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Navigating the Landscape of Prompt Engineering in GenAI: Insights from the outside

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Abstract

Given the pervasive influence of generative artificial intelligence (GenAI) platforms, educators are increasingly confronted with novel challenges, particularly in the context of Globally Networked Learning (GNL) and navigating its concomitant cultural perspectives. Consequently, a salient question confronting international higher education is how to optimally support students and scholars in this rapidly evolving and frequently unpredictable landscape. In the context of global networks, learning entails a comprehensive consideration of the diverse participants' cultural, social, historical, and material dimensions. Concurrently, students and educators from diverse global locations are engaged in collaborative learning and knowledge creation for sustainability. A research initiative has been established to explore the connections between local and global entities, collaboration, creation, and the critical examination of novel domains of understanding. This project aimed to cultivate GenAI-driven environments for teaching, training, and assessing teacher candidates across multiple countries. In pursuit of this objective, a large language model (LLM) bot was utilized to interact with students alongside various other methodologies proposed within the framework of this project. This paper offers hermeneutical acquired insights into creating effective educational prompts, emphasizing critical milestones for establishing and maintaining the theoretical framework, enhancing usability, and promoting creativity and critical thinking. Based on this research, a model for the process of prompt engineering has been developed. It indicates that conceptualizing prompt engineering is not solely as a technical challenge, but rather an educational process that fosters intersubjective understanding within the learning group. The results present new opportunities for collaboration and learning from outside their institution into the formerly familiar learning environment of students and scholars.

Keywords: generative artificial intelligence (GenAI); globally networked learning (GNL); large language model (LLM); prompt engineering

With the widespread use of GenAI platforms like ChatGPT, educators encounter new, culturally specific challenges in Globally Networked Learning (GNL). These issues are deeply rooted in social contexts and linked to the environments in which students live. Regarding GenAI, on the one hand, GNL-related educational processes are varied and become more complex when GenAI is introduced. On the other hand, GenAI bots can create a learning environment that trains students in globally relevant competencies within a space that may seem safer than those where students from different national or cultural contexts interact

directly. Insofar as GenAI-driven learning environments play a crucial role in learning globally relevant competencies, the behavior of the GenAI bot also needs deep consideration. As the bot is driven by the prompting before, prompt engineering needs special consideration in GNL environments.

Consequently, a salient question confronting international higher education and its practical applications is: How can we optimally support students and scholars in this rapidly evolving and frequently unpredictable landscape of GenAI? In the context of global networks, learning involves a comprehensive consideration of the cultural, social, historical, and material dimensions of diverse participants. Simultaneously, students and educators from various global regions engage in collaborative learning and knowledge creation aimed at sustainability, which conceptualizes and utilizes GenAI in potentially diverse forms. In this regard, GenAI within GNL warrants a deeper examination, with the prompting process serving as the foundation for the development of various learning methodologies. Prompting can be comprehended in terms of interpersonal interactions in a general context. As will be demonstrated subsequently concerning GenAI, prompting within this paper is regarded as a broader, language-based interaction with an AI bot, which involves tailoring a Generative AI bot to achieve specific objectives within a complex domain, supported by specialized professional knowledge, and understood both as a technical and educational practice.

While the pervasive influence of GenAI (Böhmer et al., 2024; Bozkurt et al., 2024) is evident, culturally influenced issues in GNL (Böhmer et al., 2023; Byker et al., 2022) also require crucial consideration. Culture is not a matter of fact, but a social product both when people adhere to their customs as well as when others consider individuals or groups as different (regarding culturalized "othering," cf. Hall, 1996, 1997). If GNL employs GenAI and, in doing so, the biases associated with this LLM (see below for further discussion), it is also necessary to consider cultural inheritances. This consideration becomes even more critical during the prompting process, as the potential biases of prompt engineers must also be considered. For example, cultural bias may appear in prompt wording or in the bot's generated responses. Regarding these cultural heritages and biases, the prompt engineers conduct their interactions accordingly, both generally and with the bot. Consequently, the process of prompt engineering transcends purely technical considerations and constitutes a profoundly complex theoretical, cultural, and practical undertaking.

A research initiative entitled iBot (i.e., "The Bot & I") has been instituted at our university to explore the connections between local and global entities, collaboration, creation, and critical exploration of novel domains of understanding.[1] This project aims to cultivate GenAI-driven environments for teaching, training, and assessing teacher candidates across multiple countries. In pursuit of this objective, an LLM bot is utilized to interact with students alongside various other methodologies proposed within the framework of this project. The challenge of generating appropriate and relevant feedback from the bot regarding scientific accuracy and ethical responsibility remains. However, the prompting process has been identified as a fundamental aspect of developing this educational environment.

The primary objective of the iBot project is to bridge the diverse learning environments in which pre-service teachers engage, such as universities, school internships, and roles as learning assistants within educational companies, among others. All of these learning environments vary significantly in GNL projects due to differences in national,

cultural, and administrative factors. These differences influence both the learning approaches and the processes, and therefore, must be taken into account. Consequently, the project must generate knowledge and products that foster an environment both challenging and conducive to learning across various educational cultures. In this context, students from diverse educational backgrounds begin with varying starting points and are likely to possess distinct learning requirements.

In this context, Vygotsky's (1978) concept of the "zone of proximal development" becomes pertinent (Kozulin, 2004; McLeod, 2022), as it shapes efforts to simulate one learning environment (the university) with another (the school). As previously discussed, this necessitates the creation of a tailored and individualized learning experience, which is to be developed through the deployment of a GenAI bot as a social actor within the school setting. This bot is designed to present specific challenges and engage in targeted interactions with individual students, such as when parents complain about a classroom situation or when a student bullies their fellow students. The configuration of prompts for this bot constitutes the core of the project outlined in this article. Moreover, prompt engineering emerges as a fundamental task alongside traditional pedagogical activities such as instruction and student assessment.

The purpose of this paper is to reflect on those complexities, consider educational and social research, and suggest a concept of field-tested prompt engineering that makes critical usage of GenAI bots in learning environments of GNL, presents approaches that are based on practical evidence, and, in this, supports the critical usage and reflection of GenAI in GNL. This poses two key challenges: one relates to the GNL concept with its culturally diverse interactions between learners. The second challenge pertains to the equally distinctive interaction with the bot, which produces linguistically structured output through a different mechanism, relying on disparate logical processes from the individuals involved, specifically those based on pure statistical probability. To capture these complexities, we not only rely on our "insiders' knowledge" but also employ our scientific approach of distancing to obtain a broader perspective. Therefore, our objective is to present valuable and robust knowledge on prompt engineering from a dedicated standpoint in educational science.

This procedure aims to demonstrate that learning encompasses cultural, social, historical, and material dimensions, all of which must be considered when establishing an effective learning environment for GNL courses. Furthermore, exploring connections between local and global entities, fostering collaboration, and engaging in critical inquiry to deepen understanding are essential in an increasingly interconnected world, especially with the incorporation of GenAI into learning environments.

Literature Review

Before referencing our project-based insights, we intend to consider existing research on GenAI within educational settings. To this end, our primary focus is on GenAI and the associated research findings. Our observations are based on the processes implemented in the iBot project.

GenAI

Artificial Intelligence is a broad field of machine learning that is believed to have originated with McCarthy's (1955) proposal for a research project. In this paper, we focus in more depth on recent developments within this sector, specifically the deployment of GenAI, which commenced in 2022. At this time, OpenAI unveiled version 3.5 of ChatGPT, a rapidly expanding artificial intelligence model.

However, the development of interactions with AI bots has been observed for a considerably longer period. In 1966, Joseph Weizenbaum observed what he termed the ELIZA effect (Berry, 2023; Weizenbaum, 1966). In this instance, he detailed his encounters with the interaction of users and an AI chatbot developed by Weizenbaum, referred to as "ELIZA." This bot seemed to simulate the experience of having thoughts and emotions (Glover, 2023). Users tended to treat the machine as a peer interlocutor, as though it were an additional human dialogue partner. This might occur through explicit social-emotional approaches that are attributed to being an empathetic interactor (Rubin et al., 2025). The early Weizenbaum saw this observation as an example that users do not significantly distinguish between a human and a bot when it comes to dialogue and relationship, particularly when exploring a common inquiry.

This is an early but not singular example illustrating the necessity of competencies for appropriate interaction with an AI bot. Researchers emphasize the importance of "AI literacy," highlighting that knowledge, understanding, usage, evaluation, and ethical competencies are essential (Ng et al., 2021). Furthermore, these researchers observe that learners navigate multiple levels of Bloom's taxonomy of learning (Bloom et al., 1956) in their engagement with AI; they not only acquire knowledge but also create novel content within an AI environment. Accordingly, learners should be informed about the opportunities and risks associated with GenAI within their learning trajectories. However, recent research shows that it is possible (but not self-fulfilling) that GenAI and critical thinking can be combined when adding elements such as melioration, ethical reasoning, and iterative learning (Gonsalves, 2024).

A more basic critique marks: "As GenAI continues to evolve, we face critical challenges in maintaining human oversight, safeguarding equity, and facilitating meaningful, authentic learning experiences" (Bozkurt et al., 2024). Furthermore, research has indicated that LLMs exhibit suboptimal performance in emotional tasks (Kocoń et al., 2023). LLMs are capable of emulating human cognition and decision-making processes (Tlili et al., 2023). Rubin et al. (2025) have demonstrated that interactions attributed to humans are perceived as more empathetic and supportive, eliciting more positive and fewer negative emotions, compared to those believed to originate from GenAI. Additionally, many individuals have expressed that AI-assisted responses, which are attributed to humans, seem to exhibit reduced levels of empathy and support.

Prompt Engineering

Prompt engineering techniques are already well-known and widely systematized (Schulhoff et al., 2024). A prompt ensures the development of verbal instructions for a GenAI bot regarding its execution and the production of outcomes. Hence, prompt engineering can be understood as "the iterative process of developing a prompt by modifying or changing the prompting technique that you are using" (Schulhoff et al., 2024, p. 7). Prompt engineering

represents a highly sound and applied method of engaging with an LLM. Additionally, given the aforementioned increasing complexity of GenAI as it adapts to various educational fields, it is concurrently emerging as a fundamental competence for educators operating within GenAI-based learning environments.

Various forms of prompting and the methodologies for engineering them have already been delineated, including references to their potential and limitations (e.g., for Chain of Thought prompting, see Meincke et al., 2025b; for the scaffolding technique of meta-prompting, see Suzgun & Kalai, 2024). This illustrates that the various outcomes of prompting remain inherently unpredictable (Meincke et al., 2025a; Wang et al., 2024), indicating that prompting frequently requires iterative refinement and adjustments to achieve the desired objective. This is why prompt engineering, in a broadly applicable sense, signifies that prompting inherently undergoes transformation. Engineering a prompt involves intentionally and progressively enhancing and adapting it. Consequently, prompt engineering may be characterized as a technical process aimed at guiding a GenAI platform within a complex environment. Therefore, prompt engineering can be regarded as a "wicked task," relating to the "wicked problems" (Rittel & Webber, 1973).

In summary, we understand prompt engineering as the language-based tailoring of a GenAI bot for specific purposes in a complex field of application, conducted based on a professional understanding of the domain.

Educational Prompting

As already shown, prompting is embedded in its field of practice. Therefore, prompting for educational purposes presents a specific challenge, requiring tailored inputs (prompts) and receiving field-related outcomes. Insofar as prompting is a very complex and intense task. As an educational practice (not only a technical one), it needs to create skills, competencies, and literacy in many domains alongside the learners. Educational prompt engineering now can be seen as a practice of "designing, crafting, and refining contextually appropriate inputs or questions" (Bozkurt & Sharma, 2023, p. ii). In more detail, educational concepts, teaching strategies, pedagogical methods, and virtual facilities need deeper consideration (Dillig et al., 2024).

So, prompt engineering requires consideration of both the conceptual framework and the resulting practical execution (ibid.). Furthermore, utilizing GenAI for educational purposes necessitates proficiency in AI literacy, prompt engineering, and enhanced critical thinking skills (Walter, 2024). When considering these requirements together, prompt engineering in the field of education is a task that involves both practical prompting and critical thinking about content, concepts, strategies, and facilities, applying critical thinking and deconstructing the supposed certainties of the GenAI machine.

Theoretical Framework

Taking into account the transition from searching to dialogue within the learning process (Dillig et al., 2024), this methodology adopts a dialogical approach to better comprehend the development of prompts concerning LLMs. In this context, the dialogue in the learning process occurs not only between humans in the roles of instructor and learner, but also in multiple ways that refer to the different roles played by humans and the GenAI bot simultaneously. Consequently, the roles associated with these various participants in the

learning environment are not exclusively human; instead, they are based on an underlying conceptualization akin to a human-like entity, which we refer to as “android” (Böhmer et al., 2024).

While these various acting positions primarily pertain to human learners, it is necessary to consider that the ways of presenting, responding, and creating can also be embodied by “android actors,” i.e., bots as well. Their expressions might appear human-like, but do not necessarily originate from a human actor.

However, the responses, positions, and roles termed ‘android’ require further scrutiny. While GenAI is lauded for its potential to customize educational experiences, improve efficiency, and spread access to education, it is not a neutral instrument (Bozkurt et al., 2024). Instead, algorithms profoundly influence human interaction, communication, and the resulting outputs, thereby raising crucial questions concerning human independence in thought and agency, as well as biases linked to the values embedded within GenAI frameworks and their foundational designs. In this context, critical thinking regarding the use and analysis of GenAI bots necessitates that both the prompting process and its outcomes be critically evaluated in terms of the underlying theoretical and normative foundations.

