

From Screen to Practice: Integrating AI, YouTube, and Orange Data Mining in ELT

¹Edgar R. Eslit, ²Melchora A. Lector

¹St. Michael's College of Iligan, Inc., Iligan City, Philippines

²Maria Cristina National High School, Iligan City, Philippines

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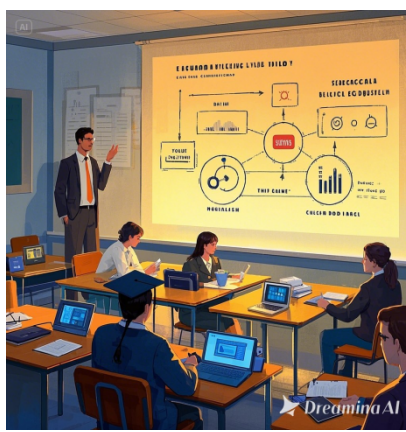
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ABSTRACT

Graduate-level English Language Teaching (ELT) is undergoing a deep transformation as shaped by the convergence of artificial intelligence (AI), YouTube, and data science. Yet, despite the increasing availability of digital tools, a persistent practical gap remains between technological innovation and pedagogical implementation particularly in a blended learning environment. This study addresses that gap by examining how AI, YouTube, and Orange Data Mining. It is anchored in constructivist pedagogy, personalization theory, Technological Pedagogical Content Knowledge (TPACK) framework, and Data-informed learning models which can meaningfully enhance blended ELT instruction. Guided by a qualitative research design which is rooted in the interpretivist tradition, the study draws insights from semi-structured interviews, classroom observations, and participation of 20 graduate students from SMCII, AY 2024-2025. Findings reveal that AI fosters tailored learning experiences, YouTube enriches multimodal engagement, and data science enables real-time instructional responsiveness. However, disparities in digital fluency, confidence in using educational technologies, and limited training opportunities emerged as significant barriers to effective implementation. In response, the Tri-Tech ELT for Grad School program was designed as a practical model to address these barriers through structured training, professional development, and ongoing mentorship. This framework promotes not only the integration of digital innovations but also cultivates a reflective, learner-centered approach that sustains pedagogical depth. The study underscores the importance of aligning technological advancement with human-centered teaching practices, ensuring that digital tools empower rather than overwhelm. By actively addressing issues of access, preparedness, and relational pedagogy, the research affirms that innovation in graduate ELT must be both inclusive and intentional. Overall, the findings highlight that when educators are equipped with the right support systems and theoretical grounding, technology can expand the transformative potential of graduate English language education.

Keywords: AI in education, blended learning, English teaching, educational technology, YouTube learning, data science in ELT

INTRODUCTION



Source: Microsoft Copilot (2025)

Graduate students often find themselves struggling with the challenge of mastering essential academic skills—whether it is writing solid research papers, delivering compelling presentations, or thinking critically about complex issues. These are not just academic requirements; they are keys to thriving in a fast-changing world that values innovation and insight. Fortunately, technology is becoming a trusted ally on this journey. YouTube, for example, is not just for entertainment—it is now a dynamic learning tool, helping graduate students grow more confident and creative through video projects and presentations. At St. Michael's College of Iligan Inc. (SMCII), this approach has taken root. Graduate students are using YouTube to sharpen their research communication and prepare for the demands of academic and professional life (PIDS, 2025). True to UNESCO's vision of human-centered innovation, the graduate school is also embracing tools like artificial intelligence and Orange Data Mining—not just to stay current, but to ensure that learning remains inclusive and grounded in real human needs (UNESCO, 2023). This commitment echoes CHED's call to action as well, championing ethical AI use and digital platforms that support flexible, engaging, and responsive learning environments (CHED, 2019).

However, while technology offers exciting opportunities, it also brings its own set of challenges. Blended learning, which combines face-to-face and online instruction, has become increasingly popular in graduate education because of its flexibility and ability to cater to different learning styles. Yet, for it to be effective, it is crucial that these digital tools align with rigorous academic standards, ensuring that learning remains meaningful and substantial. YouTube, with its vast range of educational content, holds immense potential, but its effective use in graduate-level courses requires careful integration into the curriculum. It is not enough to simply show videos; instructors must guide students to engage critically with the content, ensuring that their learning experience remains intellectually rigorous. This balancing act—incorporating technology while maintaining academic standards—is where much of the challenge lies, and also where opportunity lies for innovation in education (Villanueva et al., 2023).

This is why the primary goal of this study is to explore how Artificial Intelligence (AI), Data Science, and YouTube can work together to transform blended English Language Teaching (ELT) for graduate students at SMCII. By leveraging AI tools to personalize learning, using data analytics to improve engagement, and incorporating YouTube as a platform for creative and interactive activities, this study seeks to offer new, innovative methods to engage graduate students in more meaningful ways. With the right combination of these tools, it's possible to create a learning environment that is not only more personalized but also more engaging, catering to the diverse needs of students in a digital world (Mapúa University, 2025).

The need for the conduct of this study is to further emphasize the growing integration of digital tools in education worldwide. AI, Data Science, and YouTube represent three key pillars that can address several challenges inherent in traditional teaching methods, especially in ELT graduate school. By integrating these technologies into the learning process, this study hopes to offer solutions to improve how students learn, engage, and succeed. YouTube, in particular, promotes interactive and multimodal learning, giving students a platform where they can actively engage with the material, rather than passively absorbing it (Espinosa et al., 2023). Similarly, AI and Data Science open up new avenues for personalization, providing students with real-time feedback and data-driven insights that can guide them along individualized learning paths. This technological integration is especially important for institutions like St. Michael's College of Iligan, Inc., which is committed to staying ahead of the curve by adopting modern educational tools that help students succeed in an increasingly digital and globalized world (Lee, 2023).

As the educational landscape shifts, exploring how these technologies reshape the learning experience is both exciting and necessary. This study looks into the perspectives of graduate students, focusing

on how AI, YouTube, and Data Science can enhance their ELT experiences. By analyzing these insights, the study aims to uncover how these tools can foster greater personalization, interactivity, and engagement in the classroom. In particular, the research explores the following questions:

1. How do graduate students perceive the role of AI tools in personalizing their learning experience in a blended ELT environment?
2. What are the influences of YouTube-based activities on enhancing interactivity and creativity among graduate ELT students?
3. How can data-driven insights from Data Science tools improve student engagement and outcomes in blended ELT?
4. What challenges and opportunities do graduate students encounter when integrating AI, Data Science, and YouTube into their blended learning routines?
5. How do the combined use of AI, Data Science, and YouTube contribute to achieving academic success and linguistic competence for graduate students in ELT?
6. What ELT program can be crafted based on the findings of the study?

These questions serve as the foundation for understanding how the integration of technology into ELT can reshape the learning process, making it more personalized, interactive, and effective. The study ultimately aims to provide a framework for educators looking to integrate AI, Data Science, and YouTube into their teaching models to achieve better outcomes for graduate learners (Sung, 2024).

