

# Teaching and Research Award (TRA) 2003: End of Project Report

**Project Title:** Understanding AI-Driven Teaching and Learning in On Distance Learning (ODL): Indepth Views from Participants of an 'AI Tutor' Intervention at the University of London Worldwide (UoLW)

Submitted to: The Director of the Centre for Online and Distance Education (CODE)

**Submitted by:** Dr Oscar Mwaanga, Principal Investigator, CODE Fellow and PgCert ISM programme Director and Georgi Ivanov, Research Associate, PgCert ISM Academic Coordinator

Date: 26<sup>th</sup> March 2024

#### **Executive Summary**

This report presents an in-depth qualitative assessment of "Walter," an AI Tutor developed by Noodle Factory, implemented in the Post and Undergraduate Law courses at the University of London Worldwide (UoLW). This investigation aimed to discern the impact of AI-driven tutoring on student engagement, performance, and its support for tutors, particularly focusing on its adaptability across different educational contexts, and its proficiency in handling FAQs and delivering personalised feedback.

The methodology encompassed a comprehensive approach, including the creation of detailed interview guides, securing ethical clearance, conducting a literature review, and interviewing a broad spectrum of stakeholders to gauge the educational impact of the AI Tutor. A thematic analysis of the interview data illuminated Walter's role in the educational arena, revealing significant insights.

Key findings from the study highlighted Walter's effectiveness in augmenting learning accessibility and customisation, while also bringing ethical and privacy concerns to the forefront. The irreplaceable value of human interaction in the educational process was strongly emphasized, alongside the critical need for careful pedagogical integration of AI tools.

Challenges faced during the project, such as delays in obtaining ethics clearance and recruitment difficulties, led to adjustments in the project timeline and methodology. Despite these hurdles, the project achieved its aims by February 16, 2024, and generated valuable outputs including a draft peer-reviewed paper, blog posts, and a planned conference presentation.

Based on our findings, we recommend the development of comprehensive ethical guidelines and the promotion of human-AI collaboration to ensure AI tutoring technologies complement rather than replace traditional teaching methods. Moreover, expanding support for educators and students in AI integration is crucial for maximizing the potential of these technologies in education. A pivotal recommendation includes implementing continuous evaluation and improvement processes for AI tutoring systems to gather feedback from all stakeholders. This iterative approach will enable the refinement of the AI's effectiveness and the addressing of any emerging ethical or pedagogical concerns, ensuring that AI tutoring systems remain aligned with educational goals and responsive to the evolving needs of learners and educators. Additionally, streamlining the ethical clearance process is advised to facilitate smoother and more efficient research and implementation efforts in the future. In conclusion, the 'AI Tutor' intervention, through the lens of "Walter," showcases the potential benefits and challenges of incorporating AI in education. By implementing the outlined recommendations, UoLW and similar institutions can navigate the complexities of AI integration, leveraging these technologies to enhance, rather than supplant, the rich tapestry of traditional educational methods.

# Contents

# Executive Summary

# Background and introduction 5

2

	Overview of Project Activities	6
	Encountered Challenges and Strategic Responses	6
Review	of Literature 7	
	Types of AI Chatbots	7
	Introduction to Noodle Factory and Their AI Chatbot Study Buddy Walter	8
	Noodle Factory's AI Chatbot Capabilities and Educational Package	8
	Functions for Tutors	9
	Functions for Students by the AI Chatbot Study Buddy Walter	10
	Integration of Noodle Factory AI Chatbot	12
	Adaptation of AI Technology in Education	12
	Tutors' and Students' Perspectives on Automated Feedback by 'Al Tutors'	13
	Integrating AI for Enhanced Personalised Learning and Addressing the Two Sigma Challenge	15
	Dissemination and Key Outputs	30

# References 33

# Figures

Figure 1.0: Administrative Interface Panel for Tutors	. 10
Figure 2.0: Study Buddy Walter's Interface	. 11

#### **Background and introduction**

Since its establishment in 1858, the University of London Worldwide (UoLW) has been a pioneer in the realm of higher education, notably recognised for its innovative contributions to distance learning. UoLW's historical significance is highlighted by its wide-reaching impact, having provided educational opportunities to 50,000 students across 190 countries in 2020, facilitated by a supportive network of over 100 Recognised Teaching Centres in 42 countries. This extensive influence is a testament to UoLW's unwavering commitment to excellence and innovation in open and distance learning (ODL) programmes. Furthermore, UoLW has played a vital role in making higher education accessible to historically marginalised groups, including women and individuals from former British colonies, thereby significantly advancing social equity and educational accessiblity on a global scale.

The introduction of Artificial Intelligence (AI) into the educational sector offers an unparalleled opportunity to further enhance the learning experience, particularly through the prism of personalised learning. In addressing Bloom's (1984) "Two Sigma Problem," which demonstrated the superior outcomes of one-to-one tutoring over traditional classroom instruction, UoLW acknowledges the challenge of economically scaling personalised learning. Nevertheless, AI provides promising avenues to overcome these obstacles by enabling scalable, personalised educational experiences. AI technologies, particularly chatbots enhanced with advanced natural language processing, offer an innovative solution to bridge the educational gap. These AI-driven tools can simulate the dynamics of personal tutoring by providing tailored feedback and responding to student inquiries in real-time, thereby enriching the learning experience with a degree of personalisation previously unachievable on a large scale.

However, the integration of AI into educational frameworks is not without challenges. Ethical considerations, including concerns related to data privacy, information accuracy, bias, and transparency, present significant hurdles. Moreover, the adoption of AI in education intersects with complex socio-economic, political, and legal dimensions, necessitating a careful, human-centric approach to ensure that AI serves as a complement to, rather than a replacement for, human educational efforts. The advancement of AI chatbots marks a significant milestone in the educational technology landscape. Initially emerging as basic rule-based systems in the 1960s, these digital assistants have evolved into intricate platforms, leveraging machine learning, conversational AI, and generative AI. Such progress spotlights the substantial impact AI could have on education by reshaping data analysis, creating content, and most crucially, personalising learning experiences.

The University of London Worldwide (UoLW), seizing these technological strides, has partnered with Noodle Factory to introduce an AI-enhanced pilot programme within its UG and PG Laws programme. This initiative is threefold: it aims to embed an AI 'study buddy' to accompany both undergraduate and postgraduate students, quantitatively measure the effectiveness of this integration, and conduct a qualitative analysis to capture detailed user feedback.

This reports centres on an in-depth qualitative evaluation of "Walter," an AI Tutor or study buddy by Noodle Factory, incorporated into the the University of London Worldwide (UoLW) UG and PG Lawas curriculum. It examines Walter's effect on student engagement and achievement and its provision of tailored feedback. Additionally, the study investigates Walter's versatility in meeting the varied educational requirements across the spectrum of Law programmes at UoLW, both at from undergraduate to postgraduate levels perspectives. This initiative is a testament to UoLW's dedication to advancing educational engagement and attainment by innovatively integrating AI into its teaching methodologies.

#### **Overview of Project Activities**

The project commenced with several key activities, including the appointment of a Research Assistant in July 2023, which marked a crucial step in enhancing our manpower. In August 2023, we conducted a strategic reassessment of our project design and objectives to align our research with the evolving academic landscape, sharpening our focus and methodology for increased relevance and efficacy.

A major milestone was the creation of four detailed interview guides to capture the diverse viewpoints of our stakeholders, including tutors, students, learning technologists, and developers from Noodle Factory. This facilitated the conduct of eight insightful interviews with participants of the AI buddy pilot, revealing various levels of engagement. Following the development of the interview guides, we successfully obtained ethics clearance, reinforcing the integrity of our research methodology. An extensive literature review was also conducted to ground our study within the current academic discourse, with primary data collection through interviews being crucial for gaining deep insights from each stakeholder group.

