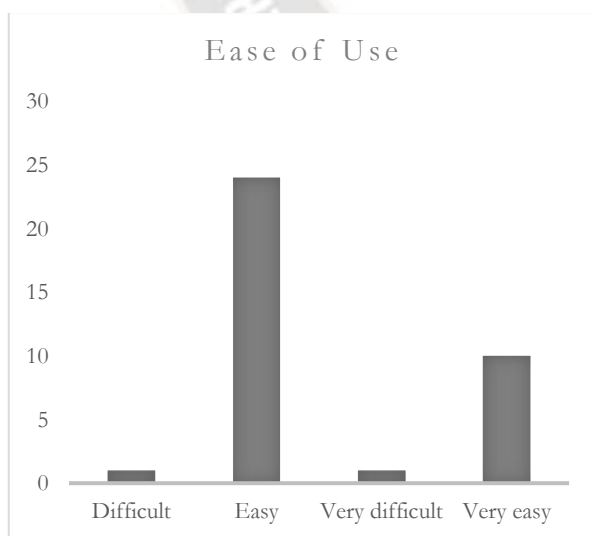


Figure 3. Ease of Use

10 users (28%) found Project Celine very easy to use, 24 users (67%) found it easy to use, 1 user (3%) found it difficult to use and another (3%) found it very difficult to use.

The ease-of-use assessment produced a mean score of 3.19 out of 4 (SD = 0.63). The relatively high mean and moderate dispersion suggest that respondents shared a broadly positive perception of the platform's usability.

The high usability scores suggest strong potential for broader adoption. The transition from the current prototype to a more advanced version available in the whole continent, will be seamless, as the User Experience (UX) is already validated. The provision of sufficient resources will allow us to accelerate this process.

E. Pedagogical Impact

The analysis of Project Celine's pedagogical impact reveals the following:

- Major assistance (Helped a lot) => 80.5% of respondents (29);
- Moderate assistance (Helped moderately) => 11.1% of respondents (4);
- Minor assistance (Helped a little) => 5.6% of respondents (2);
- No impact => 2.8% of respondents (1).

The pedagogical impact dimension recorded the highest average score among all evaluated variables, with a mean of 3.69 out of 4 (SD = 0.68). This finding indicates that respondents perceived Project Celine as having a substantial positive influence on their learning experience.

The reported impact of Project Celine on learning and course comprehension is illustrated in Fig. 4.

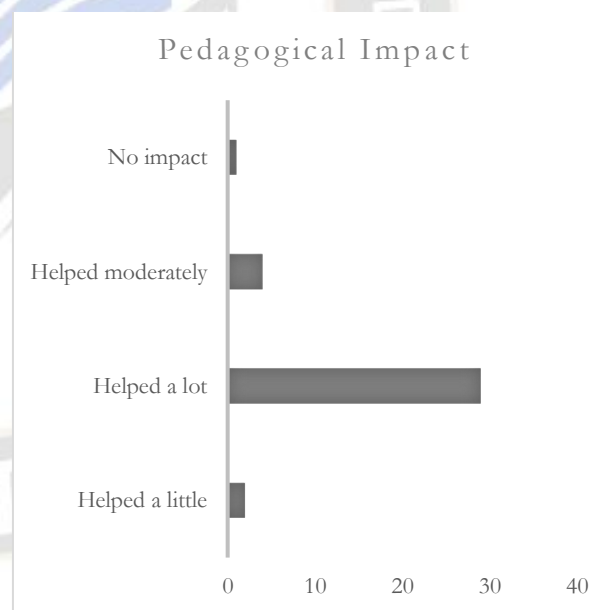


Figure 4. Pedagogical Impact

This figure proves that beyond simple assistance, participants reported that Project Celine positively supported learning by facilitating the assimilation of complex concepts.

F. Most used features

The most appreciated features are:

- Answering questions: 58% (21 respondents);
- Lesson explanations: 47% (17 respondents);
- Educational exercises: 33% (12 respondents);
- Level assessment: 17% (6 respondents).

This confirms that the primary value of the product lies in direct pedagogical interaction.

G. Project Celine’s Innovation

The major innovation of Project Celine lies in its specialization.