In line with these goals, this study responds to a persistent challenge in graduate ELT: the difficulty of translating digital innovations into sustainable pedagogical practice. While AI, YouTube, and data science tools are increasingly present in higher education, many educators face barriers in applying them meaningfully. This research directly addresses that practical gap, arguing that their integration into blended learning enhances personalization, engagement, and academic outcomes. As more institutions seek effective strategies, the papers' findings is hoped to offer timely insights into how technology, when grounded in reflective pedagogy, can elevate English language education in the Philippine context (PIDS, 2025; UPOU, 2024; Villanueva et al., 2023; Espinosa et al., 2023).

That being said, his paper is significant to school administrators, ELT instructors, graduate students, and future researchers, as it offers a structured and theory-informed framework—Tri-Tech ELT for Grad School—that bridges the practical gap between digital innovation and pedagogical application. For administrators, it provides a strategic model to lead institutional transformation through infrastructure, policy, and training. For instructors, it equips them with integrative approaches to personalize learning, foster creativity, and inform instruction. Graduate students benefit by developing digital fluency and self-directed learning habits, while researchers gain a replicable model for exploring long-term impacts, contextual adaptability, and equity in technology-driven ELT.

LITERATURE REVIEW

Education is constantly evolving, with technology playing a crucial role in reshaping how we teach and learn. Graduate-level education, particularly in fields like English Language Teaching (ELT), is undergoing a transformation due to the integration of blended learning, artificial intelligence (AI), data science, and tools like YouTube. This integration presents exciting opportunities for enhancing graduate students' learning experiences, particularly in their advanced studies, where personalized and flexible approaches are becoming increasingly important. This literature review delves into key research on these technologies, their impact on education, and how they can work together to address the challenges and opportunities faced by graduate students.

Blended learning has become a prominent trend in graduate education, offering students the flexibility to engage with both in-person and online learning. Several studies emphasize the advantages of this model, particularly its flexibility, as it allows students to learn at their own pace and access materials whenever needed (Li et al., 2023). In graduate education, where students often balance work and personal responsibilities, the blend of face-to-face and online learning offers a more inclusive and accessible environment. However, while blended learning provides flexibility, it also presents challenges such as maintaining student engagement and ensuring the content is suitably customized to meet the needs of advanced learners (Tonbuloğlu & Tonbuloğlu, 2023). Graduate students, in particular, require more personalized approaches that go beyond traditional methods, and this is where the integration of AI and data science can play a pivotal role in enhancing the learning experience.

The application of AI and data science in education has garnered significant attention, particularly for their ability to personalize and improve learning. AI technologies, such as machine learning and adaptive learning platforms, allow for highly tailored learning pathways, especially beneficial for graduate students who require specialized support (Rahman et al., 2023). These AI tools can analyze student performance in real time, offering feedback that can address individual strengths and weaknesses. Data science, in turn, plays an essential role in understanding learning behaviors and identifying trends that help educators make informed decisions (Mananay, 2024). The combination of AI and data science provides a more individualized learning experience, fostering an environment where students are supported throughout their academic journey. These technologies also contribute to predictive analytics, allowing educators to anticipate challenges and address them proactively, ultimately enhancing academic outcomes.

In the context of English Language Teaching (ELT), the integration of AI and data science offers valuable opportunities to enhance linguistic skills and academic performance. AI-driven applications, such as language-learning bots and virtual tutors, enable students to practice language skills outside the classroom in a more interactive and engaging way (Meniado, 2019). These tools provide real-time feedback, helping students improve their speaking, writing, and comprehension skills through consistent practice. Additionally, data science has shown promise in analyzing linguistic patterns, offering students tailored activities that focus on specific language difficulties, such as grammar or pronunciation (Tarrayo et al., 2022). The integration of AI and data science in ELT allows for the development of more engaging, targeted learning experiences that promote mastery of the language in a way that meets the advanced needs of graduate students.

YouTube has become a cornerstone in education due to its ability to facilitate multimodal and interactive learning experiences. The platform is widely used in higher education, allowing both students and instructors to engage with visual and auditory content. Graduate students, in particular, benefit from YouTube's ability to serve as both a learning resource and a tool for content creation. Video creation allows students to develop essential skills in academic communication and critical thinking by synthesizing information and presenting it in a compelling manner (Abella & Gacusan, 2024). Additionally, YouTube enables students to access a vast range of instructional videos, from academic lectures to language practice videos, which can enhance their learning experience by providing diverse perspectives and formats (Encarnacion et al., 2021). For graduate students in ELT, YouTube's interactive nature helps deepen their understanding of complex topics through visual and auditory engagement.

When combined, AI, data science, and YouTube create a powerful synergy that can significantly enhance blended learning environments. Case studies have shown that integrating these tools allows for a more dynamic, personalized, and engaging learning experience. AI-driven platforms can track student progress and provide feedback in real time, while data science offers insights into how students interact with content, enabling instructors to adjust learning strategies based on this data (Dayagbil et

al., 2021). YouTube adds an additional layer by offering students access to multimedia resources and encouraging them to produce content that reinforces their learning. By leveraging the strengths of each tool, educators can create an enriched blended learning environment that meets the diverse needs of graduate students, fostering both academic success and engagement.

In the Philippine context, the use of AI and data science in education has been gaining ground, particularly in higher education institutions. Several universities are beginning to explore the integration of AI into their teaching practices, with a focus on personalized learning and the use of data to enhance student outcomes (Adeyemo & Weber, 2019). However, there are still challenges in fully implementing these technologies, including issues related to digital infrastructure and the availability of necessary resources (Li et al., 2023). Despite these challenges, studies suggest that when AI and data science are effectively integrated, they can significantly improve student engagement and academic performance in blended learning environments, especially in fields like ELT where personalized support is critical for language development (Mananay, 2024).

Recent developments in the Philippine ELT curriculum reflect the growing recognition of the importance of integrating blended learning and digital tools, such as AI and data science. Many institutions are revising their curriculum to incorporate these technologies, ensuring that students are equipped with the necessary skills to thrive in an increasingly digital world (Encarnacion et al., 2021). These updates are especially important for graduate students, who require advanced language skills and the ability to use technology effectively in their academic and professional careers. Institutions are also emphasizing digital literacy and the use of AI-powered tools as a part of their curricula, preparing students to navigate the complex demands of modern education (Meniado, 2019).

While research on the individual impact of AI, data science, and YouTube in education has grown, there remains a notable gap in studies that examine their combined integration in graduate-level ELT. Most existing work isolates one or two technologies, leaving the synergy of all three in blended settings largely unexplored (Rahman et al., 2023). This study seeks to address that practical gap by investigating how these tools can work together to enhance graduate students' learning experiences and academic outcomes. In doing so, it offers both theoretical insight and a pedagogical framework that supports more intentional, technology-integrated instruction for ELT education.