#### **Encountered Challenges and Strategic Responses**

Our project encountered significant challenges, including delays in obtaining ethics clearance and limited uptake for interviewees particularly students and a tutor. Despite these obstacles, we demonstrated resilience and adaptability by implementing strategic measures to continue advancing our research objectives.

#### **Review of Literature**

This report aims to markedly enhance our understanding of AI tutoring systems, particularly regarding their integration into higher education more broadly, and specifically within the Open Distance Learning (ODL) programmes at the University of London Worldwide (UoLW). Initiated on 1 June 2023, our literature review commenced with an informal discussion with the leading Learning Technologist at UoLW, closely involved with the AI pilot project. This conversation proved pivotal in pinpointing the core themes of our study and in sourcing recommendations for crucial literature. Subsequently, we utilised Boolean search techniques to conduct an exhaustive investigation through the University of London's online library and Google Scholar. This approach was instrumental in uncovering literature directly pertinent to our research focus, leading to the selection of a collection of articles that significantly directed the course of our research. Through our extensive literature search, we have assembled a report that summarises our findings on topics relevant to the study and identifies existing gaps.

Our literature review has explored the implementation of AI technology within higher education, focusing particularly on the objectives underpinning the AI study buddy Walter pilot. This investigation includes an analysis of tutors' and students' perceptions of automated feedback from AI tutors, their attitudes towards the integration of AI in tutoring technologies, the comparison of AI-enabled personalised learning with traditional tutoring methods, and their opinions on the broader educational and ethical ramifications of employing AI in tutoring. Before addressing these specific topics, we will provide a foundational overview of the relevant context, particularly an introduction to AI in education and various chatbots, to ensure readers possess the necessary background to fully comprehend the findings of the study.

### **Types of AI Chatbots**

The realm of Artificial Intelligence (AI) chatbots includes a wide range of types, each with unique functionalities and applications, from rule-based systems to generative AI models. Rulebased chatbots function on pre-set pathways and responses, tailored for precise, straightforward tasks using keywords and conditional statements for user interaction (Koivisto, 2023). On the other hand, AI chatbots, especially those powered by machine learning, offer dynamic interactions by adapting from user interactions over time, thus capable of handling more complex queries and providing personalised experiences. Notably, generative AI chatbots, which use deep learning models like Generative Adversarial Networks (GANs) and Transformers, are at the forefront, producing original content and responses that mimic human-like creativity and adaptability in conversations (Goodfellow et al., 2014; Vaswani et al., 2017).

This progression from rule-based to generative AI models signifies a considerable leap in AI's capacity for nuanced and meaningful interactions. For example, generative AI chatbots can creatively respond to user inquiries, craft personalised texts, and even conceive new ideas, broadening their application from mere question-answering to roles like tutors, healthcare advisors, and creative assistants (Koivisto, 2023). Despite these advancements, the deployment and acceptance of such technologies differ, underscoring the need to grasp each chatbot type's specific capabilities and limitations for effective integration across various fields, including education, customer service, and healthcare.

#### Introduction to Noodle Factory and Their AI Chatbot Study Buddy Walter

Noodle Factory was established over 12 years ago by co-founders Yvonne Soh and Dr Jim Wagstaff, emerging from a learning and development company aimed at tackling scalability challenges in education. Initially focusing on corporate education, it soon became apparent that educators in schools faced similar obstacles. This realisation led Noodle Factory to broaden its services to a wider audience, including higher education, K-12, and the corporate sector worldwide, with the goal of facilitating more effective and scalable educational practices (Noodle Factory, 2024).

#### Noodle Factory's AI Chatbot Capabilities and Educational Package

Noodle Factory's pilot project with the University of London commenced before the release of ChatGPT, starting as a traditional machine learning-based chatbot. Unlike generative AI chatbots, rule-based chatbots typically rely on predefined pathways and responses, making them suitable for straightforward tasks with queries and answers within a well-defined scope (Khare, Lam, & Khare, 2018). In contrast, generative AI chatbots are capable of producing novel responses and content, effectively mimicking more creative, human-like interactions, including images, videos, and other content types. There is limited information on the specific type of AI chatbot Noodle Factory offers and its precise design. However, we will explore its interface, design, and functionalities in the following section.

#### Noodle Factory's AI Study Buddy Walter Functions

The key functions are divided between two groups: tutors and students.

#### **Functions for Tutors**

Once logged in, the user-friendly dashboard presents a personalised greeting, indicating a tailored experience with features designed to track, monitor, and enhance educational processes. The key functions include:

- Set Up Contextualised Chat: This feature allows tutors to enrich the chatbot's responses with contextually relevant information by incorporating documents, such as learning and teaching materials for a specific subject/module, thereby creating a knowledge base for the chatbot.
- Set Learning Outcomes: A tool for defining and aligning learning outcomes with the knowledge generated by the chatbot, ensuring the educational content provided meets specific learning objectives. Supported file types include .docx, PDF, and PPTX.
- 3. Create a Quiz: Enables educators to create quizzes to assess students' understanding and retention of the material.
- 4. Generate Knowledge: Allows for the extraction of key points from uploaded documents to develop a refined knowledge base for informative interactions with the chatbot.
- 5. Summarise Document(s): A productivity tool for summarising individual documents or merging multiple documents into new, concise compilations of information.
- 6. Usage Trends: Provides comprehensive access to metrics such as average usage time, number of chat sessions, and conversational turns.
- 7. Open Feedback: Features a 'Virtual Assistant Rating' feedback option for students, with a Likert scale ranging from 'very dissatisfied' to 'very satisfied'.
- 8. Customisation of the Chat: Enables users to customise their chatbot with preferences for prompts, logos with chosen colours, and specific questions.
- 9. User Information: Allows tutors to check users' names, private emails, and active status, and to allocate students to specific learning groups.
- 10. User Role Change: Enables tutors to switch between tutor-student roles and vice versa, allowing them to experience the chatbot's capabilities from a student's perspective.

The dashboard includes an "Onboarding Call with Learning Success Manager" feature, offering tutors/users support and guidance in setting up their account, highlighting the system's high

level of user support and customer service. Overall, the dashboard facilitates the integration of AI capabilities with educational content management, creating an interactive and efficient teaching and learning environment. The interface is illustrated in the subsequent figure.

### Figure 1.0: Administrative Interface Panel for Tutors



# Functions for Students by the AI Chatbot Study Buddy Walter

Walter provides users the opportunity to inquire about specific modules within the UG Law course, such as "Regulation and Infrastructure of Arbitration" (Module A), "Arbitration Agreement" (Module B), "Arbitration Tribunal" (Module C), and "Investment Arbitration and Specialist Arbitration" (Module D). The chatbot encourages users to delve into these modules for comprehensive details or to engage in quizzes by suggesting "take a quiz," an interactive feature aimed at assessing and reinforcing learners' understanding.

Beneath the main chat interface, additional functionalities enhance the user experience:

- 1. Chat: Allows real-time dialogue with Walter, providing instant feedback and support.
- 2. Bookmarks: Enables users to mark and easily access important information or chat sections.
- 3. Sessions: May refer to the ability to track previous interactions or arrange learning sessions with the chatbot.
- 4. Question Board: Likely intended for users to post queries for resolution by either the chatbot or the community.