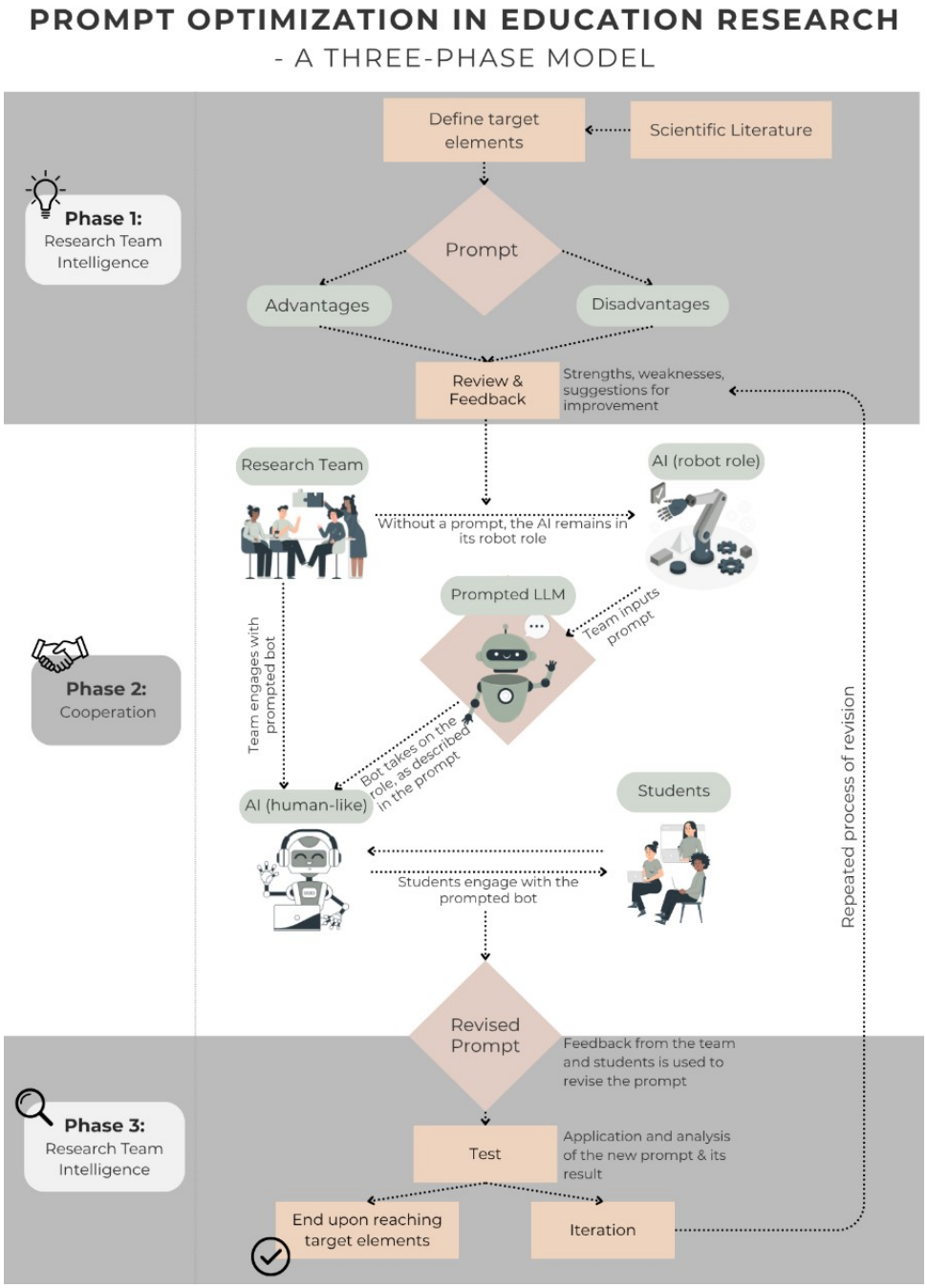
Methods

This paper presents an analysis of a project focused on developing tailored GenAI bots for pre-service teacher education. In reference to Vespone’s (2023) methodology, which integrates, among other components, meaning-making and relational learning, our approach seeks to identify the co-construction process involved in the development of meaning and pursuing the shared purpose of using GenAI, rooted in the practical experience of the involved researchers over the recent years. We offer hermeneutical acquired insights into creating effective prompts, emphasizing critical milestones for establishing and maintaining the theoretical framework, enhancing usability, and promoting creativity and critical thinking.

To this end, we employ Clandinin’s (2023) approach of hermeneutic inquiry for meaning in narratives and experiential knowledge, grounded in Dewey’s (1998) transactional theory of experience and Gadamer’s (2003) philosophy of understanding. In more detail, we collected the researchers’ experiences from former prompt engineering projects, gathering them in their narratives about the research project. Subsequently, the results of this collection were systematically organized into a framework that considers the relevance and appropriateness of the objectives related to general learning processes and individual educational expectations. These findings served as key reference points for educational research and practice. Ultimately, this process led to the iterative development of a flowchart for prompt engineering (Figure 1).

Figure 1

The many actors and levels of Prompt Optimization



Although the model presented here can currently be regarded as substantially optimized, it is not yet fully ideal. Certain limitations remain, which may be further addressed and refined depending on the specific task and objective, and consolidated through ongoing research. However, it has guided our prompting procedures, directed our modifications, and continues to be utilized in research and education. Naturally, the emerging demands for prompting, along with evolving learning environments and educational methodologies, will require continuous further development of the concept.

The project in question is devoted to redefining the understanding of learning outcomes within an environment based on GenAI. To enhance comprehension of the outputs

generated by the bot, the above-mentioned hermeneutical process was initiated to acquire insights into the formulation of effective prompts. To attain this understanding, establishing intersubjectivity is essential in the process of prompt reconstruction (Habermas, 1984).

This means that the practical execution of the prompting in our project is a process involving multiple actors in particular roles, which shall be described as follows: two members of the research team develop the prompts, two other team members use them in teaching in Higher Education, and provide feedback to the prompt engineers. In this way, at least four different members of the scientific team create, develop, apply, analyze, and improve the prompts. These findings are then verbally validated with the students and reflected upon with the prompted bots to further develop their functionality and content appropriateness in the production of the outcome with the students (for more details, see the discussion section: Prompt Optimization). This process ensures that different expertise and insights are combined and utilized to develop prompts that fit the diverse learning environments and tasks within.

Findings

Based on the team's extensive and sustained experience in prompt engineering, spanning from one to five years within digital or GenAI-based learning environments, several key milestones for preserving the theoretical framework in prompt engineering were identified.

(1) The initial insight is that human agency and that of the bot frequently "overlap" in numerous instances (Böhmer et al., 2024). This implies that the activities of the human learner and the bot are not distinctly separable. Both entities contribute impulses towards describing a situation, responding to the conversational context, or proposing solutions to the issue at hand within the chat. Insofar as both parts are active in responding to the issue described in the prompt, it is the reciprocity of the chat that leads to a final result.

(2) It is also evident that the responsibility for the bot's output during the conversation is still uncertain, including the questions of who is accountable and to what extent. That means not only can it not be precisely identified which of the actors has which role, but also it cannot be clarified which role played what part in developing the chat's result. Consequently, the segment of the conversation or the resolution cannot be exclusively attributed to one participant; rather, it is the interaction between the two, student and bot, while these two remain somewhat independent of each other.

(3) As outlined, the positions, contributions, and shares of the chat results cannot be attributed solely to one party. Consequently, questions concerning ethical considerations, responsibilities for outcomes, and their repercussions remain unresolved, similar to challenges related to authorship of a product or ownership of the process and its results. Hence, many of these issues remain largely unresolved.

(4) A particular challenge arises, for example, when operating within an intercultural setting such as GNL. In such environments, it is more likely for the bot to generate responses that may be unfamiliar to some of the students, potentially causing irritation, frustration, or even offense. Variations in sensitivity, habits, and prior knowledge are significant among both learners and teachers, which can lead to unforeseen disruptions or serious offenses. These situations necessitate prudent and swift intervention by the teachers involved. Consequently,

close and continuous monitoring of the bot's outputs is essential. Additionally, the prompts must be crafted with particular care and cultural sensitivity to ensure appropriateness within the GNL context.

(5) The primary scientific inquiry pertains to the reflexivity of prompt engineers. As previously illustrated, they hold a pivotal role in the foundational aspects of the chatbot, as well as in the processes initiated and developed by it in collaboration with various learners. It has been demonstrated that learners and bots cannot be absolutely distinguished from each other. With the intervention of prompt engineers within this dynamic tension, the question of agency – specifically, who creates what, how, and under what specific responsibilities – becomes increasingly pertinent. Empirical experiences indicate that the team assumes a crucial role in discussing, providing feedback, and collaboratively developing suitable prompts, as well as re-adjusting those that may have posed issues in the initial iteration.

(6) We also observed the modification of human self-reflexivity that occurs when employing the LLM, and individual learners receive feedback from the bot that is unfamiliar to them. In doing so, we have found that educational topics in particular require a very specific approach, as they must be explicitly tailored to the learners and, in line with the didactic approach, developed together with them. These special challenges also require distinct process structures, which we now intend to present using our hermeneutic methodology.

Discussion

These findings offer insight into prompt engineering, particularly for GNL courses, in two key domains: the levels of prompt optimization and the steps involved in the prompt engineering process.

Prompt Optimization

As demonstrated above, numerous levels of agency, responsibility, and feedback mechanisms are incorporated within prompt engineering, in many cases "overlapping" with each other, and by this causing high complexity. Consequently, prompt engineering is neither a linear process nor a straightforward feedback procedure (see Figure 1 above). This highly complex procedure, which we have developed over recent years, is called prompt optimization and is described as follows.

Phase 1 begins with the delineation of target elements, derived from findings in the scientific literature. Diverging from this multifaceted baseline results in an initial prompt, which, in our project, is frequently formulated within the RISEN framework.[2]

Following this, the team proceeds to *Phase 2*, which involves a repetitive process of revision that engages not only researchers but also students and various types of bots. The inclusion of *students* is based on the understanding that they act as essential partners in educational processes, requiring appropriate assistance and capable of articulating their needs and identifying gaps. Consequently, students are considered highly significant collaborators. Prior to the students' involvement, two forms of automated agents are introduced: the GenAI actor in its *robot role*, characterized by a straightforward, machine-like behavior.

The initial interaction with GenAI yields a prompted LLM that is already more aligned with the objectives established in Phase 1. After some duration of interaction with the bot, the team provides the prompted bot as a dialogue partner, now assuming its more *human-like role*. This human-likeness is designed to create a learning environment that encourages

interaction with “android” interactors, facilitates training for professional challenges, and promotes learning through these interactions in a controlled setting and, in this, safe(er) space of learning. Additionally, these outcomes are utilized for the further optimization of the bot.

This multilevel and iterative engineering process ultimately culminates in *Phase 3*. At this stage, comprehensive feedback is incorporated, and the prompt undergoes a final evaluation. If the results of this evaluation are satisfactory, the prompt is established as final. Many of these final prompts have been developed for various subjects and levels of difficulty. Should the prompt still or again prove to be inadequate, it is returned to the initial stage of Phase 2 for further development.

The Competencies for Prompt Engineering

Following these descriptions of engineering the prompt through numerous iterations, on various levels, in different educational cultures, and involving many actors, it is evident that prompt engineering necessitates a series of distinct steps. This consideration is of particular importance for GNL projects, as it is precisely within this context that the various technical, social, and cultural challenges associated with the education systems and cultures of the participating nations become evident. Consequently, projects that intend to utilize GenAI specifically for GNL should anticipate an intensification in learning difficulties and increased complexity. In addition to the technical challenges inherent in GenAI learning environments, it is essential to address the global differences that arise. This requires not only the general expertise in prompt engineering outlined herein but also the ability to navigate these differences with sensitivity within globally networked learning environments and processes.

These single steps do not need to be described again here, as they are already visible above. Nevertheless, their structural aspects are of significantly greater interest in this GNL context, as they delineate the competencies required by prompt engineers, which we observe in the literature cited above as well as in our project:

- *scientific competence* to identify, comprehend, and include the current research into the prompt regarding AI literacy (Ng et al., 2021),
- *technical competence* is essential for designing a robot and an android bot that maximizes the efficiency of the LLM, as well as takes into account the different technical frameworks of the learners participating in the GNL project (Dillig et al., 2024; Böhmer et al., 2023),
- *social competence* involves functioning effectively as a team player within a scientific team while simultaneously serving as a valued educator who interacts consistently, responsibly, and actively with students (Bozkurt et al., 2024; Bozkurt & Sharma, 2023) from different countries, being part of the GNL project (Byker et al., 2022),
- *emotional competence* (Rubin et al., 2025), which enables individuals to endure and repeat optimization cycles multiple times, allowing them to be error-prone, which can often occur during technical or GNL-induced situations,
- *cultural competence* opens the horizons (Gadamer, 2003) in GNL settings to foster cultural responsiveness (AITSL, 2022) in international collaboration.

These competencies, among others, demonstrate the significance of what we explored for the role of a prompt engineer, as well as its inherent complexity, demanding nature, and challenges. An important aspect can also be observed in this approach to prompt optimization:

it fundamentally relies on a dedicated team that supports and empowers the engineers in their responsibilities.

Conclusion

Our findings have led us to initial approaches that conceptualize prompt engineering not solely as a technical challenge, but rather as an educational process that fosters intersubjective understanding within the GNL learning group. Hence, our paper outlines some steps, challenges, and educational outcomes that have emerged from the global collaboration in applying GenAI to GNL at the participating universities. This collaboration has brought new opportunities for collaboration and learning from outside their institution into the formerly familiar learning environment of students and scholars.

As observed in various aspects of the iBot project, prompt engineering is not merely a technical challenge but rather an educational process that promotes intersubjective understanding. Prompt engineering requires numerous competencies, particularly when related to GNL. This implies that the social, cultural, and material disparities among learners need to be considered. Although the learners collaborate on identical tasks within the GNL project, they do so with diverse educational backgrounds, technical capabilities and equipment, and didactic cultures. Consequently, prompting needs to specifically address this heterogeneity, remain cognizant of it throughout the collaboration process, and promptly incorporate new insights from the learners into revised prompts. In this respect, and when addressing challenges related to cultural responsiveness, it is essential that not only the engineers but also their entire team are aware of the many differences that some participating learners might encounter. This shows that prompt engineering is not merely technical but indispensable for GNL. To work productively and respond flexibly in the heterogeneous settings described, we suggest that prompt engineers and teachers should collaborate directly in GNL projects; ideally, they should be integrated as a single role.

Additionally, prompt engineering within the field of education has been identified as highly specialized, necessitating not only the creation of a functional platform but also a deeper understanding and consideration of the different “zones of proximal development” of many individuals and their specific needs for tailored learning environments.

Ultimately, this paper made evident that global learning is both *promoted* and *challenged* by the influence of GenAI bots. Prompt engineering provides numerous solutions, broadens learning opportunities, and is equally innovative and essential for education in these evolving learning environments.