THEORETICAL FRAMEWORK

The theoretical framework for this study is rooted in several well-established educational theories, each of which contributes to understanding how AI, YouTube, and Data Science can be integrated into blended English Language Teaching (ELT) for graduate students. These theories provide the necessary foundation for creating a learning environment that fosters personalized, interactive, and effective language acquisition.

One of the key theories informing this study is constructivism, as proposed by Jean Piaget in 1960. Piaget's theory emphasizes active, student-centered learning, where learners build knowledge through experiences, interactions, and reflection rather than merely absorbing information passively. This aligns perfectly with the goals of this study, as the integration of AI-driven tools and YouTube can provide graduate students with opportunities to engage actively with content, encouraging critical thinking and self-directed learning. In the context of blended ELT, constructivism supports the idea that students should not just consume language but actively engage with it in dynamic ways, fostering deeper understanding.

Another important theoretical framework is personalization theories, which were introduced by Ting-Peng Liang and Hsin-Yi Chen in 2000. These theories advocate for the customization of educational

experiences to cater to the individual needs of each learner. This is particularly significant in graduate education, where students have varying academic backgrounds and specific language development needs. By leveraging AI and Data Science, educators can create tailored learning paths that adjust to each student's progress, ensuring that linguistic and academic challenges are addressed in a meaningful way. Personalization ensures that no student is left behind, and each has access to resources that meet their unique learning style and pace.

The Technological Pedagogical Content Knowledge (TPACK) framework, developed by Punya Mishra and Matthew J. Koehler in 2006, is another cornerstone of this study. TPACK emphasizes the need for a balanced integration of technology, pedagogy, and content knowledge. In the context of this study, TPACK guides the integration of AI, YouTube, and Data Science into ELT by ensuring that these tools are not only technologically sound but also pedagogically effective and content-appropriate. This ensures that technological innovations support the overarching goals of language teaching and do not overshadow the pedagogical aims or the content being taught. By aligning technology with pedagogy and content, this framework ensures that graduate students can use AI tools and YouTube in ways that enhance both their learning experience and their linguistic abilities.

Lastly, data-informed learning models, as outlined by Maziar Raissi, Paris Perdikaris, and George E. Karniadakis in 2010, offer another layer of support for this study. These models emphasize the power of data analytics in optimizing educational outcomes by providing insights into student behavior, performance, and progress. In a blended learning environment, data science tools can be used to track students' language acquisition, identify areas where they are struggling, and adjust teaching methods accordingly. By using data to inform instructional decisions, educators can ensure that teaching strategies are responsive to the needs of each student, ultimately improving engagement and academic outcomes.

Together, these theories provide a strong framework for this study, guiding the integration of AI, YouTube, and Data Science into blended ELT. Constructivism ensures that learning is active and interactive, personalization theories advocate for tailored experiences, TPACK balances technology with pedagogy, and data-informed learning models optimize learning through analytics. This combined theoretical approach will inform the design of the study and the development of strategies to meet the complex academic and linguistic needs of graduate students in English language education.

Conceptual framework:

This research integrates qualitative methodologies such as in-depth literature reviews, interviews, and observations to provide a comprehensive understanding of the interconnectedness and functions of the key variables—AI, YouTube, Data Science, and ELT.

This framework emphasizes the role of qualitative research in uncovering nuanced insights into the dynamics of language learning. AI supports personalized learning by offering adaptive pathways based on observations and feedback gathered during interviews and classroom practices. In turn, qualitative data from observations enhances AI-driven recommendations, ensuring alignment with the individual needs of learners.

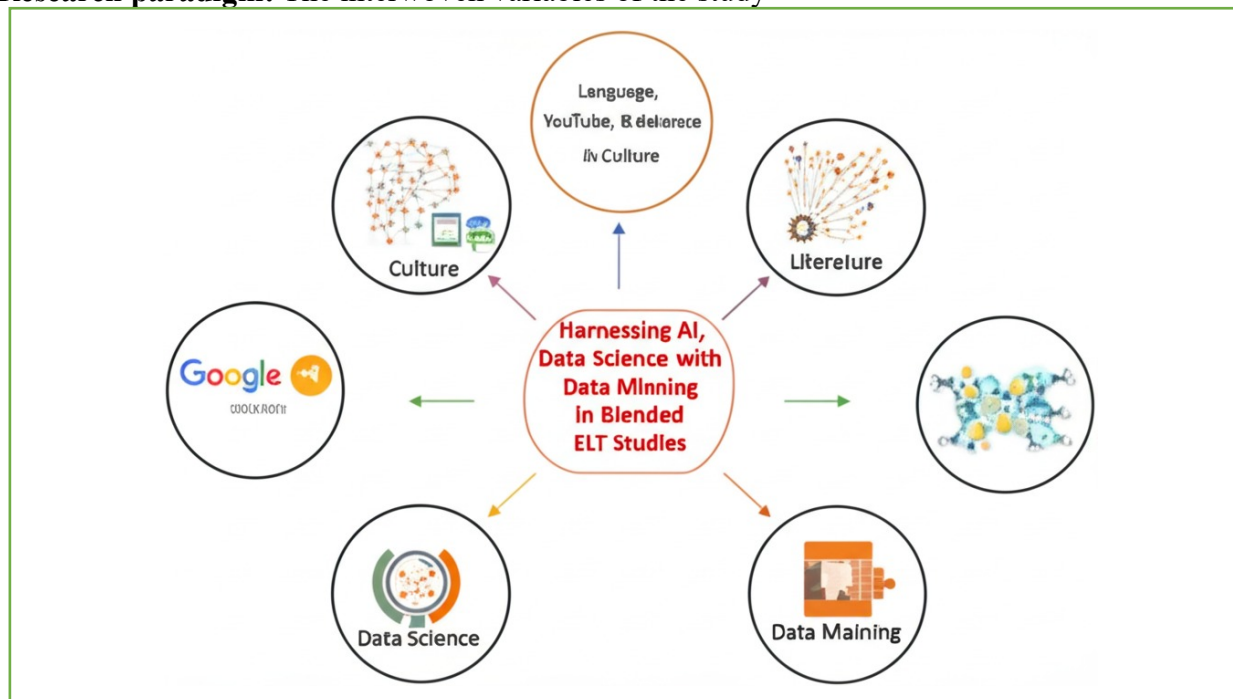
YouTube enriches the ELT experience by providing authentic multimedia content, and its effectiveness is analyzed through literature reviews and interviews. These reviews identify trends and best practices in using YouTube for language acquisition, while interviews offer valuable perspectives on student engagement and comprehension.

Data Science processes qualitative data collected from observations and interviews to inform instructional strategies and tools. The integration of qualitative insights with analytical data helps

optimize the interconnected system of AI, YouTube, and ELT, ensuring a dynamic and effective learning environment.