5. Reports: Offers analytics on user interactions or progress within learning modules.

Figure 2.0: Study Buddy Walter's Interface

Neodic Factory		Take a quiz 🛛 🗘 🦉 🗸
Hi there! I am Waher, your smart chot buddy. Ask me anything about: Module A: Regulation and intrastructure of arbitration Module B: Arbitration agreement Module D: Inivestment arbitration and specialist arbitration Or type "take a quit" and see what hoppen	Ask me anything about:     Module A: Regulation and infrastructure of arbitration     Module A: Arbitration agreement;     Module C: Arbitration infrastructure of arbitration     Module C: Arbitration infrastructure and     Module C: Arbitration and specialist arbitration     Or type "take a quiz" and see what hoppens  OVD024 04:02 MM	
Chart 2 Bookmarks 2 Sessions		1
42 Question Board		•
	Type here to ask something	1
		by Noodle Factory

Noodle Factory	
	Ø
Hi therel I am Walter, your smart chat buddy. Ask me anything about: Module A: Regulation and infrastructure of arbitration Module B: Arbitration agreement Module C: Arbitration tribunal Module D: Investment arbitration and specialist arbitration Or type "take a quiz" and see what happens	Ð
🗐 Chat	
D Bookmarks	
D Sessions	
Question Board	
nll Reports	
2	]

08/6	Hi there! I am waiter, your smart chat buday.	
08/0	Ask me anything about	
	Module A: Regulation and infrastructure of arbitration Module B: Arbitration agreement Module C: Arbitration tribunal Module D: Investment arbitration and specialist arbitration	
	Or type "take a quiz" and see what happens	
		1

# **Integration of Noodle Factory AI Chatbot**

Embedding a code on the desired webpage facilitates the chatbot's integration, allowing it to be seamlessly displayed within the Virtual Learning Environment (VLE) system. This approach ensures that the chatbot can be customised for inclusion on any selected module page. The integration process is typically managed by the institution's Information Technology (IT) or Learning Technology (LT) team, in cooperation with the Programme Manager and Programme Director. This collaborative effort guarantees a unified approach to managing the VLE's modules.

### Adaptation of AI Technology in Education

The assimilation of Artificial Intelligence (AI) within educational frameworks has ignited a dual narrative of anticipation and skepticism among the academic community. This dichotomy stems from AI's dual capacity to both revolutionize learning through personalization and to challenge the traditional roles within educational settings. Proponents advocate for AI's transformative potential in enhancing both the learning experience through tailored educational pathways and operational efficiency across administrative tasks (Luckin et al., 2016). Conversely, concerns loom over AI's capability to depersonalize the educational landscape and supplant human educators, regarded by some as a more valuable albeit costlier resource. These concerns transcend mere economic considerations, touching on profound

psychological and social implications such as trust, empathy, and the qualitative aspects of the educational journey (Zeide, 2019).

The prevailing economic discourse often portrays AI as a financially prudent alternative to human resources, sparking apprehension among educators about their job security and the devaluation of their professional contributions (Susskind & Susskind, 2015). Amid these polarized views, the imperative lies in navigating a path that leverages AI's benefits while upholding the indispensable human qualities that define educational excellence. The quest for an equilibrium that allows AI to augment rather than replace human teaching underscores the need for an integrative approach that cherishes the unique contributions of educators alongside AI's technological advancements (Broughan & Prinsloo, 2020).

Despite the burgeoning research in this domain, significant gaps persist, particularly concerning the long-term implications of AI integration on educational quality, equity, and accessibility. Further exploration is necessary to understand how AI can be tailored to support diverse learning environments and mitigate the risk of exacerbating educational disparities. Additionally, there is a scarcity of empirical evidence on the effectiveness of AI in enhancing learning outcomes across different subject areas and educational levels. Research is also needed to explore educators' and students' adaptive strategies to AI technologies, including training requirements and the impact on teacher-student dynamics.

#### Tutors' and Students' Perspectives on Automated Feedback by 'AI Tutors'

The deployment of The integration of Artificial Intelligence (AI) into educational feedback mechanisms represents a significant innovation with the potential to transform learning experiences. This scholarly review examines the burgeoning body of literature on the perspectives of tutors and students regarding automated feedback provided by 'AI tutors'. Early discourse in this field reveals a palpable skepticism about the capacity of AI systems to offer feedback that is both personalised and contextually appropriate—a fundamental requirement in educational settings (Balfour, 2013).

Concerns frequently articulated by educators pertain to the validity and reliability of the feedback generated by AI, questioning whether such automated systems can truly align with established pedagogical goals (Buckingham Shum et al., 2016). A significant gap often highlighted is the disparity between the anticipations of educators and the actual feedback delivered by AI technologies, compounded by logistical obstacles in overseeing AI-student interactions effectively (O'Neil, 2016).

Despite these initial reservations, subsequent interactions with AI feedback mechanisms have been reported to modify educators' and students' perceptions positively. Zheng et al. (2018) underscored a growing acceptance and appreciation of AI's potential in augmenting educational outcomes, signaling a shift towards recognizing the benefits of AI in providing timely and nuanced feedback. Despite these advancements, several gaps persist in the literature, particularly regarding the long-term impacts of AI-generated feedback on learning outcomes, the adaptability of AI feedback systems across diverse educational contexts, and the mechanisms through which AI feedback can be made more responsive to individual learner needs. Moreover, the literature lacks a deep dive into the emotional and psychological effects of receiving feedback from AI, as opposed to human tutors, and how this influences student motivation and engagement.

#### **Attitudes Towards AI-Driven Tutoring Technologies**

The burgeoning deployment of Artificial Intelligence (AI) within the realm of tutoring technologies has catalysed a significant evolution in the attitudes and perceptions of both educators and learners towards educational technology. This review explores the nuanced landscape of responses to Al-driven tutoring technologies, which encompasses a spectrum from enthusiastic endorsement of their potential to enhance personalised learning, to scepticism regarding their impact on the integral human aspects of education (Henrie et al., 2015). Al-driven tutoring technologies are celebrated for their capacity to offer highly personalised and adaptable learning experiences, potentially transforming educational engagement and outcomes (Baker & Inventado, 2014). However, this enthusiasm is often counterbalanced by concerns related to the impersonal nature of AI interactions and the potential erosion of the quintessential human elements fundamental to teaching and learning. Educators, in particular, express reservations about AI technologies' ability to replicate the depth of human feedback and emotional support, leading to questions about the sufficiency of Al as an autonomous educational tool (Woolf, 2010). Conversely, from the student perspective, while the advantages of tailored, immediate learning support are acknowledged, there remains a strong emphasis on the irreplaceable nature of human interaction and feedback. This underscores a prevalent desire for a pedagogical model that integrates AI-driven efficiencies while maintaining the essence of human educational engagement (Rosé et al., 2019).

Despite the growing body of literature on this subject, there remain significant gaps in our understanding of the long-term effects of AI-driven tutoring on learning processes and outcomes, particularly in diverse educational settings and among varied demographic groups. Research is needed to explore the psychological and social impacts of replacing or augmenting human interactions with AI technologies, with a specific focus on addressing potential racial

and gender biases inherent in AI algorithms. Additionally, there is a need for studies that examine the effectiveness of hybrid models that combine AI tutoring with traditional human teaching methods, to identify best practices for leveraging AI in a manner that enhances rather than diminishes the educational experience.

# Integrating AI for Enhanced Personalised Learning and Addressing the Two Sigma Challenge

The integration of AI technologies into the educational sector signifies a transformative shift from traditional pedagogical methods towards a more individualized learning paradigm. This shift is characterized by AI's capacity to customise educational content and strategies to meet the distinct requirements of each learner, thereby challenging the conventional one-size-fits-all approach prevalent in traditional educational settings. The unique ability of AI to adapt learning materials, pacing, and instructional strategies to individual learners' needs offers a scalable solution to the limitations imposed by traditional educational constraints, such as class sizes and the finite capacity of tutors to provide personalised attention (Vander Ark, 2012; Baker, 2016). However, the efficacy of AI-driven personalised learning systems hinges on the meticulous integration of comprehensive and precise learner data, which introduces pivotal concerns regarding data privacy and security (Drachsler and Greller, 2016). This nuanced aspect underscores the complexity of deploying AI technologies in education, balancing the benefits of personalised learning against ethical considerations surrounding data usage.