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2 RISEN is the abbreviation of Role-Input-Steps-Expectation-Narrowing; for more information see https://juuzt.ai/knowledge-base/prompt-frameworks/the-risen-framework/.

Fostering Global Awareness through University, School, and Community Partnerships

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Abstract

With globalization as a focal point in the United States and encouraged in our educational system, the significance of intercultural competence has been amplified. To advance this concept among middle school students, international university students, and the local community, a partnership was formed to offer an international awareness program accompanied by a multicultural curriculum. This notion was developed into a study with the intent of promoting intercultural competence among middle school students by establishing relationships with international university students. In a survey, middle school students were assessed at the end of the project to determine how well they felt supported engaging in different activities and how comfortable they were networking with international students. Interviews with international students and observation notes recorded by program coordinators reported various benefits of fostering recognition and respect between different cultures. A significant research finding confirms the potential for strengthening of intercultural competence skills of middle school students through engagement with international university students. An implication of the study is that not only middle school students but also students at all grade levels should respect, recognize, and acknowledge the value of international global relationships.

Keywords: global awareness, intercultural competence, global learning, university, school, and community collaboration

In a rapidly changing society, there is an urgent need for universities, schools, and communities to address global awareness in the curriculum. Global awareness in the classroom and university involves teaching students about different cultures, attitudes, customs, and the importance of respecting diversity in an interconnected world (Reimers, 2017; Smith, 2021). For educators, it presents an opportunity to expose students to the broader implications of their everyday decisions, which can impact the lives of people not only in their immediate surroundings but across the globe (Banks, 2015; Reimers, 2020; Townsend, 2011). With advancements in technology, including the internet and global communication networks, it has become imperative for students to develop a nuanced understanding of individuals from diverse backgrounds (Zhao, 2010).

Building a global educational connection requires working with and actively engaging people from a wide range of customs, races, cultures, and religions. The increasing diversity in student populations in K-12 school settings underscores the importance of fostering global communication and awareness to prepare students for the challenges of a globalized world (Suárez-Orozco & Sattin-Bajaj, 2010). Understanding, respecting, and collaborating effectively

with individuals from diverse cultural contexts is crucial for social and academic success in today's interconnected society (Eden, Chosom, & Adeniyi, 2024; UNESCO, 2015).

Purpose of the Study

The purpose of this study was to examine and explore the influence of a global awareness program in Southeast Texas. The globalization of the world economy and the rapid evolution of global internet and data security have led to an increased call in education for students to develop their intercultural awareness and intercultural collaboration capabilities (Mansilla & Jackson, 2011; Salih & Omar, 2021). Global projects have become increasingly prevalent due to the diverse range of tools for communication and internet access (Oliver, Cook, & Wiseman, 2019).

In today's rapidly evolving world, students are entering a landscape vastly different from that of previous generations. According to Kirkwood (2001), "students will face a new world order, thereby creating a need to acquire a global education. Their daily contacts will include individuals from diverse ethnic, gender, linguistic, racial, and socioeconomic backgrounds. They will experience some of history's most serious health problems, inequities among less-developed and more-developed nations, [and] environmental deterioration" (p. 2). To thrive in this new world order, it is essential for students to develop critical thinking skills to navigate global issues. Adaptability will be key, as they must adjust to an ever-changing world. Being equipped with these skills and knowledge, students will be better prepared to face the challenges and opportunities of the future.

Global awareness in the schools is critical for 21st-century learners. Students today will need to be prepared for work with international peers and address society's most demanding challenges on a global scale. One strategy for concurrently introducing students to diverse cultural viewpoints is to have students from different countries work together on a joint activity. Global projects have been shown to enhance intercultural skills and broaden perspectives through collaborative communication (Oliver et al., 2019). As such, Southeast Texas is populated with people from various countries.

In this rich cultural environment, there are different cultures from all over the world. Exposure to diversity in middle schools may inform students, help them vary their perceptions of different people, and increase their appreciation of commonalities among individuals from other nationalities. A way to do this is through intercultural competence, which is the ability to develop targeted knowledge, skills, and attitudes that lead to visible behaviors and communication that are both effective and appropriate in intercultural interactions (McKinnon, Hammon, & Foster, 2017). Understanding the similarities and differences between cultures is an essential 21st-century skill for students and school practitioners to respond positively in a multicultural, pluralistic society (Banks & Banks, 2010; Sprott & Msengi, 2020).

Multicultural Education

Multicultural Education is a system of education designed to bridge the gap between different cultures and races within the school system, as well as to foster inclusivity for minority groups. An urgent need existed in the 1960s as teachers struggled to cope with the changing

demographics they faced in their classrooms (Bank & Banks, 2010). Multicultural education offers a comprehensive understanding of diverse cultures and their histories. It fosters recognition and respect between different racial societies (Gay, 2018; Wilson, 1995; Naz, L. et.al, 2023).

In 2020, at the onset of the COVID-19 pandemic, history revealed more limited intercultural and multicultural interactions due to the executive mandate to "shelter in place." Subsequently, online programs were established to maintain cultural inclusiveness by creating global collaborative communities and learning experiences (Liu & Shirley, 2021). Liu and Shirley redesigned the traditional study abroad into a fully online study course. The online cultural exchange limited the full immersion experience and intercultural online collaboration. However, this online format offered valuable opportunities for cultural exchange and collaboration.

Education programs throughout the United States and internationally delivered uniquely redesigned instructional environments with digital tools to enhance student learning experiences.

Raising awareness of cultural differences is critical for functioning effectively in a global environment. Intercultural competence has been shown to improve student skills and expand ideas through collaboration and communication when global projects are facilitated (Oliver et al., 2019). Cecil (2017) confirmed that intercultural competence can help students demystify the stereotypes and biases of other cultures while acquiring the skills to function effectively in a diverse world.

Theoretical Framework

This study used the Intercultural Competence Model (Deardorff, 2009) as a theoretical framework. The ICM consists of several key elements for developing global awareness:

1. **Attitudes**: This attribute is based on respect, openness, curiosity, and discovery. Openness and curiosity imply a willingness to take risks and move beyond one's comfort zone. Communicating respect to others is essential, as it demonstrates that others are valued. These attitudes form the foundation for developing the knowledge and skills needed for intercultural competence.
2. **Knowledge**: Cultural self-awareness, which involves understanding how one's culture is influenced by individuality and diversity, and cross-cultural knowledge, which includes the ability to accept the world from others' viewpoints.
3. **Skills**: The skills identified in this model involve acquiring and processing knowledge, including observation, listening, evaluating, analyzing, interpreting, and relating.
4. **Internal Outcomes**: Individuals develop the ability to see from others' perspectives and respond to them in ways that align with how the other person desires to be treated. Success in achieving this outcome may vary among individuals.
5. **External Outcomes**: Through behavior and communication, the visible outcomes of intercultural competence are experienced by others. While individuals determine their effectiveness, appropriateness is assessed by others and depends on cultural sensitivity and adherence to the other person's cultural norms.

Program Purpose

The Lamar University Multicultural Awareness Program (LUMAP) was designed to: (a) promote cultural and global awareness among middle school and university students, (b) teach students to show respect for other cultures, (c)enrich students' learning experiences by preparing them for the multicultural world experience, and (d) showcasing the rich cultural diversity that exists in the community. "Lamar University is a comprehensive public institution educating a diverse student body, preparing students for leadership and lifelong learning in a multicultural world, enhancing the future of Southeast Texas, the state, the nation, and the world through teaching, research, creative activity, and service" (Lamar University, n.d.).

The Lamar University Multicultural Awareness Program (LUMAP) at Lamar University offered numerous benefits through its unique approach. During its pilot phase, a diverse group of college students from various ethnic backgrounds was tasked with introducing their cultures to middle school students. Participants included individuals from countries such as India, Bangladesh, and Nigeria who had lived in their home countries for a significant period and had spent at least one year in the United States. Their firsthand experiences with cultural differences and encounters with stereotypes positioned them well to share their insights and personal stories with American middle school students.

Through LUMAP, these cultural ambassadors engaged students in a hands-on, interactive learning experience. The program provided a supportive and enjoyable environment where participants could explore and express their cultural identities without fear of racial tension. This initiative fostered mutual understanding and respect, promoting a greater appreciation for diversity among middle school students.

Methodology

This study examined the activities of the Lamar University Multicultural Awareness Program (LUMAP) and evaluated the outcomes achieved by participants through their involvement. Quantitative data were analyzed using descriptive statistics in SPSS software to assess program outcomes**.** A total of 151 middle school students from four schools in a large urban district in Southeast Texas participated in the program. These students, enrolled in sixth-, seventh-, and 8th-grade Social Studies classes**,** engaged in interactive cultural sessions led by ten university student volunteers selected through Lamar University's International Office**.**

Before delivering their sessions, university volunteers attended a faculty-led training session that covered expectations for working in schools, effective communication, culturally appropriate responses, behavior management strategies, and classroom engagement techniques**.** The grant funding for this program also provided cultural artifacts**,** enabling university presenters to incorporate authentic materials into their sessions, fostering a more inclusive and globally aware classroom environment. The following research questions guided the study:

Research Question 1. What were the activities of this Multicultural Awareness Program?

Research Question 2: What themes arose from the participants' recorded experiences in the LUMAP?

Research Question 3: What were the participants' recommendations to others regarding the program?\

Research Design

The qualitative case study design with a mixed method approach was chosen because it allows for an in-depth exploration of a specific, bounded system—international students participating in the program—within its real-life context. This approach was well-suited for capturing the complexities of participants' experiences through multiple data sources, including observations, interviews, and documents, as described by Creswell (2013).

Other qualitative methods, such as ethnography or grounded theory, were considered but ultimately rejected. Ethnography was not selected because the study did not require prolonged immersion in the participants' cultural setting. Grounded theory, which focuses on developing a theory based on emergent data, was also inappropriate since the study aimed to explore and describe participants' experiences rather than generate a new theoretical framework.

The choice of the case study method was also influenced by the study's context and research goals. Given the focus on a specific program and a defined group of international students, a case study enabled a detailed examination of the phenomenon within its specific context. Additionally, using convenient and purposeful sampling was practical for accessing relevant participants while ensuring rich and meaningful data collection.

The Intercultural Competence Model (ICM) (Deardorff, 2009) provided the framework for designing and implementing the multicultural awareness program. The ICM framework emphasizes the development of intercultural competence through attitudes (openness, curiosity, and respect), knowledge and comprehension (cultural self-awareness, deep cultural knowledge, and sociolinguistic awareness), and skills (listening, observing, evaluating, analyzing, and interpreting). This process ultimately leads to internal and external outcomes, such as adaptability, flexibility, empathy, and effective communication in intercultural settings.

Using the ICM framework, a multicultural awareness program was introduced in collaboration with four middle schools, Lamar University's International Student Program, the university library, and a local school district**.** The program aimed to foster intercultural understanding among middle school students by connecting them with international students, encouraging meaningful interactions between the two groups.

Data Collection and Analysis

Data collection involved interviews with international students to gain insight into their perspectives, while program coordinators conducted observations to assess engagement and interactions. Additionally, surveys were distributed to middle school students to evaluate their perceptions and learning outcomes from the program.

Three primary methods were used for data collection: focus group discussions, evaluation forms, and direct observations (Creswell, 2007; Yin, 2017). Institutional Review Board (IRB) approval was obtained, ensuring parental consent and district authorization. Schools were selected based on convenience, considering their proximity and the coordinators' pre-established connections. Both Lamar University international students and middle school students completed surveys to assess their experience in the program.

Focus group interviews with international students provided more profound insights into their individual and collective experiences. As Creswell (2007) suggested, focus groups are instrumental when a researcher believes that a group setting will yield richer data than individual interviews.

Observations were conducted by researchers and middle school teachers who facilitated and implemented the program. To analyze the data, notes from focus group discussions and observations were summarized, organized, and grouped into recurring themes, which helped develop a deeper understanding of the research questions. Evaluation forms provided additional feedback, reinforcing their emerging themes (Creswell, 2007; Tomaszewski, Zarestky, & Gonzalez, 2020).

Program Implementation

Each of the four targeted schools received two visits per semester, engaging sixth-, seventh-, and 8th-grade Social Studies classes in interactive cultural activities. The school district library coordinated the program, facilitating collaboration among middle schools, the community, and the university.

The Lamar University Multicultural Awareness Program (LUMAP) team consisted of ten international students who agreed to the school visits. Twelve Lamar University students from India, Bangladesh, Nepal, Nigeria, and the U.S. (with experience abroad) were initially considered for selection. However, only ten students were ultimately chosen to participate. The selected students came from Asia, Africa, South America, and the United States. They were all well-positioned to discuss cultural differences based on their firsthand experiences growing up in their home countries.

Selection Criteria for University Participants

To participate in the program, university students had to meet the following criteria:

- Be an international student or a U.S. student who had lived abroad for at least one year.
- Be available to develop and deliver a 45-minute presentation for one or two class periods.
- Ensure their presentation covered culture, history, geography, language, and other relevant aspects in an age-appropriate, engaging, and interactive manner.
- Complete training on U.S. school culture, led by an expert in education.

Presentation Structure

The curriculum was delivered in person, with each presenter given approximately 45 minutes to showcase their respective culture. Presentations included:

- National symbols, flags, geographical location, national religion, art, tourism, food, and dance styles.
- Digital videos highlighting cultural uniqueness or short dance demonstrations to enhance engagement.
- Opportunities for middle school students to ask questions and actively participate in discussions.

- At the end of each session, all participants completed a survey to assess their overall experience and learning outcomes.

Findings

Surveys from the LUMAP middle school participants showed that the majority of the students benefited from the program. Students were asked if they liked the program; 143 (94.7%) answered yes, 1 (0.7%) said no, and 7 (4.3%) answered they were not sure. Students who answered that they liked the program were asked, “Why did they like the program?” 58 (36.4%) answered that they learned something new, 32 (21.2%) said it was interesting, 19 (12.6%) answered that it was fun, and 31 (20.5%) answered that they learned about other cultures. Additionally, 2 (1.3%) respondents stated that they did not know why they liked the program.