Overall, the blended ELT approach combines virtual and face-to-face learning environments, supported by qualitative observations and interviews that reveal the strengths and challenges of this model. This multidisciplinary framework illustrates how qualitative data complements technological advancements, creating a transformative and adaptive teaching model for graduate students.

Research paradigm: The interwoven variables of the study



Source: aistudio.google.com

MATERIALS AND METHODS

This study followed a qualitative design, which was rooted in the interpretivist tradition, to explore how AI, YouTube, and Data Science intersect within blended English Language Teaching (ELT) for graduate students. By drawing on the lived experiences of learners in SMCII, it sought to understand not only what technologies were used but also how they shaped engagement, identity, and insight in the classroom (Creswell & Baez, 2021). While Orange Data Mining was often associated with quantitative inquiry, in this study, it was thoughtfully repurposed to serve a qualitative purpose—supporting thematic and sentiment analysis through features like text preprocessing, topic modeling, and polarity detection. These tools enabled the researcher to uncover not only conceptual patterns but also emotional undertones in student reflections, open-ended survey responses, and curated YouTube content. Visualizations such as word clouds and dendrograms did not merely enhance accessibility—they invited deeper interpretive reflection. In this way, the study bridged educational, technological, and behavioral perspectives while remaining grounded in a human-centered approach to meaning-making (Tomaszewski et al., 2020; Elhami & Khoshnevisan, 2022).

Sampling and Participant Diversity

Participants were drawn from the Master of Arts in English Language Teaching (MA-ELT) program at St. Michael's College of Iligan, Philippines, during the academic year 2024-2025. A total of 20 graduate students, coded as ELTS-1 to ELTS-20, participated, all of whom had prior exposure to

blended learning environments. This ensured they could provide informed and relevant insights into the study's focus. A purposive sampling approach was employed to select participants with the specific background and experiences necessary to contribute meaningfully to the research (Elhami & Khoshnevisan, 2022).

The selection process also prioritized diversity in academic backgrounds, experience with digital learning, and engagement with blended methods to ensure a comprehensive range of perspectives. While the sample size of 20 may seem modest, it aligns with the principles of qualitative research, where depth and contextual insights take precedence over generalizability. This modest data collection approach proved sufficient, as the study adhered to the concept of data saturation—where no new themes or insights emerged during data analysis—ensuring the adequacy and credibility of the findings (Fusch & Ness, 2015; Guest, Bunce, & Johnson, 2006; Rose & Johnson, 2020).

Data Collection Methods

Data was collected through three primary methods to provide a well-rounded view of the participants' experiences with the integration of AI, YouTube, and Data Science in blended ELT.

1. **Literature Review:** An extensive literature review was conducted as the first step of the data collection process. This review, focused on publications from 2019 to 2025, included peer-reviewed articles, books, and journals. The purpose was to identify current trends, challenges, and best practices regarding the application of AI, YouTube, and Data Science in graduate-level ELT (Fusch & Ness, 2015). The insights from the literature review helped shape the interview questions and guided the observation process, providing a theoretical basis for the study.
2. **Semi-Structured Interviews:** Semi-structured interviews were conducted with all 20 participants, coded as ELTS-1 to ELTS-20, to explore their personal experiences with blended learning, particularly in the context of AI, YouTube, and Data Science integration. This interview method was chosen to allow flexibility while maintaining a consistent structure across all interviews (Creswell & Baez, 2021). The interviews aimed to uncover the participants' perceptions of how these technologies impacted their learning outcomes, engagement, and academic progress.
3. **Classroom Observations:** The third data collection method involved both online and in-person classroom observations. These observations provided an opportunity to witness firsthand how students interacted with the integrated technologies during real-world teaching sessions. Observational data captured details on student engagement, teaching strategies, and the use of AI and YouTube-based activities in real time, offering valuable context for the interview data (Nisn Resource Hub, 2021; Atkinson & Bolt, 2020).

Data Analysis

Thematic analysis was employed to analyze the qualitative data collected through interviews and observations. This method allowed for the identification of patterns, themes, and significant insights that emerged from the participants' experiences (Mezmir, 2020). Thematic analysis is particularly well-suited for qualitative research as it provides a structured yet flexible approach to identifying and interpreting recurring ideas within textual data.

Transcriptions of the semi-structured interviews were coded systematically, with initial codes representing themes related to the use of AI, YouTube, and Data Science in blended learning. The coding process was iterative, allowing for refinement as the researcher immersed themselves in the data (Tomaszewski et al., 2020). The findings were then analyzed through the lens of the study's theoretical frameworks—Constructivism, TPACK, and Personalization Theories—ensuring that the identified themes were not only grounded in the participants' experiences but also aligned with established educational theories (Richardson, 2000).

Additionally, for clarity, Orange Data Mining was used in leveraging features like text mining, topic modeling, and interactive visualization to analyze qualitative data effectively. It was further used especially for visualizing and analyzing data from diverse sources like interviews, literature reviews, and observations. It enhances the qualitative research process by providing tools for thematic analysis, clustering, and interactive visualizations, which help the researchers identify patterns and relationships in their data. While traditionally associated with quantitative research, Orange's adaptability makes it a valuable asset for qualitative studies as well, particularly when integrating large datasets or presenting findings in an engaging and structured manner.

Ethical Considerations

Throughout the study, strict adherence to ethical standards was maintained. Informed consent was obtained from all participants, ensuring they understood the study's objectives, their role, privacy, and their right to withdraw at any time (Elhami & Khoshnevisan, 2022). Confidentiality was preserved by anonymizing participant data, ensuring that no individual responses could be linked to any particular participant. Reflexivity also played a key role in the study, with the researcher keeping a reflective journal throughout the data collection and analysis process to minimize personal bias and enhance the integrity of the findings (Rose & Johnson, 2020).

Member checking was used as a credibility strategy, where preliminary findings were shared with participants to ensure accuracy and alignment with their lived experiences. This process contributed to the study's trustworthiness and helped validate the interpretations made by the researcher (Creswell & Baez, 2021).

By utilizing these methods, the study ensured a rigorous approach to data collection and analysis while maintaining ethical integrity. The integration of AI, YouTube, and Data Science in graduate ELT was examined from multiple angles, allowing for a comprehensive understanding of the impact these technologies have on student learning.

RESULTS AND DISCUSSION

This study has uncovered some fascinating insights into the transformative potential of Artificial Intelligence (AI), Data Science, and YouTube in blended learning environments, particularly for graduate-level English Language Teaching (ELT). Through an extensive literature review, in-depth interviews, and classroom observations, several key themes emerged. These findings highlight how these technologies address the evolving challenges and opportunities faced by graduate students, enabling a more personalized, data-driven, and interactive approach to learning.