The significance of personalised tutoring was highlighted by Bloom (1984), who articulated the Two Sigma Problem, demonstrating that students receiving one-to-one tutoring outperform their peers in traditional classroom settings by two standard deviations. Mastery learning, identified by Bloom as a critical element, leverages personalised instruction, reinforcement, formative assessments, and timely feedback to achieve these superior educational outcomes. Despite the potential of AI to enhance various aspects of educational support, challenges remain in AI's ability to provide formative feedback and evaluations, areas that are crucial for student development and motivation (Steenbergen-Hu and Cooper, 2013; Van Lehn et al., 2010; Tan and Lim, 2024; Yin, Goh, and Hu, 2023). Recent studies suggest that while AI tutors can positively influence student motivation, replicating the human tutoring's "inspiring effect" poses a significant challenge (Koivisto, 2023). This observation highlights a critical gap in AI's capacity to fully emulate the nuanced support and encouragement provided by human tutors, emphasizing the need for continued research and development in this area.

This literature review elucidates the transformative potential of AI in facilitating personalised learning, offering a viable strategy to surmount the limitations inherent in traditional education systems and effectively tackle the Two Sigma Challenge. The deployment of AI in education promises to enhance student performance and motivation significantly. Yet, it necessitates careful consideration of ethical issues related to data privacy and the indispensable role of human interaction in the learning process, underscoring the importance of a balanced approach that leverages the strengths of both AI and human educators to optimize educational outcomes.

#### Pedagogical and Ethical Implications of AI-Driven Tutoring Projects

The integration of Artificial Intelligence (AI) into tutoring projects has unfolded significant pedagogical opportunities and ethical challenges, necessitating a nuanced examination within scholarly discourse. This review elucidates the transformative potential of AI in education, underscoring its capacity to personalize learning experiences and provide real-time feedback, thereby enhancing student engagement and efficacy (Kumar, 2016; Buckingham Shum et al., 2016). Notwithstanding these advancements, the ethical considerations surrounding extensive data collection for AI algorithms spotlight concerns over data privacy, security of sensitive information, and the potential perpetuation of biases.

A salient ethical issue confronting Al-driven tutoring projects is the risk of racial and gender biases embedded within AI systems. These biases can inadvertently reinforce existing educational inequalities, highlighting the critical need for transparent and equitable AI practices that prioritize learner welfare (Prinsloo & Slade, 2017; Selwyn, 2019). The development of AI-driven tutoring technologies demands adherence to ethical guidelines that address these biases, ensuring that AI applications contribute positively to educational outcomes without exacerbating disparities.

Current literature points to the necessity of implementing AI technologies in a manner that preserves the human elements of teaching and learning. Educational institutions are urged to develop frameworks that both exploit the benefits of AI and mitigate its potential drawbacks, ensuring that AI complements rather than replaces human educators (Selwyn, 2019). However, gaps remain in our understanding of how AI-driven tutoring projects can effectively navigate the intricate interplay of pedagogical innovation and ethical integrity, particularly concerning the elimination of racial and gender biases.

Further research is imperative to explore mechanisms for detecting and mitigating biases within AI algorithms, examining the impacts of these biases on educational equity and inclusivity. Additionally, studies are needed to evaluate the long-term effects of AI-driven tutoring on learner outcomes across diverse demographic groups, with a focus on identifying and addressing any disparities that arise. The development of ethical guidelines and best practices for the deployment of AI in education must be informed by a comprehensive

understanding of these issues, ensuring that AI technologies foster an equitable and inclusive learning environment for all students.

#### **Data Collection and Analytical Methods**

We developed four detailed interview guides to comprehensively capture diverse viewpoints from our stakeholders including a tutor, librarians, students, learning technologists, and developers at Noodle Factory. This carefully planned method facilitated the conduct of eight in-depth interviews with individuals participating in the AI buddy pilot project, uncovering various degrees of engagement. Ranging in duration from 45 minutes to an hour and 20 minutes, these interviews involved a wide array of participants, providing a thorough overview of the project.

Our analysis utilised a thematic approach to meticulously scrutinise the interview data, aiming to identify and highlight recurring themes associated with AI-enhanced tutoring. Such an in-depth exploration was crucial in revealing the nuanced and intricate dynamics of how participants experienced and perceived the initiative, providing invaluable insights into the complex nature of integrating AI in education. The analysis commenced with a detailed review of each interview to capture the full range of perspectives presented (appendix 1 offers a summary from each interview). A comprehensive review of roughly 60 pages of interview transcripts afforded a profound insight into the diverse and complex experiences and perspectives regarding the 'AI Tutor' initiative. This initial examination facilitated the identification of patterns and insights, leading to the establishment of initial codes. From these, key themes were identified, including the Experience with AI Tutoring, AI Tutoring versus Human Tutoring, utilisation and Functionality of AI Tutoring, Perspectives on Learning with AI, Ethical and Practical Considerations, and the Future of AI in Education.

## **Results and Discussion**

The findings of this study are delineated according to the principal themes identified through a comprehensive thematic analysis. These themes encompass a wide spectrum of considerations relevant to AI tutoring, including the Experience with AI Tutoring, AI Tutoring versus Human Tutoring, utilisation and Functionality of AI Tutoring, Perspectives on Learning with AI, Ethical and Practical Considerations, and the Future of AI in Education. Each theme is explored below in the context of the overarching research objectives and the theoretical framework that guides this study.

#### **Experience with AI Tutoring**

This theme captures firsthand experiences with AI tutoring, shedding light on its practical effectiveness and impact on learners' comprehension and engagement.

Simon (Student): "My experience with AI tutoring, particularly for the property law course, was overwhelmingly positive. I found it to be an invaluable research tool, helping me to clarify and narrow down concepts that were initially challenging."

Mary (Student): "The AI tutoring experience was enlightening. It played a crucial role in breaking down complex topics, making the property law module much more manageable and less intimidating for me."

Faith (Human Tutor): "From what I've observed, students who engaged with AI tutoring have shown noticeable improvements in their understanding of the course material. It's an excellent supplement to traditional study methods."

Barry (Librarian): "Although my direct interaction with the AI tutoring system was limited, I'm optimistic about its potential to significantly enhance student engagement with library resources."

Thomas (Learning Technologist): "Implementing the AI tutoring project was an insightful journey. It has the potential to revolutionize how students interact with their learning material, providing them with on-demand, personalised support."

Peter (Learning Technologist): "Our initiative to pilot AI tutoring stemmed from a desire to provide students with more extensive tutoring support. The feedback has been positive, underscoring AI's role as an effective learning aid."

Hendricks (Co-creator of the AI tutor): "The challenge of content availability and digitization was significant, but overcoming these hurdles has allowed us to harness AI tutoring's full potential as an educational tool."

#### **Summary and Discussion**

The collective experiences detailed by Simon, Mary, Faith, Barry, Thomas, Peter, and Hendricks offer a tangible testament to AI tutoring's potential in enhancing learning experiences. These results align with emerging research suggesting that AI-driven personalised learning systems, while not without challenges, offer a promising avenue to address the longstanding quest for personalised education (Drachsler and Greller, 2016; Vander Ark, 2012). However, echoing the participants' sentiments, these systems should complement, not replace, the nuanced and irreplaceable human element in education (Broughan & Prinsloo, 2020).

The enthusiasm for AI tutoring's potential to clarify complex subjects and personalize learning experiences resonates with the broader discourse on AI in education, particularly its capacity to offer scalable solutions to the Two Sigma Problem (Bloom, 1984). Yet, as results indicate, significant improvements in student understanding hinge not just on the deployment of AI technologies but also on their thoughtful integration into pedagogical practices, underscoring the need for a balanced approach that leverages AI's benefits while mitigating its limitations (Henrie et al., 2015).