The survey questions asked what their favorite thing about the event was; 72 (47.7%) of the middle school students answered they learned about new cultures, 22 (14.6%) answered they enjoyed dancing to the music from the different countries, 16 (10.6%) answered they enjoyed the videos showing different parts of the countries and 10 (6.6%) answered they enjoyed every part of the program. Students were asked if they learned anything new about other cultures and countries; 138 (91.4%) answered yes, 2 (1.3%) answered no, and 8 (5.3%) answered they were not sure. They were also asked if they would recommend this program to others; 125 (82.8%) students answered yes, 3 (2%) students answered no, and 16 (10.6%) students answered that they were unsure.

The findings indicated that participants gained significant outcomes from the program. Both students and teachers showed enthusiasm for the concepts introduced through interactions with authentic artifacts and cultures shared by international university students. Teachers were equally engaged with the material as the students. The data indicated that this initiative contributed to middle school students' enhanced understanding and acceptance of individuals from diverse cultures and ethnic backgrounds. The following list outlines some outcomes of the program:

- Provided study of culture, geography, and language from authentic sources.
- Promoted cultural and global sensitivity to help combat stereotypes.
- Encouraged students to show respect and appreciation for other cultures.
- Offered opportunities for students to celebrate diverse cultures with peers from different backgrounds.
- Stimulated further discussions about other cultures among students and teachers.
- Exposed to new perspectives, facilitators, and students from Lamar University benefited by sharing their cultural stories, providing factual insights, and offering a window into life beyond the United States.

Discussion and Conclusions

The program contributed to the growth in cultural awareness of both middle school and university students. Program competencies included (1) increasing cultural awareness among middle school and university students. (2) Middle school students practiced listening and observational skills, and awareness of language differences and various family-rearing

experiences added to their cultural knowledge base. (3) By the end of this program, participants stated they felt positive and were willing to embrace diversity. (4) The initiative garnered community interest and was covered by local television, newspapers, and university news outlets. (5) Furthermore, this research highlighted that community engagement can lead to more effective, sustainable, and locally appropriate programs, fostering positive relationships and trust within the community. This outcome is exemplified by the Entergy Charitable Foundation's funding of this program. Our study findings concluded that implementing or continuing such a global awareness program can cultivate shifts in perspectives, behaviors, skills, and practices, thereby promoting deeper intercultural competence, which aligns with Deardorff's (2009) model. The studies of Eden, Chosom, and Adeniyi (2024) and Reimers (2020) also support this conclusion. Moreover, as Walters and Nwagwu (2020) suggested, these outcomes strengthen community engagement, reinforcing the importance of community-centered approaches in global education.

Scholarly Significance and Implications for Practice

1. **Schools:** This study has practical applications for schools aiming to develop intercultural education for students. It can serve as a model for collaboration with local universities and the community to enhance intercultural competence among students.
2. **Teachers:** Educators can utilize existing community resources (e.g., universities, businesses, organizations) to participate in professional development training on intercultural competence, thereby supporting the school and community on issues related to cross-cultural competence. Accessing expertise within the community and university setting enhances the educational environment. It is essential for educators to consider student identity and backgrounds, fostering self-awareness of the multicultural community in which they reside.
3. **Universities:** Higher education institutions can create avenues for collaboration with K-12 schools, generating positive relationships with school districts. Developing online courses can reflect activities designed to build intercultural competence.
4. **Community Service Learning:** This program provides an opportunity for international students to understand U.S. culture and work in K-12 educational settings.
5. **Educational Leaders:** Educational leaders can offer professional development on understanding intercultural competence through training, workshops, and invited guest speakers. It is recommended that this program be expanded to include more nationalities, creating avenues to help children better understand the world outside the United States.

In our interconnected world, it is essential to collaborate and model global awareness for our students, fostering long-term growth. Developing a global mindset and skill set is an ongoing process (Deardorff, 2006) that can be employed face-to-face or online to promote cross-cultural learning (Dautbasic & Saracevic, 2020; Liu & Shirley, 2021).

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Self-Authorship and Resilience among African International Graduate Students in the United States

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Abstract

While graduate studies in the United States can open valuable doors for African international students, these opportunities are often accompanied by complex challenges that quietly shape their academic journeys. This study explores how African international graduate students (AIGSs) navigate cultural, academic, and social transitions in U.S. higher education. Using Baxter Magolda's self-authorship theory highlights their adaptive resilience, identity negotiation, and support networks. Findings reveal complex strategies that foster both persistence and transformation through institutional engagement and community-based support systems.

Keywords: African student; international students; graduate students; resilience; self-authorship.

African international graduate students (AIGSs) represent a steadily growing demographic in U.S. higher education, bringing with them rich academic potential and unique cultural perspectives. Typically aged between 24 and 39, these students pursue advanced degrees across various disciplines, with most obtaining financial support through institutional scholarships and graduate assistantships (Mwangi & Changamire, 2018; Institute of International Education, 2024). Despite their strong academic backgrounds, many AIGSs face significant transitional challenges that affect their performance and well-being. These include differences in pedagogical styles, language proficiency issues, cultural dissonance, and social isolation (Boafo-Arthur, 2014; Kuo, 2011; Lee & Castiello-Gutiérrez, 2020).

In the 2023/2024 academic year, more than 1.1 million international students enrolled in U.S. institutions, over 500,000 of whom were graduate students (Institute of International Education, 2024). Although disaggregated data specific to AIGSs remain limited, enrollment trends from sub-Saharan Africa, particularly from countries such as Nigeria and Ghana, demonstrate a clear upward trajectory, with a combined 29,423 students from these two nations reported in 2024 alone (Ekanem, 2024). For many African students, transitioning into the U.S. educational system requires a deep adjustment—not just academically, but also socially and psychologically. These moments of tension and adaptation often serve as pivotal developmental

junctures that shape their academic identity and personal growth (Baxter Magolda & King, 2004; Boafo-Arthur, 2014).

Although much of the current literature on international students focuses on surface-level adjustment and retention, there is a lack of in-depth examination of how African graduate students make meaning of their experiences and build internal capacity for navigating adversity. Moreover, theoretical frameworks such as Baxter Magolda's (2009) theory of self-authorship and the Learning Partnership Model (LPM), which were originally developed in the context of U.S. undergraduate education, have not been sufficiently applied to the experiences of African graduate students (Baxter Magolda & King, 2004; Goodman et al, 2006; Yaro & Smith, 2024). This study addresses this critical gap by examining how AIGSs in the United States construct meaning, negotiate identity, and develop agency in the face of cultural and institutional challenges.

Guided by this objective, the study is anchored in two research questions:

1. In what ways do African international graduate students navigate the process of self-authorship as they pursue academic and social success in the United States?
2. What resilience strategies do these students adopt to overcome barriers encountered in their educational journey?

The findings from this inquiry seek to expand the current understanding of international student development by highlighting the adaptive strategies and self-authorship processes of African graduate students. In doing so, the study aims to inform the creation of more inclusive educational environments, targeted support services, and culturally responsive institutional practices.

Literature Review

African international graduate students (AIGSs) represent a growing but often overlooked demographic in U.S. higher education, whose experiences are shaped by unique cultural, linguistic, and academic transitions. Unlike broader international student populations, AIGSs face distinct challenges tied to their collectivist backgrounds, language nuances, and reliance on religious and ethnic networks for support. Although Western student development theories like Baxter Magolda's (2009) self-authorship and the Learning Partnership Model (LPM) offer useful lenses, their application to African students remains limited. This review synthesizes key themes in existing scholarship: cultural dissonance, academic pressures, community-based resilience, and identity formation to highlight how AIGSs construct meaning, navigate challenges, and develop agency within American graduate programs.

African international graduate students (AIGSs) in the United States occupy a distinct position in the broader discourse on international student experiences. While the U.S. is often praised for its diversity and educational opportunities (Mwangi & Changamire, 2018), AIGSs face multifaceted challenges that go beyond general international student concerns (Bimpong, 2023; Osikomaiya, 2014; Yaro & Smith, 2024). Cultural dissonance, academic pressure, and social isolation create a complex environment where students must continuously adapt and negotiate their identities.

The transition to the U.S. is often marked by culture shock, which significantly affects AIGSs' initial interactions within academic and social settings (Winkelman, 1994; Yaro & Smith, 2024). Osikomaiya (2014) argues that culture shock can trigger a form of personal revolution, propelling students into unfamiliar ideological and pedagogical territories. One major source of this disorientation is the disparity in educational systems. While African educational models often emphasize rote memorization and teacher authority, U.S. institutions value critical thinking, student agency, and academic writing skills with which many AIGSs initially struggle (Boafo-Arthur, 2014). In early academic settings, these students often experience difficulties with writing conventions and can inadvertently commit plagiarism due to limited preparation in citation practices (Martirosyan et al., 2019; Lee & Castiello-Gutiérrez, 2020).

Language proficiency further complicates these academic challenges. Though many AIGSs are among the top students in their home countries (Kuo, 2011), their struggles with written and spoken English often diminish their classroom participation and confidence (Patton et al., 2016). Social anxiety and emotional withdrawal are common outcomes, with some students appearing disengaged despite being physically present (Tawwab, 2021; Haile et al., 2017).

Despite these barriers, AIGSs often demonstrate remarkable resilience. Spirituality, community networks, and ethnic associations provide essential coping mechanisms (Collier & Blanchard, 2024). Religious faith, in particular, emerges as a central resource, with students relying on prayer, scripture, and church communities for emotional support (Lih et al., 2024). These social and spiritual networks play a vital role in maintaining well-being and academic persistence.

To better understand how AIGSs navigate these complex experiences, this study draws on Baxter Magolda's theory of self-authorship, which explores how individuals develop internal authority by integrating their beliefs, identity, and relationships (Baxter Magolda, 2009). The Learning Partnership Model (LPM) extends this framework by emphasizing supportive and challenging learning environments (Baxter Magolda & King, 2004; Goodman et al., 2006; Ryder & Downs, 2022). However, both frameworks were originally developed for and tested with American students, raising questions about their cultural applicability to African students in the U.S. context (Yaro & Smith, 2024). There is limited empirical evidence applying these theories to African international students, representing a critical gap this study seeks to address.

Cultural Dissonance and Identity Negotiation Among AIGSs

Scholarly literature has consistently highlighted the centrality of culture shock in the experiences of African international graduate students (AIGSs) in the United States (Winkelman, 1994; Yaro & Smith, 2024). Culture shock is not merely a phase of disorientation but a trigger for what Osikomaiya (2014) describes as a "revolution" in identity. These students often arrive with high expectations about their academic journey in the U.S., shaped by distinct cultural values and visions of the "ideal America" (Bimpong, 2023; Boafo-Arthur, 2014). Such expectations frequently clash with the realities of U.S. academic and social environments, creating what Baxter Magolda (2009) conceptualizes as a developmental crossroads that can initiate the process of self-authorship.

The literature identifies a profound cultural contrast between collectivist African values and the individualism that characterizes much of American society (Mwangi & Changamire, 2018; Osikomaiya, 2014). This dissonance forces students to renegotiate their sense of self and belonging. For instance, navigating boundaries and interpersonal interactions becomes a major challenge, especially for students unaccustomed to the emphasis on personal space prevalent in the U.S. (Tawwab, 2021; Cherry, 2024). AIGSs may enter social spaces with assumptions of universal positive regard, interpreting initial warmth or formality as friendship, only to face distancing behaviors that are culturally normative in the host country (Boafo-Arthur, 2014; Kolk, 2014).

First-time travelers, often find these dynamics more jarring than peers with prior exposure to Western societies (Bauer, 1973; Cherry, 2024). The literature suggests that many AIGSs experience emotional isolation due to this shift in social norms, compounded by a lack of awareness or identification of these experiences as culture shock (Lee & Castiello-Gutiérrez, 2020; Winkelman, 1994). As students attempt to reconcile these new cultural expectations, they engage in identity negotiation, a complex process affecting academic performance, relationships, and self-perception (King & Kitchener, 1994; Yaro & Smith, 2024).

Academic Expectations and Performance Pressures for AIGSs

Flowing directly from cultural dissonance is the need for academic adjustment, which poses its own set of difficulties for AIGSs. While higher education enrollment in the U.S. is declining overall (Blake, 2024), African countries continue to send increasing numbers of students. These students often carry significant academic ambitions and expectations of social mobility through U.S. education (Evans et al., 2010; Schlossberg, 1984). However, their encounters with pedagogical differences, including the shift from memorization-based learning to critical thinking and student-led discussions, can be disorienting (Boafo-Arthur, 2014; Lee & Castiello-Gutiérrez, 2020). These discrepancies lead to struggles with academic writing, citation practices, and occasionally unintentional plagiarism (Martirosyan et al., 2019).

Language proficiency remains a recurring barrier, even for students educated in English-speaking systems. Difficulties with American accents, idioms, and academic vocabulary hinder participation and undermine confidence (Kuo, 2011; Patton et al., 2016). AIGSs may experience symptoms such as anhedonia and social withdrawal, exacerbating their academic challenges (Tawwab, 2021; Haile et al., 2017). Additionally, cultural norms regarding deference to authority can conflict with expectations for classroom engagement in the U.S. context (Osikomaiya, 2014; Biaku, 2016).

The literature also documents the toll of these transitions on students' physical and emotional well-being. Students often sacrifice sleep, nutrition, and self-care in favor of academic productivity (Becker et al., 2018; Mwangi & Changamire, 2018). These behaviors have been linked to insomnia, migraines, and anxiety (Haile et al., 2017). Time zone differences also contribute to sleep deprivation as students maintain communication with families across continents (Boafo-Arthur, 2014). Moreover, underutilization of campus resources remains a concern due to a lack of awareness or cultural stigma (Kuo, 2011).

Resilience Through Community Support Among AIGSs

In response to these compounding academic and cultural pressures, AIGSs often turn to community-based support as a source of resilience. A growing body of literature emphasizes the significance of ethnic communities, religious institutions, and peer networks in facilitating students' adaptation to their new environment (Collier & Blanchard, 2024; Kearney & Hyle, 2003; Yaro & Smith, 2024). Religious practices such as prayer and communal worship serve as coping mechanisms that foster emotional well-being (Lih et al., 2024).

These communities create spaces for cultural continuity, storytelling, and mutual support. Peer relationships with fellow African students offer informal mentorship and foster mutual learning (Patton et al., 2016). In such settings, Baxter Magolda's (2009) idea of self-authorship becomes especially relevant. Through these relationships, students gradually reinterpret their values and identities, developing autonomy while remaining connected to their roots (Biaku, 2016; Yaro & Smith, 2024). The shared experiences within these communities provide validation and promote adaptive strategies (Goodman et al., 2006; Mwangi & Changamire, 2018; Ryder & Downs, 2022; Schlossberg, 1984).