While most current generative AI solutions remain too general to meet specific educational needs, this project offers a technological and methodological breakthrough [10], [11], [12].

a. Comprehensive Support

Unlike standard AI tools, CELINE’s innovation lies in its transition from a simple conversational tool to a true “AI tutor” capable of providing structured support throughout the learner’s journey [5], [6], [10]. Project Celine adapts to user profiles based on their academic level and specific learning objectives (such as exam preparation or remedial learning). CELINE serves as a genuine tutor, available 24/7 for learners.

b. African contextualization

The project bridges the gap between global AI capabilities and local pedagogical realities in Africa [10], [11]. It offers a scalable alternative to overcrowded classrooms and the widespread lack of individualized tutoring.

c. Validation through usage

With a satisfaction score of 81.7%, CELINE’s innovative value is proven by its ability to translate technological interest into concrete academic performance and student success.

H. Challenges encountered

Despite the positive results, several limitations were identified such as system latency and hallucinations (4 respondents: 11%) and technical bugs (3 respondents: 8%).

The identified challenges are mainly technical: latency, early-stage bugs, or occasional comprehension errors. These limitations, inherent to the initial deployment, are purely technical and will be resolved by strengthening the server infrastructure and optimizing algorithms—hence the need for significant financial support.

I. Usage Intention and Recommendation

To facilitate comparison across the main evaluation dimensions, Fig. 5 presents the mean scores obtained for each variable.

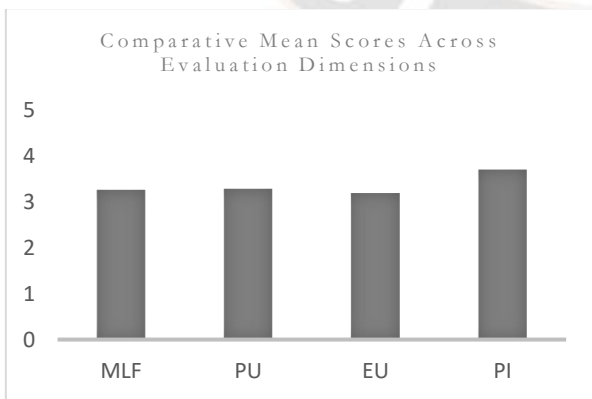


Figure 5. Comparative Mean Scores Across Evaluation Dimensions

The comparative analysis shows that pedagogical impact achieved the highest mean score, followed by perceived

usefulness, mobile learning frequency, and ease of use. This pattern suggests that participants perceived the greatest value of Project Celine in its contribution to learning support and comprehension.

92% of users wish to continue using CELINE (33 respondents) and the same percentage of users would recommend it to others. This reflects overall satisfaction and a strong potential for organic growth (word-of-mouth).

Furthermore, the analysis of the metrics shows an enthusiastic reception:

- Overall satisfaction received a score of 81.7%;
- In terms of performance, 77.7% of users stated that the tool made it easier for them to understand lessons;
- Finally, 91.6% of respondents found the interface easy to use, demonstrating a high level of accessibility.

Note: The reported instances of dissatisfaction (8.4%) primarily concern response times. We are taking this into account and plan a significant improvement to the infrastructure as soon as the necessary funding is available.

V. ECONOMIC POTENTIAL

A. B2C Model: Individual Subscription

This model directly targets learners and their families. Our market study reveals a strong willingness to pay, with an accepted price point between \$5 and \$10 per month.

The projected financial indicators for the B2C model are presented in Table I.

TABLE II. B2C MODEL

Metric	Value
Target Objective	10,000 Active Paying Users
Average Revenue Per User (ARPU)	\$7 / month
Projected Monthly Revenue	\$70,000
Annual Recurring Revenue (ARR)	\$840,000

This model allows for rapid growth driven by word-of-mouth and the urgent need for academic support.

B. Funding requirements and leverage

Project Celine is positioned within a rapidly expanding market: the African EdTech sector. Our monetization strategy relies on a hybrid approach (B2C + B2B) designed to maximize market penetration and ensure rapid profitability.

To initiate this momentum, we are seeking an initial investment of \$50,000. While this amount does not cover the full continental rollout, it represents the indispensable boost needed to reach the next stage.

This investment will be strategically allocated to:

1. Technological Infrastructure for deploying high-performance servers to guarantee minimal latency (addressing the 8.4% dissatisfaction rate identified).
2. Optimization of AI algorithm to reduce hallucinations and refining pedagogical content.
3. Customer Acquisition, specifically, targeted marketing campaigns to reach the first 10,000 users.

C. B2B Model: Institutional Partnership

This second lever targets schools and academic institutions (private schools, universities, training centers) wishing to integrate AI as an official support tool for their students.

The projected revenue structure for institutional partnerships is summarized in Table II.