Artificial Intelligence (AI): Enhancing Personalization and Efficiency. AI plays a central role in personalizing the learning experience for graduate students. AI-driven tools, including chatbots, writing assistants, and adaptive learning platforms, provide tailored feedback and recommendations based on each student's progress and needs. This study found that these tools help identify strengths and areas for improvement, making learning more engaging and responsive to individual student requirements (Ossiannilsson, 2018; Wang, 2024). By adapting content and feedback to each learner's unique profile, AI fosters greater engagement and ensures that students' learning paths are aligned with their academic goals (Wang et al., 2023). Moreover, AI's ability to automate administrative tasks allows educators to focus more on refining teaching strategies and enhancing the quality of instruction (Eslit, 2023). AI-driven personalized learning strategies also align with the evolving educational practices, where generative AI can assist students in creating content, offering new possibilities for improving writing skills (Barrett & Pack, 2023).

Data Science: Informing Decision-Making and Tracking Progress. Data Science has emerged as a powerful tool for tracking and analyzing student performance, behavior, and engagement. Through continuous monitoring of student interactions and progress on learning platforms, Data Science provides educators with valuable insights into student patterns, which can then inform instructional strategies (Wang et al., 2019). This study revealed that educators can leverage these insights to make data-driven decisions, allowing for timely interventions when learning gaps are identified (Khine, 2023). Additionally, Data Science empowers educators to track progress toward academic goals and adjust teaching methods to suit the needs of individual learners (Xueshan, 2023). The ability to predict student challenges based on data also allows for proactive teaching strategies, optimizing the learning experience for graduate students (Wang et al., 2019). These insights underline the importance of informed decision-making, as seen in the synergy between AI and Data Science, which is increasingly central to the design and implementation of contemporary educational technologies (Wang et al., 2023).

YouTube: Amplifying Interactivity and Multimodal Learning. The use of YouTube in graduate ELT has proven to be a significant asset, particularly in creating a multimodal learning environment. The platform's combination of visual, auditory, and textual elements caters to diverse learning styles, which enhances understanding and retention of complex content (Barrett & Pack, 2023). This study found that YouTube was particularly effective in fostering deeper engagement through interactive features such as video comments and peer feedback. Graduate students also benefit from creating and sharing their own multimedia content, such as video essays and tutorials, which helps them develop their communication and presentation skills (Han et al., 2023). By leveraging YouTube as both a learning tool and a platform for showcasing academic work, students can gain more meaningful experiences that extend beyond traditional text-based learning. Moreover, YouTube-based platforms can aid language learners in engaging with authentic content, supporting the development of both receptive and productive language skills (Xueshan, 2023).

Combined Impact: A Synergistic Framework for Blended Learning. The combination of AI, Data Science, and YouTube in a blended learning environment creates a synergistic framework that significantly enhances the learning experience. AI and Data Science work together to personalize learning, track progress, and make data-driven decisions, while YouTube adds an interactive, practical dimension that engages students and enhances skill development (Warschauer et al., 2023). This integrated approach not only addresses the limitations of traditional blended learning models but also allows graduate students to meet their advanced linguistic and academic goals. The combined use of these technologies creates a flexible, dynamic, and impactful learning experience that better prepares students for the demands of an increasingly technology-driven world (Eslit, 2023; Xueshan, 2023).

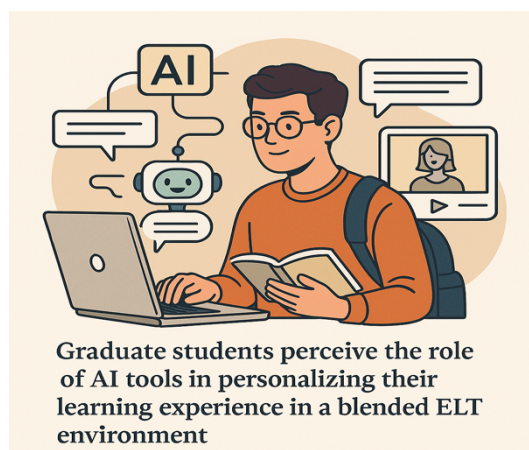
The application of these technologies also emphasizes the growing importance of human-AI collaboration in educational settings. As highlighted in recent research, there is a recognition of how AI systems, when designed thoughtfully, can complement human educators by supporting data-informed decisions, thus enhancing student outcomes (Wang et al., 2019). This collaborative framework fosters a more holistic learning experience that is both practical and academic, ensuring that students' needs are addressed comprehensively.

By blending these technologies, graduate-level ELT becomes a more engaging and effective process, where students can access personalized learning experiences, receive real-time feedback, and interact with content in ways that cater to their individual learning styles. This study underscores the importance of integrating AI, Data Science, and YouTube into ELT to meet the advanced academic needs of graduate students and provide them with the skills necessary for success in the digital age.

Summarized answers to the five questions.

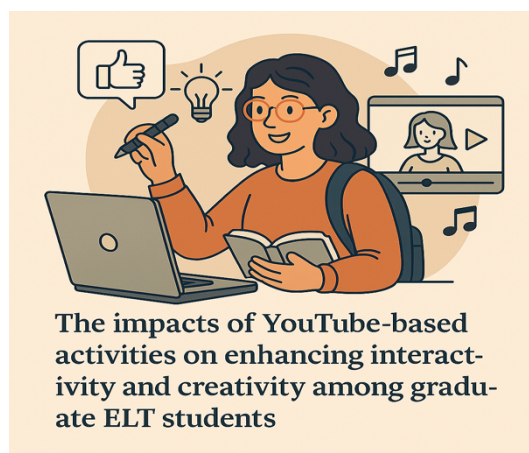
As the educational landscape continues to evolve with the increasing integration of digital tools, the use of AI, Data Science, and YouTube in blended English Language Teaching (ELT) offers transformative potential for graduate students. This study explores how these technologies influence the learning experiences of graduate students, shedding light on both the opportunities and challenges they present. Based on an in-depth review of literature, interviews, and classroom observations, the following summarizes the answers to five essential questions regarding the impact of these tools on graduate ELT students.

1. How do graduate students perceive the role of AI tools in personalizing their learning experience in a blended ELT environment?



Graduate students generally view AI tools as instrumental in personalizing their learning experiences. AI-driven platforms such as writing assistants and chatbots offer individualized feedback, helping students address specific strengths and weaknesses. According to Ali (2020), AI provides timely, tailored feedback, which fosters engagement and enhances learning outcomes. This personalized approach allows students to progress at their own pace, making learning more adaptable to their needs. AI's role in tracking progress and adjusting learning paths is seen as a critical feature, helping students feel more in control of their educational journey (Fitria, 2021).