Navigating Institutional Support Structures as AIGSs

While community-based support offers culturally intimate resources, institutional structures also play an essential role in facilitating students' adaptation (Lee & Castiello-Gutiérrez, 2020; Manning-Ouellette, 2024). University-sponsored organizations such as African student associations serve both cultural and practical purposes. They offer events like food festivals, pageants, and cultural showcases that validate cultural identity while fostering peer connection (Christians, 2024; Martirosyan et al., 2019).

Beyond cultural events, these organizations also act as information-sharing hubs, offering guidance on housing, healthcare, academic advising, and mental health services (Cherry, 2024; Kuo, 2011). Schlossberg's (1984) theory of transition underscores the importance of these practical supports in helping students regain agency over their academic and social lives. When institutions deliver culturally responsive and accessible support services, they empower AIGSs to thrive, reinforcing resilience and promoting self-authorship (Boafo-Arthur, 2014; Christians, 2024; Kuo, 2011; Martirosyan et al, 2019).

In conclusion, the literature reveals that while African international graduate students face multidimensional challenges, including cultural dissonance, academic pressures, and emotional strain, they also demonstrate remarkable resilience. This resilience is bolstered by both communal and institutional support systems that aid in their meaning-making and identity formation processes, ultimately fostering a successful academic experience in their host country.

Why Self-Authorship and Resilience are Quintessential for the AIGS?

African international graduate students (AIGSs) in the United States face significant challenges that may lead to failure to achieve academic goals if they are not properly supported to progress successfully through the transition. The issues of cultural dissonance, language barriers, academic pressures, high expectations, and emotional isolation often necessitate unique approaches to support the reevaluation of personal values and foster success (Baxter Magolda, 2009; Hyams-Ssekasi et al, 2014). The stark contrast in cultural environment has impacted how they make meaning of themselves and stay focused in the face of these difficulties (Boafo-

Arthur, 2014). While scholarship exists on their acculturation process and identity development, gaps remain in understanding how these students navigate the complex interplay between self-authorship and resilience during their transition process.

The process of adapting to U.S. higher education is often transformative for African international graduate students (Collier & Blanchard, 2024). With an average age of 38 years (Osikomaiya, 2014), AIGSs have significant responsibilities that characterize adulthood, hence the need for emotional intelligence, a sense of maturity, and commitment to personal and academic goals. (Baxter Magolda, 2009; Merriam et al, 2007; Ryder & Downs, 2022). Facing adversity enables personal growth, increases self-awareness, and enhances problem-solving skills (Baxter Magolda, 2009; King & Kitchener, 1994; Ryder & Downs, 2022). Literature underscores how students develop a stronger sense of agency, independence, and global citizenship, embodying the essence of self-authorship.

AIGSs, daily, are challenged to make decisions about preconceptions, following others, dependent on country culture, beliefs, values, and ways of knowing at the point Baxter Magolda (2009) described as a crossroads to begin the process of self-authorship. Osikomaiya (2014) asserts that by accepting the need to learn, they develop a positive attitude that impacts their overall performance.

In conclusion, arguably, the original research on the theoretical framework used was written particularly to support various American students already in the United States (Baxter Magolda, 2009; Goodman et al, 2006; Ryder & Downs, 2022), although by extension, they provide insight into how other groups of students may benefit. It appears that by applying the knowledge from the theory directly to the context of African international graduate students (AIGS), new knowledge may emerge to inform research and practice. The following section, however, will explore the experiences of some AIGSs and compare them with the literature to identify the similarities and differences. The purpose is to determine what is new, if any, and ultimately summarize how this project overall might benefit student affairs professionals working with this population of students.

Theoretical Framework

This study is grounded in Baxter Magolda's theory of self-authorship, which explains how individuals develop the capacity to define their beliefs, identities, and relationships independently of external expectations (Baxter Magolda, 2009; Kegan, 1982; Lee & Castiello-Gutiérrez, 2020). Central to the theory are three interrelated dimensions: epistemological (how individuals come to know), intrapersonal (how they understand themselves), and interpersonal (how they relate to others). Early developmental stages are marked by dependence on external authority, but as individuals confront conflicting perspectives and dissonance, they begin to question inherited beliefs. The transition, often triggered by dissatisfaction with externally prescribed paths, leads to what Baxter Magolda (2009) calls the *crossroads*, a turning point toward intentional self-definition.

Self-authorship unfolds non-linearly, shaped by challenges, reflection, and supportive environments (Baxter Magolda, 2009; Goodman et al., 2006; Ryder & Downs, 2022). These challenges are not setbacks but catalysts that foster internal meaning-making and deeper self-

awareness. Progress emerges from the negotiation between one's personal values and those of others, ultimately fostering mutual, respectful relationships that honor both autonomy and connection. To support this development, Baxter Magolda (2009) proposed the Learning Partnership Model (LPM), a framework for educators to foster self-authorship. LPM emphasizes three key practices: validating students as capable knowers, grounding learning in their lived experiences, and co-constructing meaning through dialogue. Educators act as partners rather than authorities, helping students reflect critically, recognize their voice, and build autonomy.

The model is especially effective in higher education settings where students are encouraged to take ownership of their learning and leadership paths (Baxter Magolda, 2009; King & Kitchener, 1994; Moore et al., 2022). It reinforces the importance of student agency and resilience, aligning with the broader goals of education to prepare learners for complex social and professional realities (Van der Lecq, 2016). Overall, the Self-authorship theory enables a deep understanding of how students redefine themselves intellectually, socially, and emotionally during their academic journey (Tracy, 2010). It offers a developmental perspective on identity formation, critical reflection, and agency (Lincoln & Guba, 1985; Lee & Castiello-Gutiérrez, 2020), making the framework suitable for exploring how African international graduate students persist, adapt, and thrive within new educational and cultural landscapes.

Methodology

The study is rooted in narrative inquiry, a qualitative research approach that explores how individuals make meaning of their lived experiences through storytelling. Drawing from a constructivist epistemology, this design assumes that reality is co-constructed through personal, social, and cultural interactions (Baxter Magolda, 2009; Moore et al, 2022; Tracy, 2010). Given that the study aims to investigate the personal and developmental experiences of African international graduate students (AIGSs) in the United States, narrative inquiry offers a fitting framework to capture the depth, richness, and context of their experiences over time. The guiding purpose of the research was to explore how these students navigate academic and social life in a foreign country, with a focus on self-authorship and resilience. The two central research questions were:

1. How do African international graduate students progress through self-authorship to achieve social and academic success while studying in the United States?
2. What are the key resilience strategies African international graduate students use to overcome challenges?

Narrative inquiry as a methodology values stories not only as data but also as a way of knowing (Bryman, 2012). Thus, the research process emphasized relational engagement and co-construction of meaning between the researchers and participants (Espedal, 2022). Data were collected with five African international graduate students currently studying in an R1 University located in the Southcentral region of the U.S. Each interview lasted between 30 and 45 minutes and was designed to allow participants to share their life stories in relation to the research questions. While guiding prompts were used, flexibility was built into the conversations to allow the participants' voices to shape the direction and flow of the interviews (Espedal, 2022).

From a purposeful sampling approach, participants were selected based on their identification as African international graduate students and their ability to provide in-depth, first-hand accounts of how they make sense of and navigate their academic and personal journeys. These narratives offered situated insights into the interplay of cultural, institutional, and personal factors shaping their experiences, allowing the study to capture nuanced, context-rich understandings of their trajectories. Ethical protocols, including informed consent, confidentiality, and voluntary participation, were upheld throughout, honoring the participants' autonomy and trust.

Data analysis followed a narrative analytic process, which differs from traditional coding methods by emphasizing story structure, temporality, and meaning (Clandinin & Connelly, 2000; Riessman, 2008). Instead of fragmenting participants' accounts into thematic segments alone, this approach considered the wholeness of each story; its plot, key turning points, characters, and evolving identity. Analysis began with close readings of the transcripts to identify significant narrative elements: setting, conflict, resolution, and changes in voice or perspective over time.

Next, attention was given to the three-dimensional narrative space: interaction (the personal and social conditions of the experience), continuity (how events unfold across time), and situation (the specific contexts in which experiences occur) (Clandinin & Connelly, 2000). These dimensions helped map how participants made sense of their challenges, growth, and coping strategies. Insights about self-authorship and resilience were not only coded but also woven back into the broader arc of each student's life story.

Throughout the process, researcher reflexivity was not a peripheral activity but a critical methodological anchor. Reflexivity was operationalized through systematic journaling and memo-writing to identify and interrogate underlying assumptions, positionality, and emotional responses (Tracy, 2010). These practices functioned as a safeguard against interpretive imposition, ensuring that participants' narratives were represented on their own terms. In addition, the researchers engaged in peer debriefing sessions to openly discuss potential biases and interpretive leanings, thereby subjecting individual perspectives to critical scrutiny. This reflexive rigor strengthened the credibility of the narrative inquiry, allowing participants' meaning-making processes to stand as legitimate and situated forms of knowledge.

Findings

This section presents findings from interviews with five African international graduate students (AIGSs) pursuing graduate studies in the United States. Their stories reveal challenges and growth moments as they navigate new academic, cultural, and personal landscapes. Through the lens of Baxter Magolda's (2009) theory of self-authorship, key themes that emerged include cultural dissonance and identity negotiation, academic expectations and performance pressures, resilience through community support, and navigating institutional support structures.

Theme 1: Cultural Dissonance and Identity Negotiation

Mwita – Rewriting Self through Cultural Tensions

Mwita, a Tanzanian graduate student in global studies, recounted her early months in the U.S. as marked by cultural disorientation and internal turmoil. While linguistically competent,

the subtle nuances of American English and idiomatic speech created invisible barriers. One moment that encapsulated her dissonance came when her professor remarked, *"you've got to hit the ground running."* Mwita recalled, "*I laughed, but inside I felt lost and even embarrassed*" (Interview 1, p. 3, lines 12–14). This seemingly simple phrase sparked a broader questioning of belonging and competence in the academic setting.

Having studied in Uganda under a highly structured and hierarchical academic system, the informal, discursive learning environment in the U.S. left her uncertain. Over time, she found comfort and solidarity within the African Student Association. Through shared meals and cultural storytelling, Mwita began to feel less like a foreigner and more like a contributor. Reflecting on a film night hosted by the group, she shared, *"That night, I felt seen... I realized I wasn't less than — just from a different world"* (Interview 1, p. 7, lines 22–23). This moment represented a narrative turning point, as she moved toward self-authorship by integrating her identity rather than minimizing it.

Zanele – Silence as Resistance and Reclamation

Zanele, a South African student in social work, began her journey full of optimism. However, microaggressions and a pattern of dismissal in classroom discussions quickly undermined her sense of self-worth. "*When I spoke, it was like I wasn't even in the room," she explained. "It made me question my place; am I even supposed to be here*?" (Interview 5, p. 4, lines 10–12). Initially internalizing these experiences as personal failures, Zanele withdrew from classroom participation.

Her narrative shifted when she began attending Black women's dialogue circles on campus. These spaces affirmed her voice and helped her reinterpret silence not as erasure, but as an intentional pause for reflection. Eventually, she co-founded a peer-led group focused on intersectional identity. "*Now, I choose when and how I speak. I define the room for myself," she asserted* (Interview 5, p. 8, lines 19–20). Zanele's redefinition of silence marked a critical evolution in her identity narrative from invisibility to self-determined presence.

Theme 2: Academic Expectations and Epistemological Shifts

Ama – Reclaiming Voice in Academic Discourse

Ama, a Ghanaian doctoral student in education policy, described her initial experience as one of academic invisibility. "*When they asked me to critique Foucault, I froze," she admitted. "Who am I to question such a great thinker?"* (Interview 3, p. 2, lines 3–4). Her prior academic environment emphasized deference to authority, and the expectation of critique felt both foreign and intimidating.

A pivotal shift occurred when a professor validated her insight in a seminar discussion. "*She said, 'That's a brilliant question, Ama.' I didn't even know how to respond*," she recounted. "*I felt like I had entered the conversation, finally*" (Interview 3, p. 5, lines 14–15). This moment reflects Ama's movement toward epistemological self-authorship (Baxter Magolda, 2009), redefining herself as someone capable of contributing to, rather than merely consuming, knowledge.

Kwame – Rethinking Learning through Adaptation

Kwame, a Ghanaian master's student in public health, shared how the academic load initially overwhelmed him. "By week two, I was already drowning. I called my brother and said, 'This school will finish me'" (Interview 4, p. 2, lines 7–8). Accustomed to memorization and structured pacing, he struggled with the reading load and class discussions that demanded independent thought. Guidance from a more experienced student helped Kwame adapt. He learned to prioritize, skim strategically, and contribute meaningfully during class. "They wanted to know what I thought. That was new to me, but also freeing," he reflected (Interview 4, p. 5, lines 4–5). Kwame's journey reveals a shift from compliance-based learning to reflective, dialogic participation.

Theme 3: Resilience through Community and Faith

Chibuike – Grounding Self in Faith

Chibuike, a Nigerian PhD student, described his arrival in the U.S. as surreal and disorienting. "It was like I was in a movie - everything was strange," he said. "Even in class, it felt like everyone had been trained for debate" (Interview 2, p. 3, lines 9–10). Emotional isolation gave rise to moments of despair, yet his faith became a steady anchor. "I would say, 'Do it afraid.' That kept me going," he shared, referring to a personal mantra rooted in spiritual resilience (Interview 2, p. 7, lines 3–6). He began forming relationships through campus fellowships, where he could speak Pidgin English, eat familiar food, and express his faith openly. His story is one of persistence, not through dominance, but through grounding in belief and relational connection.

Theme 4: Engaging and Navigating Institutional Support

Institutional encounters served as key inflection points in the participants' narrative trajectories. While informal community ties sustained everyday belonging, formal structures enabled transformation.

- Ama described how her mentor and teaching assistantship roles helped her feel intellectually affirmed and professionally capable.
- Chibuike participated in a university-wide 3MT competition, gaining visibility and confidence in his academic voice.
- Mwita overcame stigma around help-seeking by accessing counselling and writing centers, learning to reframe vulnerability as strength.
- Zanele collaborated with student affairs to launch a campus-wide African storytelling event, transforming marginalization into celebration.