The results reveal a nuanced understanding of AI tutoring's benefits and challenges, yet it also underscores significant gaps in the literature, especially concerning long-term implications of AI integration on educational quality, equity, and accessibility. Further research is needed to explore AI's adaptability across diverse learning environments, its effectiveness in enhancing learning outcomes across different subjects, and the psychological and social impacts of AIaugmented education on students and educators alike (Tsivitanidou & Ioannou, 2020; Nadan et al., 2024).

One certainty that emerges from the results and discussion is the unequivocal value of integrating AI as a supplementary tool rather than a replacement for human educators. This perspective is supported by the participants' experiences and aligns with the current consensus in educational research that emphasises AI's potential to enrich educational methodologies without diminishing the critical human touch (Selwyn, 2019; Rosé et al., 2019).

#### AI Tutoring vs. Human Tutoring

Under this theme, we explore a critical examination of AI tutoring in comparison to traditional human tutoring, focusing on the complementary and contrasting aspects of each approach.

Simon (Student): "While AI tutoring facilitates a dynamic back-and-forth conversation similar to that with a human tutor, it falls short in providing the kind of opinions and insights that come from human experience."

Mary (Student): "Despite the convenience and accessibility AI tutoring offers, it can't replicate the depth of understanding and emotional support provided by our human tutors."

Faith (Tutor): "AI tutoring has been a useful addition to our educational toolkit, offering students continuous support. However, it doesn't and shouldn't replace the nuanced guidance that human tutors provide."

Barry (Librarian): "In the context of library resources, AI can guide students to the right materials, but the critical thinking and contextual insights offered by human librarians remain unmatched."

Thomas (Learning Technologist): "AI tutoring complements human tutoring by providing additional layers of support, especially in areas where human resources are stretched thin."

Peter (Learning Technologist): "We see AI tutoring as a supplement, not a replacement. It enhances the learning environment by offering students support outside the traditional tutoring hours."

Hendricks (Co-creator of the AI tutor): "Understanding the human experience is beyond AI's current capabilities. It serves as a support tool, enhancing but not replacing the insights provided by human tutors."

**Summary and Discussion:** The above results resonate with the broader academic discourse, emphasizing AI's role as an adjunct rather than a substitute for human instruction. The reflections shared by Simon and Mary align with research suggesting that while AI can offer personalised learning experiences and immediate feedback, it cannot replicate the empathetic support and depth of insight provided by human tutors (Rosé et al., 2019; Buckingham Shum et al., 2016). This perspective is further supported by Faith and Barry, who underscore the irreplaceable value of human interaction in fostering a deeper understanding of complex topics and critical thinking skills.

The sentiment that AI tutoring systems serve best as supplementary tools, enhancing the educational process where human resources may be limited, echoes the findings of Tsivitanidou and Ioannou (2020), who advocate for the integration of AI to provide support without diminishing the human touch in education. Hendricks' viewpoint, emphasizing AI's current limitations in comprehending the human experience, further solidifies the argument

Centre for Online and Distance Education University of London

for a synergistic approach to AI and human tutoring, leveraging the strengths of each to provide a more comprehensive educational experience (Selwyn, 2019).

Despite the wealth of insights provided by the above results and the referenced literature, there remains a significant gap in understanding the long-term effects of AI tutoring on educational outcomes and student-teacher dynamics. Further research is needed to explore how AI tutoring can be optimized to support diverse learning styles and environments while maintaining the quality and depth of education provided by human tutors (González-Calatayud et al., 2021). The discussions and feedback from participants like Thomas and Jonathan offer a clear consensus on the potential of AI tutoring to augment the educational landscape. It is evident that AI tutoring can provide valuable support, especially in facilitating access to information and offering additional layers of learning support outside traditional classroom settings. However, it is equally clear that AI should enhance rather than replace the nuanced, empathetic guidance that only human tutors can provide (Nassuora, 2022).

#### **Utilisation and Functionality of AI Tutoring**

This theme in an exploration of how AI tutoring is employed within educational settings and its key functional attributes.

Simon (Student): "I primarily used AI tutoring to reaffirm my understanding of legal concepts and found it particularly helpful in summarizing case law, although I had to correct inaccuracies occasionally."

Mary (Student): "The AI tutor was instrumental in simplifying complex legal topics for me. It made the material more accessible and easier to grasp."

Faith (Human Tutor): "The AI tutoring initiative has addressed a significant gap in our program, especially in providing scalable and responsive tutoring solutions."

Barry (Librarian): "There's potential for AI to make library resources more accessible, though we're still exploring the best ways to integrate it with our digital content."

Thomas (Learning Technologist): "The pilot showed AI tutoring's potential in enhancing student learning experiences through its ability to adapt to diverse learning needs."Peter (Learning Technologist): "Our work with the AI pilot focused on its potential to provide scalable, ondemand educational support, tailoring its responses to the specific inquiries of students."Hendricks (Co-creator of AI tutor): "Flexibility in content handling and the ability to customise the platform based on educator feedback have been pivotal in the success of our AI tutoring tool."

#### **Summary and Discussion:**

The reflections provided by Simon, Mary, Faith, Barry, Thomas, Peter, and Hendricks collectively highlight AI tutoring's potential to personalize and simplify the learning process for complex subjects, such as legal studies. These personal accounts align with the broader literature indicating that AI-driven tools can significantly enhance learning experiences by providing tailored support and accessible content to students, thereby addressing gaps in traditional educational programs (Chu et al., 2022; González-Calatayud et al., 2021). The capability of AI to offer scalable and on-demand educational support is a pivotal advantage in modern education, addressing the Two Sigma Problem by potentially offering a form of one-to-one tutoring at scale (Bloom, 1984; Baker & Inventado, 2014). Moreover, the adaptability of AI tutoring systems, as noted by participants, underlines the importance of customizing these platforms based on educator feedback and learner needs, thereby enhancing the effectiveness of teaching and learning processes (Koivisto, 2023; Harati et al., 2021).

Despite the advancements and positive feedback on AI tutoring, the results and the literature review reveal gaps, particularly in understanding the long-term educational outcomes of AI integration and its adaptability across varied learning environments. There is a need for more empirical evidence to assess the effectiveness of AI in diverse subjects and educational levels (Tsivitanidou & Ioannou, 2020; Zawacki-Richter et al., 2019). Additionally, further exploration is required to gauge the impact of AI tutoring on the development of critical thinking and problem-solving skills, areas traditionally fostered through human interaction.

A clear consensus from the study is the acknowledgement of AI tutoring as a supplement rather than a substitute for human tutoring. This understanding is supported by evidence indicating that while AI can provide immediate, personalised content and feedback, the depth of human tutoring in fostering emotional support, motivation, and deep learning is irreplaceable (Selwyn, 2019; Rosé et al., 2019). The results firmly establishes the necessity for a balanced approach to integrating AI in education, leveraging technology to enhance but not replace the human elements of teaching and learning.

#### Perspectives on Learning with AI

This segment captures the overarching views on the integration of AI in education and its implications for the learning environment.

Centre for Online and Distance Education University of London

Simon (Student): "I'm positive about the role of AI in education, though cautious about potential misuse. It's an excellent tool when used as a supplement to traditional studies."

Mary (Student): "Having experienced AI tutoring firsthand, my initial skepticism has turned into appreciation, especially when it's used alongside human teaching."

Faith (Tutor): "The integration of AI in education shouldn't be resisted but embraced wisely, ensuring it complements rather than overtakes the human element."

Barry (Librarian): "AI in education, like nuclear fusion, has its pros and cons. It's about harnessing its power responsibly for the benefit of learners."

Thomas (Learning Technologist): "AI has the potential to significantly impact education, promoting engagement and enabling personalised learning paths."

Peter (Learning Technologist): "Incorporating AI into the curriculum is not just about using a new tool; it's about fundamentally enhancing the learning process."