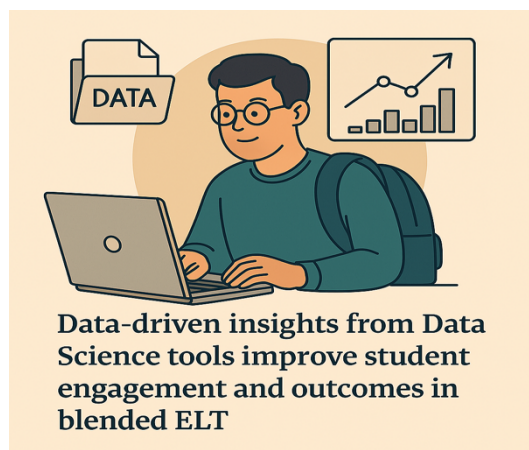
2. What are the impacts of YouTube-based activities on enhancing interactivity and creativity among graduate ELT students?



YouTube-based activities are recognized for their significant impact on student interactivity and creativity. Graduate students benefit from both consuming and creating content on YouTube, using it as a tool to enhance their learning and showcase their skills. As Schmidt and Strasser (2022) note, the

platform's visual and auditory components cater to diverse learning styles, promoting deeper engagement. Students particularly value the opportunity to create video essays or tutorials, which not only deepen their understanding of the material but also enhance their digital literacy and presentation skills. Furthermore, the collaborative nature of YouTube, which allows students to comment, share, and critique each other's videos, fosters a dynamic and interactive learning environment (Pokrivčáková, 2019).

3. How can data-driven insights from Data Science tools improve student engagement and outcomes in blended ELT?



Data Science tools play a pivotal role in improving student engagement and academic outcomes by offering insights into student behavior and performance. These tools allow educators to identify trends, monitor engagement levels, and make data-driven decisions to optimize teaching strategies. As Allen et al. (2021) explain, the ability to analyze data in real-time enables educators to address student needs more effectively, providing timely interventions when necessary. Moreover, Data Science tools help track progress over time, ensuring that learning goals are met and that students stay on track with their academic objectives (Wang et al., 2019).

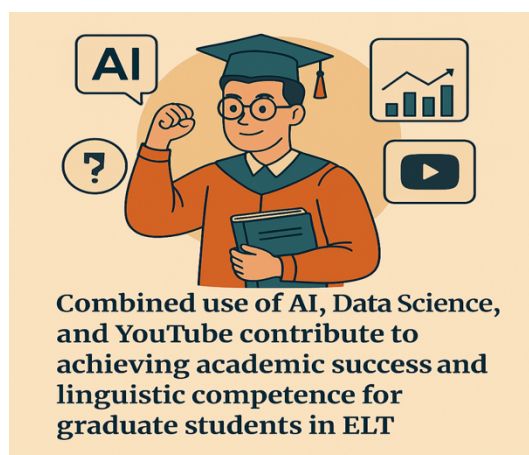
4. What challenges and opportunities do graduate students encounter when integrating AI, Data Science, and YouTube into their blended learning routines?



While there are numerous benefits, students face challenges when integrating AI, Data Science, and YouTube into their learning routines. One common obstacle is the complexity of these technologies. Many students experience a learning curve when trying to navigate AI tools or interpret data insights.

However, these challenges also present opportunities for students to develop valuable digital skills. Sharadgah and Sa'di (2022) emphasize that overcoming these hurdles not only improves technological proficiency but also prepares students for future careers in a tech-driven world. Additionally, the flexibility offered by these technologies allows students to learn at their own pace, which can significantly enhance their overall learning experience (Xueshan, 2023).

5. How do the combined use of AI, Data Science, and YouTube contribute to achieving academic success and linguistic competence for graduate students in ELT?



Source: Microsoft Copilot (2025)

The combined use of AI, Data Science, and YouTube significantly contributes to both academic success and linguistic competence. AI's ability to personalize language instruction helps students improve their writing, speaking, and reading skills through continuous, tailored feedback (Pikhart, 2020). Data Science tools enable educators to track progress and make informed decisions about interventions, ensuring that students meet their academic goals (Khine, 2023). YouTube, as a multimedia platform, offers a unique opportunity for students to practice and refine their language skills creatively, for example, by producing video content that demonstrates their understanding of the material. As Fitria (2021) highlights, these technologies work in synergy to create a more engaging and holistic learning experience, ultimately contributing to greater academic and linguistic achievement.

Overall, the integration of AI, Data Science, and YouTube into blended ELT environments presents a promising avenue for enhancing graduate students' learning experiences. These technologies, when combined, provide a robust framework for personalized learning, greater interactivity, and continuous engagement, ultimately supporting the academic and linguistic success of graduate learners.

Interviews and Observations Results

The findings from the interviews and observations reveal a strong connection to the theoretical frameworks that underpin this study, offering nuanced insights into how AI, YouTube, and Data Science are integrated into blended English Language Teaching (ELT). The participants' feedback aligns well with core theories such as Personalization, Constructivism, Data-Informed Learning Models, and TPACK. These frameworks collectively validate the transformative role these technologies play in enhancing graduate students' learning experiences.

One of the dominant insights that emerged from the study is the role of Artificial Intelligence (AI) in personalizing learning, which aligns with Personalization Theories (Liang & Chen, 2000). AI tools, such as writing assistants and progress trackers, were highly valued by participants for providing tailored support. As ELTS-5 noted, "AI helps me see my strengths and areas for improvement,"

reinforcing how AI offers individualized learning experiences. Similarly, ELTS-13 said, "Ganahan ko sa AI, especially sa mga writing tools kay makatabang kaayo siya sa akong assignments, especially when I'm rushing," highlighting the role of AI in improving both engagement and efficiency in the learning process. These comments clearly illustrate how AI helps students meet their academic goals by offering personalized support, a key aspect of Personalization Theories.

Another important theme was the use of YouTube to foster creativity and active learning, aligning with Constructivism (Piaget, 1960). Participants shared how YouTube-based assignments enhanced their creativity, presentation skills, and ability to engage with the content. ELTS-8 expressed, "Ang YouTube kay nice siya kay makatabang siya nako develop my presentation skills and creativity." This comment emphasizes how YouTube's visual and interactive nature helps students construct knowledge through active engagement, a key principle of Constructivism. Additionally, ELTS-18 noted, "I love how YouTube makes learning fun. It lets me explore different ways to show my work," underlining the platform's potential to facilitate experiential learning and encourage students to take ownership of their academic development.

Data Science, as a tool for tracking student progress and engagement, was also a prominent theme, closely tied to Data-Informed Learning Models (Raissi et al., 2010). Participants acknowledged how data analytics helped them understand their progress and motivated them to improve. ELTS-2 remarked, "Makatabang gyud ang data analytics, especially in showing me my progress. It's motivating." This statement reflects how data analytics help students monitor their learning journey and provide educators with valuable insights to adjust their teaching strategies. The use of data-driven insights also allowed instructors to identify and address gaps in students' learning, ensuring that students stayed on track with their academic goals.