These experiences demonstrate how institutional support can catalyze identity reconstruction and a sense of belonging, particularly when approached with cultural awareness and responsiveness.

Discussion

The narratives shared by Mwita, Chibuike, Ama, Kwame, and Zanele offer more than individual experiences; they reflect shared journeys of transformation that illuminate the developmental arc of self-authorship within the context of African international graduate students (AIGSs) in the United States. By viewing their experiences through a narrative inquiry

perspective, we recognize that their identities were not fixed but evolving in response to cultural, academic, and interpersonal encounters. These findings confirm and enrich Baxter Magolda's (2009) theory of self-authorship, which posits that individuals gradually transition from relying on external definitions of knowledge and self to an internally driven capacity to define their own beliefs, identities, and relationships.

A recurring theme across the participants' narratives is cultural dissonance and identity negotiation. Mwita's difficulty understanding linguistic nuances, Zanele's struggles with racial and gendered exclusion, and Chibuike's unease with American social norms underscore the disorientation that often accompanies cross-cultural transitions. However, these points of friction also served as invitations to reevaluate previously held assumptions. In narrative inquiry, the process of telling and retelling stories allows participants to make sense of such dissonance, and in doing so, reauthor their identities. For these students, their discomfort became fertile ground for redefining both themselves and their relationships with others.

The academic demands in U.S. graduate programs also posed epistemological challenges. As Baxter Magolda argues, self-authorship is marked by a shift from external authority to internal voice. This was most evident in Ama's narrative, where she transitioned from deference to scholars to becoming a contributor to knowledge. Similarly, Kwame's adaptation to a more collaborative and fast-paced academic environment and Chibuike's embrace of independent learning reveal the ways in which academic systems compelled them to confront and reconstruct their approaches to learning. These shifts exemplify epistemological growth, a key dimension of self-authorship.

Another salient theme is the central role of community and faith-based belonging in fostering resilience. Unlike some Western conceptions of identity that emphasize individualism, the participants drew strength from communal and spiritual ties. This aligns with Osikomaiya's (2014) assertion that many African students approach identity through relational and collective frameworks. The emotional validation found in African student associations, churches, and cultural events helped participants stay anchored while navigating an unfamiliar cultural terrain. These communities acted as "safe spaces" where participants could process challenges, share coping strategies, and recover from exclusion or marginalization.

Equally significant is how participants engaged with institutional resources, including writing centers, mentorship, and student-led initiatives. These forms of support, often accessed after initial hesitation, served as bridges between participants' internal development and the external environment. Zanele's co-creation of a peer dialogue group and Ama's academic recognition by faculty were not only outcomes of institutional engagement but also affirmations of self-authorship in practice. As Collier and Blanchard (2024) suggest, institutional structures must do more than provide services; they must actively recognize and validate the diverse knowledge systems and life stories that international students bring.

In sum, the participants' development was not linear but recursive, shaped by moments of rupture, affirmation, and reflection. Their narratives show that self-authorship is deeply contextual, shaped by sociocultural norms, academic systems, and access to inclusive spaces. AIGSs are not merely adapting to a new culture; they are critically engaging with it, often

challenging its assumptions while simultaneously redefining themselves. This reinforces the value of narrative inquiry in educational research, as it captures the complexity of development that standardized assessments or static interviews often miss.

Implications for Practice

As the population of African international graduate students (AIGSs) continues to grow in visibility and complexity, it becomes imperative to design programs and policies that acknowledge cultural differences and actively facilitate self-authorship and resilience. Practitioners must move beyond generic support frameworks to create culturally responsive environments that affirm identity, foster agency, and promote holistic development.

First, the study underscores the importance of intentionally creating culturally validating spaces on campus. The findings reveal moments of transformation through informal cultural gatherings, film nights, and affinity groups that affirmed their African identities. Institutions should support and fund African student associations and faith-based communities as crucial extensions of the learning environment. These spaces offer more than social connection; they function as incubators of self-authorship, where students can integrate their cultural heritage into their academic identity rather than feeling pressured to suppress it.

Second, faculty engagement and validation emerged as critical catalysts for epistemological growth. The findings also reveal that faculty who affirmed students' contributions or took time to explain expectations helped shift their self-perception from passive learners to knowledge contributors. Faculty development workshops should include training on intercultural communication, inclusive pedagogy, and how to recognize and support the intellectual potential of international students. Intentional mentorship programs that pair AIGSs with faculty or advanced peers who understand their challenges can accelerate both confidence and academic integration.

Moreover, institutions must address the underutilization of support services due to stigma, cultural misunderstanding, or lack of awareness. Chibuike and Mwita's eventual use of counseling and writing centers was transformative but delayed. Campus services should be marketed through culturally resonant narratives and with the collaboration of international student organizations. For example, inviting past AIGSs to share testimonies of how they benefited from these resources may reduce stigma and normalize help-seeking. Language-accessible workshops, orientation redesigns, and personalized academic coaching can also bridge the knowledge gap and encourage earlier engagement with institutional support.

Additionally, the findings suggest that silence and disengagement should not be misread as disinterest or deficiency. As Zanele's story revealed, students may be silently resisting microaggressions or navigating internal conflict. Staff and faculty must be trained to recognize cultural nuances in classroom participation and to create discussion spaces that feel psychologically safe. Dialogue circles facilitated reflection groups, and inclusive teaching strategies can help international students move from the margin to the center by valuing their unique ways of knowing and contributing.

Finally, institutions must incorporate the theory of self-authorship into their student development models, especially when working with adult learners like AIGSs, who often carry familial responsibilities and professional goals alongside their studies. Programs should be designed not only to support academic success but to promote personal meaning-making, identity development, and the capacity for internal voice. The Learning Partnership Model (LPM), as suggested by Baxter Magolda (2009), offers a robust framework. By validating students as knowers, grounding learning in lived experience, and fostering mutual respect, institutions can help AIGSs author lives of significance within and beyond the classroom.

In summary, to suggest that AIGSs are adapting to a new educational system is to fundamentally underestimate the depth of their transformation. As they confront daily dissonance, they are actively reconstructing their identities, often in environments that overlook their student complexities. Until institutions intentionally cultivate culturally responsive spaces, empower reflective learning, and affirm AIGSs' evolving narratives, they risk reinforcing the inequities they claim to dismantle. When viewed honestly, the developmental experience of AIGSs is central to the higher education mission. If institutions genuinely value inclusion, they must urgently shift from performative diversity to practices that measurably foster self-authorship and resilience.

Conclusion

This study illuminates the complex journeys of African international graduate students as they navigate identity, academic expectations, and belonging in U.S. higher education. Through their personal narratives, participants revealed how cultural dissonance, silence, and epistemological shifts shaped their early experiences. However, their stories also reflect growth, resilience, and transformation, often catalyzed by supportive communities, reflective practice, and moments of validation. Notably, the findings highlight that self-authorship is multilayered; it is continuously negotiated across time, space, and relationships. Institutional structures played a critical role when responsive, but equally significant were the informal networks and inner resources that students drew upon. By centering their voices, this study underscores the value of narrative inquiry in capturing the nuances of transition, self-authorship, and adaptation. These insights invite educators and institutions to rethink support frameworks in ways that affirm cultural identity while fostering agency and inclusion for international students navigating unfamiliar academic and social landscapes.

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Developing Critical Thinking Through AI-Powered Debate: Technical Design and Intercultural Implementation of an Educational Debate Bot

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Abstract

This study presents the technical design, implementation, and evaluation of an AI-powered debate bot integrated into a Globally Networked Learning (GNL) course, which connected 97 undergraduate students from Germany and the United States. Unlike traditional AI applications in education that focus on content generation or information retrieval, our debate bot was specifically engineered to challenge students' thinking through structured argumentation about the United Nations' Sustainable Development Goals (SDGs). Through careful prompt engineering and system design, we created an AI system that functions as a Socratic sparring partner, pushing students to defend their positions with evidence-based reasoning. Our mixed-methods evaluation revealed that 60% of participants reported a positive impact on research memos, 52% revised their memos with more evidence-based claims, and 32% considered alternative perspectives about their SDG. Notably, the bot played a significant role as a cultural intermediary in international collaborations, creating a "safe third space" for cross-cultural dialogue. This paper provides detailed technical specifications, prompt engineering strategies, and implementation guidelines for educators seeking to leverage AI as a catalyst for critical thinking rather than a shortcut for content generation. Our findings suggest that when thoughtfully designed, AI debate systems can promote the metacognitive reflection and analytical rigor essential for 21st-century global competencies.

Keywords: artificial intelligence; critical thinking; debate pedagogy; globally networked learning; prompt engineering; sustainable development goals; virtual exchange

The rapid integration of artificial intelligence (AI) into educational contexts has created both unprecedented opportunities and significant challenges for educators worldwide. While much attention has focused on AI's potential to automate tasks or generate content, less consideration has been given to how AI might actively develop the critical thinking skills that remain essential for human intelligence and decision-making. This paper presents a novel approach: using AI not as an answer-generating tool but as a debate partner specifically designed to challenge assumptions, demand evidence, and promote deeper analytical thinking.

Our work addresses a critical gap in the current AI education landscape. As Khan et al. (2024) demonstrated, engaging with challenging counterarguments through debate leads to more truthful answers and nuanced understanding. Yet most educational AI applications focus on providing information rather than challenging students to think more deeply. We hypothesized that by engineering an AI system to function as a persistent devil's advocate—one that questions claims, identifies reasoning gaps as operationalized by established argumentation frameworks (e.g., Will & Toulmin, 1960; Schwarz et al., 2017), and demands explicit, citable evidence—we could transform AI from a potential threat to critical thinking into a powerful catalyst for its development.

This approach becomes particularly significant in the context of global education and intercultural exchange. The complexities of sustainable development require not just knowledge acquisition but the ability to navigate conflicting perspectives, evaluate evidence from multiple cultural contexts, and synthesize diverse viewpoints into coherent arguments. Our AI Debate Bot was implemented within a Globally Networked Learning course connecting students from Germany and the United States, providing a unique opportunity to examine how AI-mediated debate might facilitate both critical thinking development and intercultural understanding.

Literature Review

Current State of AI in Education

The integration of AI in educational settings has evolved rapidly over the past decade, with applications ranging from intelligent tutoring systems to automated assessment tools. Zawacki-Richter et al. (2019) conducted a comprehensive systematic review of AI applications in higher education, identifying four primary areas of implementation: profiling and prediction, assessment and evaluation, adaptive systems and personalization, and intelligent tutoring systems. However, their analysis revealed a concerning gap: most AI applications focused on efficiency and automation rather than developing higher-order thinking skills.

Chen, Chen, and Lin (2020) traced the evolution of AI in education through three distinct phases of technological development. The first phase involved basic computer and computer-related technologies, primarily used for administrative tasks and simple computer-aided instruction. The second phase saw the transition to web-based and online intelligent education systems that could adapt to user behavior and provide more personalized learning experiences. The third phase represents the current state, characterized by embedded computer systems integrated into humanoid robots and web-based chatbots that can perform instructional duties either independently or in collaboration with human teachers. The authors emphasized that this progression has enabled AI to impact education across three key areas: administration (automating grading and feedback), instruction (personalizing content delivery), and learning (customizing educational experiences to individual student needs and capabilities). Our debate bot represents what we propose as a fourth-generation AI, designed specifically to challenge rather than assist, to complicate rather than simplify, and to develop critical thinking rather than provide shortcuts.

Debate-Based Learning Research

Debate education is recognized as an effective pedagogical approach for developing critical thinking through structured argumentation and intellectual exchange (Freeley &

Steinberg, 2013). In the era of generative AI, debate education has gained renewed significance as a method for cultivating uniquely human analytical capabilities that remain essential despite technological advances (Lee et al., 2024).

The benefits of debate education can be summarized in three key areas. First, it enhances critical thinking and analytical reasoning. Through the process of constructing arguments and responding to counterarguments, learners develop sophisticated reasoning skills (Darby, 2007). When students must defend their positions against challenges, they learn to identify logical flaws, evaluate evidence, and apply critical analysis beyond the debate context (Colbert, 1987). Second, debate improves communication and persuasive abilities. Effective debate requires not only articulating ideas clearly but also understanding opposing viewpoints, finding common ground, and adapting arguments in real-time (Aclan & Aziz, 2015). These skills transfer directly to professional and academic communication contexts. Third, debate facilitates integrative thinking by requiring participants to synthesize diverse information sources, reconcile conflicting evidence, and construct coherent narratives from complex data (Schwarz et al., 2017). A systematic review of structured debate implementation in nursing education found that debate enhanced declarative capacity, argumentative capacity, idealistic moral judgment, and realistic moral judgment among students, though the authors noted the need for more rigorous research methodologies to establish debate as a validated teaching tool (Cariñanos-Ayala et al., 2021)

Recent technological developments have expanded debate education beyond traditional classroom formats. AI-powered debate systems have emerged as promising tools for enhancing learning outcomes. Studies have shown the potential of ChatGPT-based applications in debate education, with participants reporting enhanced divergent thinking and improved analytical capabilities through AI-mediated debate practice (Lee et al., 2024). However, traditional debate pedagogies face persistent challenges: securing appropriate debate partners, managing skill-level disparities between participants, overcoming time constraints for practice, and addressing cultural barriers that may inhibit direct intellectual confrontation, particularly in international educational contexts. These limitations have motivated the development of AI debate systems that can provide consistent, adaptive challenges while maintaining the cognitive benefits of adversarial learning.

Intercultural Competence in GNL/Virtual Exchange: Concepts and Measurement Challenges

Intercultural competence (IC) is commonly described as the ability to communicate and work effectively across cultural contexts, but models differ in what that entails. A foundational synthesis groups IC models into compositional, co-orientational, developmental, adaptational, and causal types, highlighting that IC spans knowledge, skills, attitudes, and interactional processes rather than a single trait. (Spitzberg & Changnon, 2009)

Building on this, Leung, Ang, and Tan (2014) organize IC into intercultural traits, attitudes/worldviews, and capabilities, and argue for methodological diversity (beyond self-report) to capture these layers. This framing matters for GNL because virtual, task-focused collaboration can activate different facets of IC than short, decontextualized surveys.