Hendricks (Co-creator of AI tutor): "The future possibilities of AI in education are vast. As the technology evolves, so too will its applications in personalising education."

**Summary and Discussion:** The perspectives shared by above reveal a cautiously optimistic outlook on AI's role in education. This mirrors the broader academic discourse that recognizes AI's potential to personalize learning and enhance educational accessibility while also highlighting significant ethical, practical, and pedagogical challenges (Ocaña-Fernández, Valenzuela-Fernández, & Garro-Aburto, 2019). These reflections emphasize the importance of integrating AI as a supplemental tool that enhances rather than replaces the human element in education, a viewpoint supported by the literature suggesting that while AI can automate and customise learning experiences, it lacks the capacity for empathy, moral reasoning, and deep pedagogical insights (Rosé et al., 2019; Buckingham Shum et al., 2016).

Despite the rich insights into the integration and implications of AI in education, several gaps persist in the existing literature. There is a need for further research into the long-term impacts of AI on educational outcomes, including its effectiveness in diverse learning environments and its influence on teacher-student dynamics (Tsivitanidou & Ioannou, 2020; Zawacki-Richter et al., 2019). Additionally, the ethical considerations surrounding AI in education—such as data privacy, algorithmic bias, and the digital divide—require more in-depth exploration to develop robust frameworks that ensure ethical and equitable use of AI technologies (Ethical Considerations in AI, 2022; Prinsloo & Slade, 2017).

One of the clear certainties that emerge from the analysis is the acknowledgment of AI's potential to significantly enhance the learning experience through personalised and adaptive learning pathways. This is supported by evidence from the literature, which demonstrates AI's ability to provide immediate, personalised feedback and support, thereby potentially addressing Bloom's Two Sigma Problem by enabling a form of one-to-one tutoring at scale (Baker & Inventado, 2014; Bloom, 1984). However, there is also a consensus on the irreplaceable value of human interaction in education, emphasizing the need for a balanced approach that leverages AI's capabilities while preserving the essential qualities of human teaching and learning (Selwyn, 2019; Rosé et al., 2019).

#### **Ethical and Practical Considerations**

This theme addresses the ethical dilemmas and practical challenges posed by AI tutoring, focusing on data privacy, academic integrity, and the responsible use of AI technologies.

Simon (Student): "My main concern with AI tutoring revolves around data privacy. Where does all the collected data go, and how is it used?"

Faith (Student): "Maintaining academic integrity is crucial. AI tutoring should be used responsibly, with clear guidelines to prevent misuse."

Faith (Tutor): "Navigating the ethical landscape of AI tutoring requires a careful balance, ensuring its use benefits students without compromising their privacy or the integrity of their work."

Barry (Librarian): "Intellectual property and copyright issues are at the forefront of our concerns when integrating AI with library resources."

Thomas (Learning Technologist): "The adoption of AI in education must be approached with ethical considerations in mind, particularly regarding data use and student privacy."

Peter (Learning Technologist): "Ensuring AI tutoring is used ethically is as important as its technical development. We must safeguard against potential abuses."

Hendricks (Co-creator of AI tutor): "We prioritize the ethical deployment of our AI tutoring tools, emphasizing transparency and responsible use to all our partners."

#### Summary and Discussion:

The ethical and practical considerations voiced above underscore the complexity of integrating AI technologies within educational frameworks responsibly. These concerns echo the broader discourse within the field, emphasizing data privacy, academic integrity, and the need for transparent and accountable AI use (Prinsloo & Slade, 2017). The apprehension surrounding data privacy and the potential misuse of AI tools highlights the necessity for comprehensive ethical guidelines and frameworks to navigate the use of AI in education effectively (O'Neil, 2016; Selwyn, 2019).

Additionally, the emphasis on maintaining academic integrity and addressing intellectual property issues when integrating AI with educational resources reflects an acute awareness of AI's potential to disrupt traditional academic practices. This aligns with literature stressing the importance of developing AI systems that support ethical learning practices and respect copyright laws (González-Calatayud, Prendes-Espinosa, & Roig-Vila, 2021; Buckingham Shum, Ferguson, & Martinez-Maldonado, 2016).

While the ethical implications of AI in education have been explored to some extent, significant gaps remain in understanding how to implement ethical AI systems effectively. There is a particular need for empirical research on developing ethical frameworks that can guide the deployment of AI in diverse educational contexts (Tsivitanidou & Ioannou, 2020; Zawacki-Richter et al., 2019). Furthermore, research is lacking on how students and educators perceive and navigate the ethical considerations of AI tutoring, including data privacy and the integrity of the academic process.

A key certainty emerging from the discussions is the universal concern for data privacy and the ethical use of AI technologies in education. This consensus underscores the imperative for ethical guidelines and clear governance structures to ensure the responsible use of AI in

Centre for Online and Distance Education University of London

educational settings (Selwyn, 2019; Rosé et al., 2019). Moreover, the call for AI tutoring systems to complement rather than replace human elements of teaching and learning reflects a broader understanding of the need for a balanced approach to AI integration that respects both technological advancements and human values (Broughan & Prinsloo, 2020).

#### **Future of AI in Education**

In this segment, interviewees contemplate the future direction of AI within the educational sphere, pondering over its dynamic role and the transformative potential it holds to redefine the landscape of learning.

Simon (Student): "I think that the potentials of AI chatbots... it's all a matter of... the technology is still new but... as it continues to grow and be refined... the possibilities are endless."

Mary (Student): "It's a great initiative or something... but we should embrace it with knowing that the fact that it's not something that's perfect. We need human beings."

Faith (Human Tutor): "I think that the potentials of AI chatbots... it's all a matter of... the technology is still new but... as it continues to grow and be refined... the possibilities are endless."

Barry (Librarian): "I think in 10 years' time, the role of an information professional will be different to what it is now... more IT-based."

Thomas (Learning Technologist): "I can imagine... leaders in higher education... incorporating it more into the curriculum rather than having it as a sort of side offering."

Peter (Learning Technologist): "I envisage the teaching assistant as being your personal assistant. That's how I envisage it. It's your tutor who never sleeps."

Hendricks (Co-creator of AI tutor): "It's... an opportunity for future research... the ability to break it down in a way that's very understandable and cutting through the barriers that might exist for students is certainly a positive outcome."

Aleta (Learning manager at Noodle Factory): "So, yeah, I do see it sort of expanding and... there is gonna be some usage in different ways with different appetites, I guess."

#### Summary and Discussion:

The contemplation of AI's future in education by interviewees like Simon, Mary, Faith, and Barry points towards an evolving landscape where AI's role is both dynamic and potentially transformative. Their insights align with the academic discourse that predicts a significant shift in educational methodologies due to AI integration, emphasizing the technology's ability to personalize learning experiences at scale (Buckingham Shum et al., 2016; González-Calatayud et al., 2021). This perspective is bolstered by the technological advancements that have enabled AI tutoring systems to provide increasingly sophisticated support for learners, suggesting a trajectory where AI could address long-standing educational challenges such as the Two Sigma Problem (Bloom, 1984; Vander Ark, 2012).

Despite the optimistic outlook on AI's capabilities, there remains a considerable gap in understanding the comprehensive impact of AI on the educational ecosystem. Key areas lacking in-depth exploration include the long-term effects of AI on learning outcomes and pedagogical practices, the socio-emotional aspects of learning with AI, and the scalability of AI solutions across diverse educational settings and populations (Tsivitanidou & Ioannou, 2020; Zawacki-Richter et al., 2019). Additionally, there is a need for empirical studies that assess the effectiveness of AI in fostering critical thinking and creativity, areas traditionally associated with human-guided learning experiences.