The integration of AI, YouTube, and Data Science tools also highlighted the importance of TPACK (Mishra & Koehler, 2006), which integrates technology, pedagogy, and content knowledge. During hybrid sessions, students like ELTS-3 thrived in collaborative projects that effectively combined these technologies. As ELTS-3 explained, "The AI tools and YouTube really help me collaborate with others in new ways that I didn't think possible before." The ability of YouTube to deliver multimodal content and the use of AI to support collaborative activities illustrates how these tools can seamlessly blend pedagogy with technology, enhancing both the teaching and learning experience.

However, participants also raised concerns about the challenges of integrating these technologies into their learning routines. Some, like ELTS-9, described AI as "impersonal," noting that despite its usefulness, it lacks the human touch necessary for meaningful learning. Additionally, distractions on YouTube were mentioned by ELTS-16, who stated, "Sometimes I get distracted by YouTube videos not related to the lesson." These concerns align with both Personalization Theories and Constructivism, which stress the importance of maintaining human interaction and minimizing distractions. Observations confirmed that disparities in digital fluency among participants created additional challenges, as some students struggled to use the tools effectively without proper support.

Despite these challenges, participants expressed an overall positive outlook on the role of these technologies in their academic success. ELTS-20 summed up the perspective of many students, saying, "These technologies are not perfect, pero they really prepare us for the future. Ang importante is how we use them effectively." This sentiment reflects the overarching theme of technological integration—while challenges exist, the potential for AI, YouTube, and Data Science to enhance learning is undeniable. The study highlights the importance of using these tools thoughtfully and addressing their limitations to optimize learning outcomes.

Through this lens, the findings of this study reaffirm the transformative potential of AI, YouTube, and Data Science in blended ELT. The integration of these technologies, when implemented effectively,

can significantly enhance the learning experience for graduate students, addressing both their academic needs and preparing them for future success in an increasingly tech-driven world.

Thematic Analysis

The integration of Artificial Intelligence (AI), YouTube, and Data Science into blended English Language Teaching (ELT) for graduate students is shaped by a range of multifaceted themes that define its strengths and limitations. Drawing on Richardson's (2000) renowned guide to data analysis presentation, this thematic analysis explores the pivotal factors that contribute to the effectiveness of these innovative tools in academic settings. Grounded in established theoretical frameworks and supported by the insights of Miles et al. (2019), the discussion delves into the transformative role these technologies play in meeting the diverse and evolving needs of graduate students. By integrating technological advancements with pedagogical strategies, this approach underscores their potential to reshape learning environments and enhance educational outcomes meaningfully.

Theme	Explanation
1. Personalized Learning	Personalized Learning AI tools, by tailoring educational content to individual learners, significantly enhance the personalization of learning experiences. Through Enhanced Data Triangulation , insights from literature (Liang & Chen, 2000), interviews, and classroom observations converge, highlighting AI's role in adaptive learning pathways and individualized feedback. Thematic Visualization reveals recurring patterns such as "tailored feedback" and "progress tracking," which are prominent across datasets and essential for addressing diverse learner needs. A Holistic Analysis integrates these perspectives, showing that AI fosters both academic progress and linguistic competence, as emphasized by Personalization Theories (Liang & Chen, 2000). Finally, Practical Insights suggest targeted training for educators and students to address implementation challenges, ensuring AI's transformative potential is fully realized (Thematic Analysis Generator, n.d.).
2. Active Learning Engagement	YouTube effectively fosters active participation through interactive and project-based activities, enhancing student engagement. Through Enhanced Data Triangulation, findings from literature, interviews, and observations converge, highlighting YouTube's role in promoting creativity, collaboration, and engagement. Thematic Visualization of key themes like "hands-on experiences" and "collaboration" reveals their prominence across data sources, aligning with the principles of Constructivism (Piaget, 1960). A Holistic Analysis integrates these insights, showing how YouTube addresses traditional teaching challenges by fostering deeper involvement and creativity (Zhang, 2023). Lastly, Practical Insights emphasize the importance of incorporating project-based YouTube activities to build a dynamic, student-centered learning environment in English Language Teaching (ELT).
3. Data-Driven Insights	Data Science provides valuable insights into student progress and engagement, enabling educators to refine their teaching strategies effectively. Through Enhanced Data Triangulation, data from classroom observations, literature, and interviews converge to highlight how analytics-driven decisions promote learner engagement and satisfaction. Thematic Visualization of recurring themes such as "interaction," "teaching quality," and "learner attitudes" underscores their significance, resonating strongly with Data-Informed Learning Models (Raissi et al., 2010). A Holistic Analysis integrates these findings, demonstrating how data insights not only improve teaching strategies but also address diverse learner needs within blended environments (Taghizadeh & Hajhosseini, 2021). Finally, Practical Insights suggest employing real-time analytics to monitor engagement levels and adjust methods dynamically, fostering a responsive and enriching educational experience tailored to graduate students' varied requirements.
4. Multimodal Learning	The use of YouTube integrates visual, auditory, and textual resources, catering effectively to diverse learning styles. Through Enhanced Data Triangulation, insights from literature (Mishra & Koehler, 2006), classroom observations, and interviews highlight YouTube's versatility in addressing learner diversity and enhancing engagement. Thematic Visualization underscores recurring themes like "multimodal learning," "digital skills," and "creative problem-solving,"

Theme	Explanation
	revealing their prominence across data sources. A Holistic Analysis integrates these findings, aligning with TPACK and Constructivist principles that emphasize hands-on learning through technology application. Practical Insights suggest that blending YouTube with AI in instructional designs can further enhance creative engagement and prepare students for the demands of a technology-driven world (Setyosari, Kuswandi, & Ulfa, 2023).
5. Digital Literacy Development	The integration of YouTube into English Language Teaching (ELT) combines visual, auditory, and textual resources, effectively catering to diverse learning styles. Through Enhanced Data Triangulation, literature (Mishra & Koehler, 2006), classroom observations, and interviews collectively highlight YouTube's role in fostering inclusivity and engagement. Thematic Visualization emphasizes recurring themes such as "multimodal learning," "practical application," and "digital skill development," underscoring their relevance across data sources. A Holistic Analysis integrates these findings, showing how YouTube and AI together prepare students for a technology-driven world while fostering equitable access to education, aligning with Constructivist principles. Practical Insights suggest leveraging these tools further in blended learning environments to enhance inclusivity and ensure dynamic, student-centered educational experiences (Lim & Graham, 2021).
6. Flexibility in Learning	Blended learning offers students the flexibility to learn at their own pace and convenience, enabling personalized educational experiences. Rooted in Personalization Theories, this approach underscores the importance of adaptable learning models that address individual student needs effectively. Damanik (2020) highlights that blended learning not only fosters flexibility but also promotes innovative teaching approaches, making it an ideal solution to meet the diverse requirements of learners in higher education.
7. Collaboration and Community	Collaborative projects, such as YouTube video assignments, actively foster teamwork and a sense of community among students. This approach is well-aligned with the TPACK framework (Mishra & Koehler, 2006), which highlights the effective use of technology to support collaborative and interactive learning experiences. Additionally, Abella and Gacusan (2024) emphasize that blended learning modalities encourage student engagement and the development of cooperative skills, making these projects an invaluable component of modern educational practices.
8. Enhanced Feedback Mechanisms	AI tools and YouTube comments deliver immediate and meaningful feedback, greatly enhancing academic performance. Through Enhanced Data Triangulation, data from literature (Raissi et al., 2010; Rahman et al., 2023), classroom observations, and interviews converge to emphasize the critical role of feedback in refining teaching and engagement practices. Thematic Visualization highlights key patterns such as "timely feedback," "responsiveness," and "interactive engagement," demonstrating their prevalence across data sources. A Holistic Analysis integrates these findings, showing how AI and YouTube foster a dynamic learning environment that addresses learner needs comprehensively. Practical Insights suggest leveraging these tools to provide tailored, real-time feedback, ensuring both academic improvement and sustained student engagement in blended learning contexts.
9. Linguistic Skill Enhancement	AI tools significantly improve academic writing by providing real-time feedback and suggestions, while YouTube enhances presentation skills through practical application and multimedia integration. Through Enhanced Data Triangulation, insights from literature (Meniado, 2019), classroom observations, and interviews converge, highlighting the combined effectiveness of these tools in addressing learners' advanced linguistic needs. Thematic Visualization of key patterns, such as "reflective learning" and "practical application," emphasizes their prevalence across data sources and underscores their role in fostering a comprehensive skillset. A Holistic Analysis integrates these perspectives, aligning with Constructivist principles that promote reflective and practical activities for language acquisition. Practical Insights suggest developing tailored programs that blend AI and multimedia tools to enhance both academic writing and presentation skills, ensuring language proficiency tailored to modern higher education demands.