Within language education and GNL, virtual exchange (also called telecollaboration or COIL) is a well-established vehicle for developing IC. Two systematic reviews document consistent IC gains in online exchanges, but also warn that outcomes vary with task design, modality, and scaffolding—implications for how we structure AI-mediated debate (Avgousti, 2018). At the same time, recent overviews caution against oversimplifying "the intercultural" in VE research and call for clearer constructs and assessment practices—again underscoring the need to align pedagogy, tasks, and measurement (Dooly & Vinagre, 2022). Measuring IC remains a central challenge. A major assessment review in higher education finds that the field is dominated by Likert self-reports, with uneven validity evidence, susceptibility to social desirability/faking, and limited predictive validity. The authors recommend scenario-based tasks, performance evidence, and multi-source ratings (Griffith et al., 2016).

Critical Thinking Assessment in Digital Environments

Measuring critical thinking development in digital environments presents unique challenges. Key indicators of critical thinking in written online discourse include the use of qualifying language, acknowledgment of counterarguments, and precision in evidence citation. Al-Husban (2020) highlights that written student contributions in asynchronous forums commonly exhibit these elements, particularly through justification and critical assessment of ideas (Al-Husban, 2020). Similarly, Misdi (2018) emphasizes that features such as elaborative reasoning and proper citation are central to demonstrating critical engagement in academic writing (Misdi, 2018). Their frameworks informed our analysis of student debate transcripts and pre-post writing samples.

Recent research has raised important concerns about the over-reliance on AI dialogue systems in education (Zhai et al., 2024), particularly when these tools are used as substitutes for thinking rather than as catalysts for deeper learning. Studies have shown that excessive dependence on AI can impair students' problem-solving abilities and reduce their capacity for independent critical thinking (Çela et al., 2024; Gerlich, 2025; Bai et al., 2023). This cognitive offloading can lead to reduced memory retention and lower creative engagement, especially among younger students (Tamrin et al., 2024).

In response, educational theorists and technologists have emphasized the importance of designing AI systems that foster, not replace, critical thinking. For example, introducing intentional "positive friction" into AI interactions can encourage users to reflect, question assumptions, and engage more deeply with content (Inan et al., 2025). Similarly, promoting AI-complementary skills, those that AI cannot easily replicate, can help students thrive in an AI-mediated world (Panthalookaran, 2024). This underscores the importance of our approach: building AI tools that increase cognitive demand and support students in developing analytical, creative, and reflective capacities rather than bypassing them.

The Research Gap

Despite growing interest in educational AI, we identified a significant gap in the literature: few studies examine AI systems designed specifically to challenge students' thinking through structured opposition. Existing research on AI in education largely focuses on supportive and assistive roles. Our study addresses this gap by investigating whether AI can effectively serve as an intellectual adversary, promoting the kind of rigorous thinking essential for addressing complex global challenges.

Theoretical Framework: Debate as a Cognitive Catalyst

The theoretical foundation for our AI Debate Bot rests on three interconnected pillars: the dialectical nature of knowledge construction, the role of productive cognitive conflict in learning, and the unique affordances of AI-mediated interaction for promoting metacognitive awareness.

Dialectical Learning and Knowledge Construction

The Socratic method has long been recognized as a powerful pedagogical approach for developing critical thinking. Through systematic questioning and the examination of assumptions, learners are pushed beyond surface-level understanding toward a deeper comprehension. Vygotsky's (1978) concept of the Zone of Proximal Development suggests that learning is optimized when students are challenged just beyond their current capabilities with appropriate scaffolding. Our AI Debate Bot was designed to provide this scaffolding through persistent but calibrated challenges to student thinking.

Research on debate-based learning provides compelling evidence for its effectiveness in developing critical thinking skills. Cariñanos-Ayala et al. (2021) found that structured debate protocols significantly enhanced participants' ability to evaluate complex information and understand nuanced concepts. The adversarial yet constructive nature of debate forces participants to anticipate counterarguments, strengthen their evidence, and refine their reasoning —precisely the skills necessary for navigating complex global challenges, such as sustainable development.

Productive Cognitive Conflict

Central to our design philosophy is the concept of productive cognitive conflict—the idea that learning is enhanced when students encounter challenges to their existing mental models. Piaget's (1952) theory of cognitive development emphasizes the role of disequilibrium in promoting intellectual growth (Pakpahan & Saragih, 2022). When students' predictions about SDG achievement are systematically challenged by the AI, they experience this disequilibrium, motivating them to seek additional evidence and refine their arguments.

This approach directly counters concerns about AI making learning "too easy." Rather than reducing cognitive load, our debate bot intentionally increases it in productive ways. Students reported that the AI's challenges forced them to "dig deeper" and "verify facts"—exactly the kind of effortful processing that promotes long-term retention and transfer of learning.

AI-Mediated Metacognition

Perhaps most significantly, AI-mediated debate creates unique opportunities for metacognitive development. Unlike human debate partners who may vary in their approach or become fatigued, the AI provides consistent, systematic challenges that make patterns in reasoning more visible. Students can review their debate transcripts, identify weaknesses in their argumentation, and observe their thinking processes evolve over multiple interactions.

The neutrality of the AI can also reduce the social and emotional barriers that often inhibit critical self-reflection. We therefore posit that an AI-mediated debate environment may reduce the social costs of error in cross-cultural exchanges, easing “face-threat” pressures and encouraging greater intellectual risk-taking.

Technical Architecture and Prompt Engineering

The effectiveness of our AI Debate Bot hinges on sophisticated prompt engineering that transforms a general-purpose language model into a specialized educational tool. This section provides detailed technical specifications for researchers and educators seeking to implement similar systems.

System Architecture

Our system utilizes the GPT-4o API as its core language model, chosen for its advanced reasoning capabilities and ability to maintain context throughout extended dialogues. The architecture consists of three main components:

1. **Input Processing Layer**: Captures student selections (SDG choice, country selection, initial prediction) and formats them for the API
2. **Prompt Management System**: Maintains the carefully crafted system prompt that guides AI behavior throughout the interaction
3. **Response Generation and Moderation**: Ensures responses maintain appropriate tone, challenge level, and educational value

API parameters were primarily set to the default values recommended by OpenAI, with the notable exception of the "temperature" parameter, which was set to 0.7. This temperature setting strikes a balance between response creativity and consistency, ensuring the AI's replies remain contextually relevant and reliably challenging without becoming overly unpredictable.

Prompt Engineering Strategy

The system prompt represents the most critical component of our implementation. Prompt engineering was carefully tested and iteratively refined based on user feedback. As one of the authors had previously completed the Globally Networked Learning (GNL) course, specifically researching Sustainable Development Goal (SDG) 11, substantial expertise informed initial prompt development. Early prompt iterations were tested by inputting the research-based SDG predictions and systematically reviewing AI-generated responses. Prompt refinements continued until satisfactory outcomes were consistently achieved, ensuring rigorous, thoughtful, and educationally valuable debate interactions. The prompting strategies employed were directly informed by OpenAI's prompting guidelines, ensuring alignment with best practices in leveraging large language models (LLMs) for educational dialogues (OpenAI platform, n.d.).

Layer 1: Expert Persona Definition

You are now DebateGPT, an expert in debating global issues, with a special focus on the SDGs (Sustainable Development Goals).

a. *Experience: Participated in numerous global debate competitions, conferences, and discussion panels.*
b. *Roles and Companies: Former debate coach at top universities and member of international debate panels.*
c. *Education: Master's degree in International Relations.*
d. *Skills: Constructive argumentation, logical reasoning, understanding of global policies and SDGs, ability to spot argument flaws, and effective counter-argument formation.*

This persona layer serves multiple functions. It constrains the model's vast knowledge to a specific domain while establishing an authoritative yet approachable voice. The specific credentials were chosen to balance expertise with accessibility—sophisticated enough to challenge advanced students yet not so intimidating as to discourage engagement.

Layer 2: Behavioral Guidelines

Tone and Style: Your tone should be respectful, analytical, and evidence-based. While you play the devil's advocate, maintain a balanced approach, challenging the user's claims but also listening and conceding when appropriate. At the end of each of your answers, you should ask the User relevant questions to keep the debate going.

These guidelines ensure consistent interaction patterns. The directive to ask questions at the end of each response is particularly important, as it maintains the dialogical nature of the exchange and prevents the interaction from devolving into simple statement-rebuttal patterns.

Layer 3: Task Specification

User's Task:The user will present an argument on whether Germany or the US will be able to achieve a specific SDG by 2030. Your task is to debate this point, bringing up potential flaws in their argument. You will serve a dual role: challenging their claims while also considering their evidence. If the user makes a compelling case, you should eventually concede and agree with them.

This task layer grounds the interaction in a clearly defined educational activity. It orients the AI toward its role within the learning context and ensures that interactions are framed within structured, goal-oriented tasks rather than open-ended conversation.

Layer 4: Structured Evaluation Process

Steps and Evaluation Method:

Step 1: Understand the user's argument.
Evaluation Method: Accurate comprehension of the user's claims and evidence regarding the specified SDG. If appropriate, ask for clarification.
Step 2: Identify and challenge any flaws or weak points in their argument.
Evaluation Method: Logical and evidence-based counterarguments provided.
Step 3: Consider and weigh the user's evidence.
Evaluation Method: Objective assessment of the user's evidence without bias.
Step 4: Concede and agree with the user if their argument is solid.
Evaluation Method: Fair and objective decision-making based on the strength of the user's argument.

This final layer introduces a transparent reasoning process for the AI to follow. It models the type of critical evaluation students are expected to emulate and reinforces the importance of fairness, rigor, and evidence-based decision-making in academic discourse.

Methodology

Research Design

This study utilized a mixed-methods research approach, combining quantitative and qualitative methodologies to comprehensively capture students' perceptions and experiences with the AI Debate Bot, which was embedded in the Globally Networked Learning virtual exchange and required at least one engagement during a scheduled online session. The rationale for selecting a mixed-methods approach was rooted in the complex, multifaceted nature of critical thinking and intercultural competence, which are not fully measurable through quantitative methods alone. While quantitative surveys provided broad and standardized measures of students' initial knowledge, AI usage, and perceptions, qualitative open-ended questions enabled a deeper exploration of students' reflective processes, specific experiences, and nuanced views about AI interactions.

Data Collection and Analysis

Data collection occurred in three stages: a pre-survey, an interactive debate exercise, and a post-survey. The pre-survey employed a 5-point Likert scale to measure students' initial AI usage and their knowledge of the SDGs. Following the survey, students conducted independent research on their assigned SDG, formulated initial predictions regarding their country's progress, and answered structured open-ended questions designed to foster critical thinking and

comparative analysis between Germany and the United States. Subsequently, students engaged directly with the AI Debate Bot to challenge and refine their predictions and research posters. Finally, a post-survey was administered, utilizing a 5-point Likert scale, to capture students' perceptions of the AI tool's effectiveness and its influence on their learning process.

Quantitative data from both surveys were collected using an online survey tool, ensuring straightforward and efficient data management. Open-ended responses were analyzed using conventional qualitative content analysis: one author read all responses repeatedly to achieve immersion, highlighted salient phrases, and created codes directly from the text, then inductively grouped codes into broader categories (Hsieh & Shannon, 2005). A detailed thematic analysis, utilizing qualitative analysis software, is planned for future research to deepen the interpretation and rigorously validate emergent themes (Braun & Clarke, 2022).

Ethical Considerations

Ethical considerations were paramount throughout this study, particularly concerning participant consent, data privacy, and the transparency of AI interactions. All student participants provided explicit informed consent, which clearly detailed the nature, purpose, and voluntary participation of the study, including the option to withdraw at any point without repercussions. Data confidentiality was ensured by anonymizing all collected responses and securely storing data on encrypted platforms, accessible only to authorized researchers.

Moreover, participants were explicitly informed about the capabilities and potential limitations of the AI Debate Bot, including inherent biases or inaccuracies in AI-generated content. Students were encouraged to critically engage with the AI's responses and to independently verify information through credible sources. Researchers also remained cognizant of potential interpretative biases, openly acknowledging limitations in interpreting qualitative data due to subjective analysis. The first author (non-instructor, tool developer) analyzed de-identified data; instructor co-authors only reviewed de-identified summaries. We acknowledge possible role-related bias and will add member-checking/independent analysis in future work.

Findings and Results

This section presents the quantitative findings from our mixed-methods evaluation of the AI Debate Bot's impact on student learning, organized according to our four primary research questions. Ninety-seven undergraduates from two partner institutions participated in the Globally Networked Learning (GNL) course: (a) PH Ludwigsburg (Germany)—students in English teacher education, and (b) University of North Carolina at Charlotte (USA)—students majoring in English. The course was conducted in English. The AI Debate Bot activity was embedded in the course, and each student was required to complete at least one debate during a scheduled online session. Study surveys were voluntary and de-identified; item-level response counts ranged from n = **75** to n = **97**.

Student perceptions of the AI Debate Bot

The quantitative data revealed predominantly positive student perceptions of the AI Debate Bot's educational value. When asked about the tool's impact on their research memos, participants reported the following outcomes:

- **60% (45 out of 75 participants)** reported a positive impact on their research memos
- **52% (39 participants)** revised their memos with more evidence-based claims
- **46% (34 participants)** expanded their arguments with additional details
- **32% (24 participants)** considered alternative perspectives about their SDG

- **15% (11 participants)** reported no significant change to their memos

Perceived impact on critical thinking

Student perceptions of the AI Debate Bot's influence on critical thinking development showed strong positive trends. When asked to rate their agreement with the statement "I believe artificial intelligence improves my critical thinking skills" on a 5-point Likert scale, participants responded as follows:

- **70% agreed or strongly agreed** that AI improves their critical thinking skills
- **18% remained undecided** about AI's impact on critical thinking abilities
- **12% disagreed** with the statement
- **0% strongly disagreed** with the statement

The high percentage of agreement (70%) suggests widespread recognition of AI's potential to enhance analytical capabilities. The absence of strong disagreement responses further indicates general acceptance of AI's role in fostering critical thinking development. However, the substantial undecided group (18%) reflects meaningful ambivalence about AI's cognitive impact, potentially stemming from concerns about over-reliance or uncertainty about AI's limitations.