TABLE III. B2B MODEL

Metric	Value
Target Objective	50 Partner Institutions
Average Students per Institution	500 Students
Group Pricing (B2B Rate)	\$3 / month / student
Revenue per Institution	\$1,500 / month
Projected Annual B2B Revenue	\$900,000

By combining these two models, the project aims for an annual global turnover exceeding \$1.7 million, demonstrating a powerful leverage effect.

VI. DISCUSSION

The findings of this study demonstrate a strong level of acceptance and perceived usefulness of Project Celine among the surveyed learners. The results indicate that learners are already accustomed to using mobile devices for educational purposes, with the majority reporting frequent use of smartphones and tablets for learning activities. This finding supports the feasibility of deploying AI-based educational assistants through mobile platforms and aligns with previous studies highlighting the growing role of digital technologies in modern education [10].

The high usability scores obtained during the evaluation suggest that Project Celine successfully addresses one of the major barriers to technology adoption: ease of use. More than ninety percent of respondents considered the platform easy or very easy to use. According to Diffusion of Innovations theory, ease of use plays a key role in the adoption of new technologies, particularly during the early stages of deployment [9]. The positive reception observed among the early adopters therefore provides encouraging evidence regarding the project's scalability and future adoption potential.

The perceived usefulness of Project Celine also emerged as a significant finding. A large majority of participants reported that the platform was useful or very useful for their studies. This observation is consistent with previous research demonstrating that AI-powered educational systems can enhance learner engagement and provide personalized academic support [5], [6], [11]. The ability of Project Celine to answer questions, explain lessons, and generate educational exercises appears to correspond directly to the needs expressed by learners, reinforcing its practical relevance within educational environments.

The pedagogical impact results further support the potential contribution of specialized AI assistants to learning outcomes. More than four-fifths of respondents reported that Project Celine significantly helped them understand educational content. This finding is consistent with the literature on intelligent tutoring systems, which emphasizes the effectiveness of personalized guidance and immediate feedback in improving learner performance [6]. While the present study did not directly measure academic achievement through examinations or standardized assessments, the positive perceptions reported by participants suggest that the platform contributes to improved comprehension and learning support.

The findings also highlight the importance of contextualization within educational technology. Unlike general-purpose generative AI systems, Project Celine was designed specifically to address educational needs. This specialized orientation reflects recommendations found in recent studies advocating for domain-specific AI systems capable of delivering more accurate and pedagogically relevant responses [10], [12]. The emphasis on African educational realities further strengthens the project's relevance in contexts where access to individualized tutoring remains limited.

Despite these encouraging outcomes, several challenges were identified. Respondents reported issues related to latency, occasional hallucinations, and technical bugs. These limitations are commonly reported in studies involving generative AI systems and large language models [12]. Their presence does not invalidate the usefulness of the platform but highlights areas requiring technical improvement. Addressing these limitations will be essential to increase reliability, user trust, and long-term adoption.

This study also presents certain limitations that should be acknowledged. First, the sample consisted of only thirty-six respondents, limiting the generalizability of the findings. Second, the participants were selected from a population of early adopters who may be more receptive to technological innovations than the general student population. Third, the evaluation relied primarily on self-reported perceptions rather than objective measurements of academic performance. Future research should therefore involve larger and more diverse populations, longitudinal evaluations, and controlled studies measuring actual learning outcomes.

Overall, the findings suggest that Project Celine possesses significant potential as a specialized AI-powered educational assistant. The combination of high usability, positive learner perceptions, and strong reported pedagogical impact provides preliminary evidence supporting its relevance within the African educational landscape. While further development and validation remain necessary, the results indicate that specialized generative AI systems may contribute meaningfully to addressing educational challenges related to accessibility, personalization, and learner support.

VII. CONCLUSION

Project Celine is not just a digital tool; it is a revolution in pedagogical support in Africa. Our vision is to break down social barriers by offering every learner, regardless of their background, access to an intelligent personal tutor available 24/7.

In Africa, private tutoring remains an expensive luxury, often reserved for the elite. This reality leaves the vast majority of students struggling alone in overcrowded classrooms, facing significant difficulties in mastering core subjects. Project Celine bridges this gap: it offers a high-quality support solution at an affordable cost, ensuring that financial means are no longer a barrier to academic success.

By evolving into a comprehensive AI Assistant, we are creating an indispensable learning companion for the continent's future. For investors, supporting Project Celine means participating in building the EdTech of tomorrow: a technology that does not just inform, but empowers every African student to succeed and transform their destiny.

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