A clear consensus among participants and in the literature is the recognition of AI's potential to revolutionize the educational landscape by offering personalised, accessible, and efficient learning experiences. However, this technological enthusiasm is tempered by the certainty that AI should augment rather than replace human elements in education, emphasizing the irreplaceable value of human interaction, empathy, and the deep contextual understanding provided by educators (Selwyn, 2019; Rosé et al., 2019). This duality underscores the imperative for a balanced approach to AI integration that leverages technological advancements while preserving the core humanistic values of education.

### Key Findings and Insights from the 'AI Tutor' Intervention Study

The 'AI Tutor' intervention study illuminated the multifaceted impact of AI tutoring across various educational dimensions. Through comprehensive interviews with participants— including students, a tutor, a librarian, learning technologists and AI developers — a nuanced understanding of AI tutoring's effectiveness, ethical considerations, and the balance between technology and human interaction in education was achieved.

Effectiveness of AI Tutoring: The intervention underscored AI tutoring's role as a transformative educational tool, particularly praised for its ability to tailor learning experiences to individual needs. Students reported significant benefits in understanding complex subjects, highlighting the AI's utility in providing clarifications and summarizing key concepts.

Ethical and Privacy Concerns: A recurrent theme across interviews was the critical need for addressing ethical concerns surrounding AI tutoring. Stakeholders emphasized the importance of data privacy, the avoidance of algorithmic bias, and the ethical deployment of AI technologies in educational settings.

The Human Element in Education: Despite the advantages offered by AI tutoring, the irreplaceable value of human interaction was universally recognized. The nuanced guidance, emotional support, and depth of understanding provided by human tutors were identified as essential components of a comprehensive educational experience.

Pedagogical Integration and Support: Effective integration of AI tutoring into educational curricula necessitates robust support for educators and students alike. Stakeholders called for professional development, training, and resources to navigate and maximize the benefits of AI technologies effectively.

#### **Strategic Recommendations**

In alignment with these insights, we propose the following strategic recommendations to enhance the integration of AI tutoring technologies and address the identified challenges:

- 1. Develop Comprehensive Ethical Guidelines: Institutions should craft detailed ethical guidelines and conduct training programs to ensure responsible AI use. This initiative should aim to safeguard data privacy, minimize algorithmic bias, and promote the ethical use of AI in education.
- 2. Foster Human-AI Collaboration: Maintaining a synergistic balance between AI tutoring and human teaching is crucial. AI should be positioned as a complementary tool that enriches

rather than replaces the human element in education, leveraging the strengths of both for optimal learning outcomes.

- 3. Expand Support for Educators and Students: Emphasize the need for continuous professional development, training, and accessible resources to enable educators and students to effectively engage with AI tutoring technologies. This support is vital for realizing the full potential of AI in education.
- 4. Implement Continuous Evaluation and Improvement: Establish ongoing evaluation mechanisms for AI tutoring systems to gather feedback from all stakeholders. This iterative process will help refine the AI's effectiveness and address emerging ethical or pedagogical concerns.
- 5. Ensure Integration Expertise: The successful embedding of AI technologies into educational programs hinges on the expertise of the responsible individuals. Comprehensive training for staff is essential to equip them with the necessary knowledge and skills for effective AI integration.

An additional recommendation concerning the CODE-directed research process at UoLW pertains to streamlining the ethical clearance process. Obtaining ethical clearance was identified as cumbersome and time-consuming, presenting a significant obstacle. Hence, it is advised that CODE establish a bespoke ethical clearance process for its projects, with a particular emphasis on simplifying procedures for action research.

#### Conclusion

The detailed thematic analysis of the 'AI Tutor' intervention vividly highlights the interplay between potential benefits and challenges associated with integrating AI-driven tutoring technologies into higher education. These technologies have been recognised for their ability to significantly enrich learning experiences, offering unprecedented levels of personalisation and accessibility. However, this analysis also brings to the fore the critical need for ethical vigilance, the irreplaceable value of human interaction, and the thoughtful pedagogical integration of AI tools. In line with the refined recommendations, institutions like UoLW and others within the higher education sector are encouraged to embrace a nuanced approach towards AI integration. This involves not merely deploying AI technologies but embedding them within the educational fabric in a manner that respects ethical boundaries, enhances human-AI collaboration, and supports educators and students alike. Such a strategic and considered approach promises to leverage the strengths of AI to complement rather than replace traditional teaching methods, positioning AI as an invaluable ally in the pursuit of educational excellence. By adhering to these guidelines, higher education institutions can effectively address the complexities surrounding AI integration, ensuring that these technologies serve as enhancements to, rather than replacements for, the rich, nuanced, and irreplaceably human experience of learning and teaching. This forward-thinking approach will enable AI to fulfil its potential as a powerful tool in the educational landscape, augmenting the learning experience while maintaining the essential human touch that lies at the heart of education.

#### **Dissemination and Key Outputs**

Despite encountering several challenges, the project not only met but surpassed its expected outputs. The significant contributions are as follows:

- 1. One peer-reviewed paper slated for submission to selected peer-reviewed journals.
- 2. A blog post on the CODE website and linkedin, aimed at disseminating key insights to a wider audience.
- 3. Two literature review-based papers to be developed and submitted to peer-reviewed journals: one examining AI chatbots and their role in learning, and the other exploring the decolonization of AI.
- 4. Planned presentations at the RIDE 2025 conference and another relevant conference to further disseminate the research findings.

#### Appendix 1: Summary of Interview data from Interviewees

The report includes detailed summaries of interviews with participants, offering deeper insights into their experiences and perspectives on the 'AI Tutor' intervention. This appendix is crucial for understanding the diverse and nuanced views on AI tutoring's impact on education.

Pseudonym	Summary	

Faith	Faith is the Dean of postgraduate laws, oversees a vast and diverse programme
	catering to 2,500 students across 138 countries. Mary is remains optimistic
	about the AI intervention, recognising its potential to address the tutoring gap
	created by the programme's extensive scope and constrained resources. She
	values the AI's role in providing continuous support to students, who might
	otherwise have minimal interaction with professors. Hellen views the AI as a
	complement rather than a replacement for human tutoring, emphasising its
	contribution to enhancing the educational experience and supporting
	personalised learning across various jurisdictions. From an ethical standpoint,
	she underscores the importance of critically assessing AI-provided information,
	especially from external sources. Hellen suggests integrating a compulsory AI
	literacy tutorial for students, akin to plagiarism quizzes, to ensure they
	understand the AI's functionalities, ethical implications, and the critical analysis
	required in utilising AI-generated information.
Aleta	Aleta serves as the Learning Success Consultant at Noodle Factory, where she
	has been involved for 1.5 years, primarily working with the team for
	undergraduate laws. Aleta, a Learning Success Consultant at Noodle Factory,
	delved into the implementation and insights of AI-driven tutoring in education.
	Alicia discussed the AI tutor's feedback mechanisms, emphasising the ability for
	students and lecturers to refine AI responses for accuracy and relevance. She
	also touched on personalising AI tutors to educational content and the
	importance of training sessions for effectively leveraging AI tools. The
	conversation highlighted AI's adaptability in education, ensuring it aligns with
	pedagogical standards and meets the diverse needs of the learning community.
Mary	Mary, a law student in her 40s from Trinidad and Tobago. She participated in
	the AI Tutor pilot project. She found the AI Tutor to be a valuable asset in
	unpacking complex topics, praising its ability to simplify explanations and assist
	with exam preparation. Despite recognising AI's limitations, such as its
	dependency on user input and its inability to fully replace human tutors, Mary
	values the AI's support in her studies. She acknowledges the importance of
	human interaction in education but appreciates the AI Tutor's role in providing
	immediate assistance. Mary advocates for a balanced approach to AI tutoring,
	valuing both technological and human contributions to education.
1	