Perceived impact on written communication

Participants demonstrated even stronger confidence in the AI Debate Bot's ability to enhance written communication compared to critical thinking skills. When rating agreement with "I believe artificial intelligence improves my written communication," responses showed:

- **76% agreed or strongly agreed** that AI improves written communication skills
- **19% remained undecided** about AI's impact on writing abilities
- **5% disagreed** with the statement
- **0% strongly disagreed** with the statement

These results indicate even greater confidence in AI's writing support capabilities compared to critical thinking enhancement. The higher agreement rate (76% vs. 70%) suggests students may more readily recognize AI's concrete benefits for grammar, style, and structural improvements in their writing compared to the more abstract concept of critical thinking development.

SDG understanding and prediction

Items on SDG understanding and prediction yielded the strongest perceived effects. Among respondents, **91%** reported that the AI Debate Bot broadened their understanding of their assigned SDG, and **82%** indicated that it improved their ability to predict SDG achievement. Taken together, these results suggest that students experienced the bot as most helpful for deepening subject-matter comprehension and sharpening evidence-based judgments about likely outcomes.

Summary of Quantitative Findings

The quantitative data reveal consistently positive student perceptions across all measured dimensions, with particularly strong results for understanding of SDGs (91% positive) and improvement in prediction (82% positive). Written communication enhancement received the next highest rating (76% positive), followed by critical thinking development (70% positive), and research memo improvement (60% positive).

These findings suggest the AI Debate Bot was most effective in its core educational function—deepening subject matter understanding and analytical capabilities—while also providing meaningful support for communication skills and research processes. The consistent positive trends across multiple dimensions indicate the tool's broad educational utility. However, the varying response rates also highlight areas where different students experienced different levels of benefit from the AI-mediated learning experience.

Discussion

Impact on Intercultural Competence

The qualitative feedback from students highlighted the significant role the AI Debate Bot played in fostering intercultural competence during international collaborations. A consistent theme identified was the AI's role as a neutral intermediary, effectively reducing direct interpersonal tension when students discussed sensitive global issues. For example, one student remarked, "The AI gave me a way to explore differences between our perspectives without worrying about offending my international partners." We did not directly measure intercultural competence (IC). Rather, the "safe third space" theme emerged in several qualitative comments. Using a minimal definition of IC as appropriate and effective communication across cultures, we interpret these comments as suggestive of IC-relevant behaviors (e.g., openness, perspective-taking, civil disagreement). We report this as a perception-based, exploratory observation, not as evidence of validated IC gains.

Moreover, the AI's neutral stance encouraged students to engage more critically and confidently with complex topics, preparing them for direct discussions with international peers. Another student reflected, "Initially, I was hesitant to challenge my classmates directly about climate issues, but debating first with the AI gave me confidence." Thus, the AI's structured environment likely reduced face-threat and enabled IC-relevant practices—openness to alternative viewpoints, perspective-taking, and civil disagreement—observable in several qualitative comments.

Additionally, students frequently noted how debating the AI first enabled them to approach subsequent intercultural dialogues with greater openness and preparedness. This preparation enhanced their ability to empathize and better understand diverse perspectives, improving the quality of intercultural interactions throughout the course. Thus, the AI Debate Bot not only deepened students' analytical capabilities but also appeared to support intercultural competence—understood here as appropriate and effective communication across cultures—by reducing face-threat and enabling perspective-taking and civil disagreement; we treat this as an exploratory, perception-based observation

Cognitive Demand and Productive Friction

A key finding of this study was the positive effect of cognitive demand and productive friction induced by the AI Debate Bot. Unlike common formats that can unintentionally amplify confirmation bias (Kuhn & Crowell, 2011)—for example, lecture-only delivery, unstructured "pro–con" debates which often elicit my-side reasoning and group polarization (Isenberg, 1986), and unguided online discussions/search tasks which foster selective exposure to congenial information (Hart et al., 2009; Schweiger et al., 2014)—the AI deliberately challenged assumptions and pressed students to verify claims with counterevidence. One student specifically highlighted this, stating, "After the AI questioned my statistics on renewable energy adoption, I realized I needed to find more current data. This discovery led me to identify contradictions in my earlier assumptions."

This concept of productive friction became central to deepening students' cognitive engagement. Rather than simplifying tasks, the AI required active intellectual effort, prompting students to engage in deeper reflection and analysis. Students noted the AI's persistent questioning and counter-arguments as particularly beneficial. Another student stated, "Having to defend my position against challenging questions forced me to critically evaluate my evidence in ways I hadn't before."

Moreover, the AI's consistent, structured feedback allowed for continuous refinement and improvement of arguments, promoting sustained cognitive engagement. Students frequently expressed appreciation for how this iterative process significantly enhanced their critical thinking skills, highlighting that productive friction facilitated deeper learning, critical evaluation, and analytical rigor.

Longitudinal Observations on Critical Thinking Improvement

As students engaged in longer and more sustained interactions with the AI Debate Bot, the quality of their responses noticeably improved. Early contributions were often intuitive and general, but over time, students demonstrated increasing depth, nuance, and sophistication in their arguments. This progression suggests a strong correlation between extended AI engagement and the development of more advanced critical thinking skills.

Early debate sessions commonly involved students making generalized claims with limited evidence. However, with consistent engagement and feedback from the AI, students increasingly incorporated detailed, data-driven arguments. For instance, one student's initial claim that Germany was "spending too much abroad" evolved into a nuanced argument citing specific emissions data (244 Mt CO_2e) and precise policy timelines ("coal phase-out by 2030"). This exemplifies the depth of learning facilitated by continuous interaction with the AI.

Furthermore, over successive debates, students increasingly acknowledged counterarguments, refined their claims with more precise language, and actively recognized limitations and complexities in their arguments. These changes were evident not only in debate transcripts but also in subsequent research memos and presentations, where students demonstrated heightened analytical rigor and more sophisticated reasoning.

Such longitudinal improvements underscore the potential for AI-mediated debates to significantly enhance critical thinking capabilities. The iterative, dialectical nature of the debates encouraged ongoing reflective practice, indicating that sustained use of AI as an intellectual adversary can yield substantial, lasting cognitive benefits in educational settings.

Technical and Pedagogical Recommendations

Technical Improvements

Student feedback highlighted several key areas for improving the technical reliability and responsiveness of the AI Debate Bot. Primarily, participants emphasized the necessity for enhanced accuracy in AI-generated responses, noting occasional factual inaccuracies and outdated information, which undermined trust and required extensive fact-checking. To address this, future iterations should incorporate real-time data integration or verification mechanisms to ensure responses remain accurate and current.

Responsiveness was another critical area needing improvement. Students reported frustration with delayed or inconsistent AI replies, particularly during intensive debate sessions. Thus, optimizing the AI model's efficiency and ensuring reliable network connectivity is essential to maintaining active engagement. Deploying caching strategies or edge computing solutions could minimize latency and enhance user experience.

Furthermore, students recommended user-friendly interfaces with intuitive designs, emphasizing that complexity or technical difficulty negatively impacted their willingness to engage deeply. Enhancing interface simplicity and incorporating customizable features—such as adjustable difficulty levels, targeted topic selection, and transparent information sourcing—could substantially increase user satisfaction and educational effectiveness.

Pedagogical Strategies

Successfully integrating AI Debate Bots into broader curricular frameworks requires strategic planning and thoughtful pedagogical scaffolding. To effectively leverage AI's educational potential, educators should adopt a structured, incremental approach that progressively deepens student interaction complexity. Initial debate sessions could involve guided practice, with explicit demonstrations illustrating how to critically engage with AI-generated counterarguments. Over subsequent sessions, educators can gradually reduce scaffolding, encouraging students to independently challenge, critique, and respond to the AI's prompts.

Critical reflection activities should be embedded into the curriculum to maximize cognitive engagement and metacognitive awareness. Following each debate interaction, students could complete reflective journal entries or structured response templates focusing on their learning processes, challenges encountered, and strategies employed to refine their arguments. Such reflective practices help students consciously identify their cognitive growth areas and deepen their understanding of argumentation strategies.

Additionally, educators should explicitly address AI literacy within instructional activities, emphasizing skills like critical evaluation of AI-generated information, identification of biases, and appropriate academic citation practices involving AI interactions. Classroom discussions and workshops focusing on AI limitations and ethical considerations would empower students to use these tools responsibly and critically.

Lastly, it is crucial to incorporate periodic metacognitive checkpoints throughout the course, where students analyze debate transcripts to reflect systematically on their evolving argumentation skills and cognitive strategies. Facilitating peer review sessions where students critique and learn from each other's debate interactions further enriches their analytical capabilities, reinforcing the collaborative and reflective dimensions of critical thinking development through AI-enhanced educational experiences.

Future Research Directions

The promising outcomes of our study suggest several valuable avenues for further research to deepen understanding and enhance the effectiveness of AI-powered debate systems. One primary area warranting exploration is longitudinal research. While our study provided initial evidence that repeated AI interactions enhance critical thinking skills, future studies should systematically examine these effects over extended periods—such as entire academic years or across multiple courses—to evaluate sustained cognitive and educational impacts more robustly. This could help determine whether skills acquired through AI debates transfer effectively into broader academic and real-world contexts.

Concrete next steps for empirical analyses should include a detailed content analysis of student debate transcripts using validated frameworks such as the Critical Thinking Assessment Test (CAT) (Center for Assessment & Improvement of Learning, n.d.). Specifically, future research should quantitatively measure changes in argument sophistication, use of evidence, complexity of reasoning, and acknowledgment of alternative perspectives across multiple debate

sessions. This systematic coding would yield robust, objective measures of critical thinking development, providing stronger empirical validation than self-reported survey data alone.

Another crucial area for further research involves extensive cross-cultural comparative analyses. While our study highlighted initial intercultural benefits, a more rigorous, comparative approach involving diverse cultural contexts beyond the U.S. and Germany would enrich the understanding of how cultural variables influence AI debate interactions and outcomes. Investigating whether AI debate tools function similarly across varied cultural settings could significantly inform instructional design, ensuring broader applicability and inclusivity of AI-supported educational initiatives.

Moreover, impact studies with diverse student populations, including differing academic backgrounds, proficiency levels, and socioeconomic conditions, are necessary. While our participants were primarily university students with some familiarity with AI tools, further research should examine how these debate systems support the development of critical thinking among learners with limited exposure or less technological proficiency. Additionally, exploring the tool's adaptability for younger learners or non-academic contexts could greatly expand its utility and inclusivity.

Finally, rigorous examination of technical refinements. Integrating real-time fact-checking, more advanced prompt engineering strategies, and adaptive AI models that dynamically respond to individual learner profiles could significantly enhance educational outcomes. Evaluating the effectiveness of these technical enhancements would provide concrete data to guide future AI system designs, ensuring robust, reliable, and impactful educational experiences.

Challenges and Limitations

While our findings offer promising initial insights into the potential of AI-powered debate systems to enhance critical thinking and intercultural competence, several limitations must be acknowledged. Firstly, the results presented in this study primarily reflect student perceptions gathered through self-report surveys and qualitative feedback. Although student perspectives are valuable in understanding engagement and subjective experiences, further empirical analysis of student-produced debate transcripts, reflective writings, and final research outputs is required to substantiate the effectiveness of AI interactions in objectively enhancing critical thinking and academic performance.

Additionally, our study was relatively short-term, covering interactions over an eight-week period within a single Globally Networked Learning course. To confidently assert long-term impacts and benefits, more comprehensive longitudinal studies are necessary. Such investigations should evaluate sustained changes in critical thinking, IC, and analytical skills across multiple academic terms or diverse curricular settings, examining whether these effects endure and meaningfully transfer into broader academic or professional contexts.

A significant methodological challenge arises from the current lack of established, validated frameworks specifically designed for evaluating AI-assisted educational outputs and interactions. The nascent nature of AI integration in pedagogical contexts means that existing analytical tools may not fully capture the nuances and complexities of AI-mediated cognitive processes or sufficiently account for AI's unique contributions versus human-driven inquiry. This limitation underscores an urgent need for developing rigorous evaluative instruments and frameworks that can accurately measure and interpret the impact of AI on learning outcomes, cognitive processes, and intercultural development. We also did not include a validated IC instrument, so IC claims are provisional and perception-based.

Lastly, the generalizability of our findings may be constrained due to the specific demographic characteristics of our participant pool—primarily undergraduate students already somewhat familiar with AI technologies. Future studies should intentionally explore more diverse educational settings and student populations, including those with varying degrees of technological literacy and exposure to AI tools, to better understand the broader applicability and adaptability of AI-supported debate pedagogy.

Recognizing and systematically addressing these limitations will be essential for future research efforts to more definitively establish the educational efficacy and practical benefits of AI-powered debate interventions.

Concluding Reflection

This study has demonstrated the transformative potential of thoughtfully designed AI-powered debate systems in enhancing critical thinking, intercultural competence, and global citizenship among university students. Through structured dialectical interactions, AI proved effective not merely as an informational resource, but as an active intellectual partner capable of pushing students beyond superficial engagement toward deeper, more reflective cognitive processes. The iterative nature of AI-mediated debates allowed students to progressively refine their arguments, critically evaluate evidence, and systematically engage with diverse perspectives, thereby fostering crucial analytical skills essential for 21st-century learners.

Accordingly, any implications for global education should be viewed as hypothesis-generating: AI tools may help create conditions for authentic engagement and cross-cultural understanding, but confirmatory evidence will require validated IC measures and comparative discourse analyses (e.g., AI-first vs. no-AI controls).

In conclusion, while AI-powered debate systems present exciting possibilities for educational innovation, their successful implementation demands thoughtful integration, continuous evaluation, and ongoing refinement. When utilized responsibly, AI debate tools can significantly enrich educational environments, cultivating critical, reflective, and culturally competent global citizens equipped to navigate an increasingly complex and interconnected world.

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4. Use *italics* when you want to emphasize concepts or words.
5. Use the *automatic* hyphenation function to keep the character and word spacing at a minimum. In Microsoft Word, users can automatically hyphenate documents by altering the options within the program. The location of the automatic hyphenation option varies depending on the version of Word you are using. In Microsoft Word versions 2007 and 2010, it is found by clicking on Page Layout, Page Setup box, and hyphenation. In Microsoft Word 2003, it is located in the "Tools" menu under "Language." Automatic hyphenation is also available in earlier versions of Microsoft Word. Reference the Help menu in the program you're using if you need help with either automatic or manual hyphenation.

Phi（philomatheia）-love of knowledge

Beta (biotremmonia)-valuing of human life

Delta (diapheren)-achieving excellence