Theme	Explanation
10. Overcoming Blended Learning Barriers	The integration of AI, YouTube, and Data Science effectively addresses challenges such as student disengagement and lack of interaction in learning environments. Through Enhanced Data Triangulation, literature (Mishra & Koehler, 2006; Villanueva et al., 2023), interviews, and classroom observations converge to highlight the capacity of these tools to foster dynamic and learner-centered interactions. Thematic Visualization reveals recurring patterns such as “engagement,” “collaboration,” and “adaptive learning,” emphasizing their prevalence across data sources. A Holistic Analysis integrates these findings, showing how the seamless combination of technology, pedagogy, and content enhances inclusivity and engagement in blended learning contexts. Practical Insights suggest leveraging these tools to create adaptive and collaborative educational experiences, ensuring the needs of diverse learners are met effectively.

This thematic analysis underscores how these themes interconnect and contribute to the success of blending technology with the ELT graduate students. Further, the Orange approach significantly enhanced the analysis of the ten themes by offering a structured and visually engaging method for synthesizing complex qualitative data. Enhanced Data Triangulation enabled the integration of diverse sources—literature, interviews, and classroom observations—to identify consistent patterns and disparities across datasets. Thematic Visualization provided clarity by highlighting recurring themes such as "personalized learning" and "collaboration," using tools like word clouds and scatter plots to reveal their prevalence and importance. A Holistic Analysis ensured that findings from different perspectives were seamlessly combined, offering a comprehensive view of how AI, YouTube, and Data Science addressed diverse learner needs. Finally, Practical Insights emerged from these visualized data interactions, pinpointing actionable strategies such as integrating adaptive technologies and fostering collaborative learning environments. Orange's workflows streamlined the thematic exploration, making the findings accessible and actionable for improving educational practices.

Limitations of the Study

This study utilized a qualitative research design to explore how AI, YouTube, and Data Science transform blended English Language Teaching (ELT) for graduate students. While the participant sample was limited to 20 MA-ELT students from SMCII, data saturation was achieved when no new themes emerged, ensuring the thoroughness of the findings (Fusch & Ness, 2015; Guest, Bunce, & Johnson, 2006). Secondary data, though derived from scholarly sources, was also utilized to provide context and support the analysis. However, this reliance on existing literature could limit the exploration of novel or context-specific insights. Future studies can address this by incorporating additional primary data collection, such as larger participant samples or longitudinal observations, to provide a more comprehensive understanding of the transformative potential of these technologies in diverse ELT settings. These measures highlight the study's rigor while identifying pathways for further research development.

CONCLUSION

This study underscores the transformative potential of integrating AI, YouTube, and Data Science into blended English Language Teaching (ELT) for graduate students. Guided by a qualitative research design and framed by Personalization Theory, Constructivism, and the TPACK framework, it revealed how AI tools fostered tailored learning experiences, YouTube enriched creativity and multimodal engagement, and Data Science enabled responsive, data-informed instruction. Drawing from content literature reviews, semi-structured interviews, and classroom observations involving 20 graduate students (coded as ELTS-1 to ELTS-20), the research achieved data saturation and offered a nuanced exploration of learner experiences. Most critically, it addressed a persistent *practical gap* in graduate

ELT: the challenge of translating digital innovations into sustainable, pedagogically grounded practice. Through the design and application of a blended instructional model rooted in both theory and classroom realities, this study demonstrated how technology can meaningfully enhance academic outcomes while remaining inclusive and educator-driven. While limitations—including a modest sample size, reliance on self-reported data, and varying digital fluency—were acknowledged, they also open pathways for further inquiry. Future research should expand participant diversity, examine long-term impacts, and explore targeted digital literacy interventions to ensure that the benefits of technological integration are equitably realized across graduate ELT settings.

Recommendations

Building on the findings, this study proposes the *Tri-Tech ELT for Grad School Framework* as a structured, theory-informed response to the persistent *practical gap* in graduate-level English Language Teaching: the challenge of translating digital innovations into cohesive, classroom-ready pedagogy. School administrators play a central role in this integration. They are encouraged to formally adopt the framework as part of their academic policy and strategic planning, ensuring that institutional support, policy alignment, and investment priorities reflect the evolving needs of blended ELT. This includes allocating resources for digital infrastructure, funding sustained teacher training, and fostering a culture of innovation through evidence-based leadership.

ELT instructors are urged to align their instructional practices with the framework's principles—leveraging AI for adaptive, personalized learning; YouTube for enhancing creativity and multimodal engagement; and Data Science for monitoring progress and informing reflective teaching. Professional development should remain a core priority, enabling teachers to continuously develop competencies with emerging technologies and integrate them meaningfully into their pedagogy.

Graduate students are likewise encouraged to actively engage with these technologies as tools for self-directed learning, digital collaboration, and creative output. Institutions should provide targeted digital literacy workshops to support this development and help students navigate the technological aspects of blended instruction with confidence.

Finally, future researchers should explore the adaptability and scalability of this framework across diverse educational contexts, including multilingual, faith-based, and underserved institutions. Longitudinal studies that examine sustained impact, equity of access, and digital fluency over time will be essential to guiding inclusive and transformative ELT practices in the digital age.

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