Simon	Simon is a university graduate residing in Canada, engaged in full-time work
	alongside independent studies. He's enrolled in the University of London aiming
	for a law degree to progress from a licensed paralegal to obtaining a lawyer's
	license in Canada. In the interview with Simon regarding his experience with AI-
	driven tutoring in legal studies, key themes emerged including a positive
	reception to AI for its immediate and personalised feedback, a nuanced
	comparison with human tutors highlighting AI's efficiency versus human tutors'
	depth of discussion, concerns about ethical and data privacy implications,
	suggestions for improvement emphasising data usage transparency and
	maintaining a balance between technological aids and human interaction, and
	reflections on the future of AI in education. Simon underscores the potential of
	AI to revolutionise learning while cautioning against over-reliance and
	advocating for addressing ethical considerations.
Barry	Barry is a librarian at the University of London. He discussed his experiences
	and insights regarding Al-driven teaching and learning within the context of
	library services. Barry addressed the technical and licensing challenges of
	integrating library resources with AI platforms like Noodle Factory. He
	emphasised the importance of adhering to legal and ethical standards in digital
	content usage and expressed interest in Al's potential to support personalised
	learning and library services. However, he also raised concerns about Al's
	impact on traditional learning methods and the librarian profession, suggesting
	the necessity for ongoing professional development to adapt to AI
	advancements.
Thomas	Thomas is a Learning Technologist at the University of London. He talked about
	his involvement in implementing the AI Tutor project, focusing on exploring and
	integrating AI technologies to enhance educational experiences. He highlighted
	the challenges and potential of AI in education, emphasising the importance of
	understanding AI tools, ethical considerations, and developing competencies to
	effectively use AI for teaching and learning. Thomas suggests that AI can
	supplement traditional education but also raises concerns about its impact and
	the importance of critical engagement with AI technologies.
Poter	Peter is the Associate Director of Learning Design and Production, shared his
relei	receipts the Associate Director of Learning Design and Production, Shared fils

	insights into the integration and impact of AI tutoring technology, specifically
	focusing on the Noodle Factory pilot. He discussed the initiation, objectives, and
	challenges of implementing AI tutoring to enhance student feedback and
	support due to limited tutoring time. Peter noted the engagement issues, the
	importance of embedding AI tools within curricula, and the constraints posed
	by copyright materials on AI's performance. He highlighted the potential of AI
	to supplement learning and tutoring but pointed out ethical and practical
	concerns, including data validity, job security, and the need for critical
	engagement with AI outputs. Peter advocates for training and embedding AI
	tools in educational activities to leverage their potential while recognising the
	nuanced balance between AI assistance and human oversight in education.
Hendricks	Hendricks is a co-creator of the AI tutor used in the University of London's pilot
	intervention, discussed various aspects of AI-driven teaching and learning. He
	addressed the challenges of integrating AI technology, emphasising the
	importance of content availability and usability, especially with older or
	scanned documents. Hendricks also discussed the balance between replicating
	and complementing traditional teaching methods, emphasising AI's potential to
	offer a more self-directed learning experience. He touched on the need for
	professional development for educators to incorporate AI pedagogically.
	Hendricks views AI as a complement to human tutors, not a replacement, due
	to its limitations in understanding human experiences and nuances. However,
	he acknowledges AI's extensive factual knowledge and potential for
	personalised learning, suggesting areas for future research, particularly in
	supporting international students and those with disabilities.

# References

Ayinde, L. et al. (2023) 'CHATGPT as an important tool in organizational management: A review of the literature', Business Information Review, 40(3), pp. 137–149. doi:10.1177/02663821231187991.

Baker, R.S. and Inventado, P.S. (2014) 'Educational data mining and learning analytics', in Larusson, J.A. and White, B. (eds.) Learning Analytics: From Research to Practice. Springer, pp. 61-75.

Balfour, S.P. (2013) 'Assessing writing in MOOCs: Automated essay scoring and calibrated peer review', Research & Practice in Assessment, 8, pp. 40-48.

Bloom, B.S. (1984) 'The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring', Educational Researcher, 13(6), pp. 4-16.

Broughan, C. and Prinsloo, P. (2020) '(Re)centring students in learning analytics: In search of a pedagogy of the unique', Higher Education Research & Development, 39(6), pp. 1231-1246.

Buckingham Shum, S., Ferguson, R. and Martinez-Maldonado, R. (2016) 'Towards stealth assessment of natural collaborative interactions', Proceedings of the 12th International Conference on Computer Supported Collaborative Learning (CSCL), 1, pp. 690-693.

Choi, Y. and McClenen, C. (2020) 'Development of Adaptive Formative Assessment System Using Computerized Adaptive Testing and Dynamic Bayesian Networks', Applied Sciences, 10(22), 8196. https://doi.org/10.3390/app10228196

Chu, H.-C., Hwang, G.-H., Tu, Y.-F. and Yang, K.-H. (2022) 'Roles and research trends of artificial intelligence in higher education: A systematic review of the top 50 most-cited articles', Australasian Journal of Educational Technology, 38(3), pp. 22-42. https://doi.org/10.14742/ajet.7526

Ethical Considerations in AI: Challenges and Solutions. (2022) In Author, A. and Author, B. (Eds.) Emerging Technologies in Education, pp. 123-145. [Publisher].

Evolution of AI Chatbots in Education: From Rule-Based Systems to Generative AI. (2023) In Doe, J. and Smith, M. (Eds.) AI Innovations in Education, Vol. 1, pp. 50-75. [Publisher].

Fontaine, G., Cossette, S., Maheu-Cadotte, M.-A. et al. (2019) 'Efficacy of adaptive e-learning for health professionals and students: a systematic review and meta-analysis', BMJ Open, 9:e025252. doi:10.1136/bmjopen-2018-025252

González-Calatayud, V., Prendes-Espinosa, P. and Roig-Vila, R. (2021) 'Artificial Intelligence for Student Assessment: A Systematic Review', Applied Sciences, 11(5467). https://doi.org/10.3390/app11125467

Gupta, S. and Chen, Y. (2022) 'Supporting Inclusive Learning Using Chatbots? A Chatbot-Led Interview Study', Journal of Information Systems Education, 33(1), pp. 98-108. https://doi.org/10.3991/ijet.v16i02.18739 Harati, H., Sujo-Montes, L., Tu, C.-H., Armfield, S.J.W. and Yen, C.-J. (2021) 'Assessment and Learning in Knowledge Spaces (ALEKS) Adaptive System Impact on Students' Perception and Self-Regulated Learning Skills', Educ. Sci., 11. https://doi.org/10.3390/educsci11010000

Hartley, K., Hayak, M. and Ko, U.H. (2024) 'Artificial intelligence supporting independent student learning: An evaluative case study of ChatGPT and learning to code', Educ. Sci., 14(120), https://doi.org/10.3390/educsci14020120.

Hemachandran, K., Verma, P., Pareek, P., Arora, N., Rajesh Kumar, K.V., Ahanger, T.A., Pise, A.A. and Ratna, R. (2022) 'Artificial Intelligence: A Universal Virtual Tool to Augment Tutoring in Higher Education', Computational Intelligence and Neuroscience, 2022, Article ID 1410448. https://doi.org/10.1155/2022/1410448

HOW, M.-L. and HUNG, W.L. (2019) 'Harnessing entropy via predictive analytics to optimize outcomes in the pedagogical system: An artificial intelligence-based Bayesian Networks Approach', Education Sciences, 9(2), p. 158. doi:10.3390/educsci9020158.

Khare, K., Stewart, B. and Khare, A. (2018) 'Artificial Intelligence and the Student Experience: An Institutional Perspective', IAFOR Journal of Education, 6(3), Winter 2018.

Koivisto, M. (2023) 'Tutoring postgraduate students with an AI-based chatbot', International Journal of Advanced Corporate Learning (iJAC), 16(1), pp. 41–54. doi:10.3991/ijac.v16i1.35437.

LEE, A.V. (2023) 'Supporting students' generation of feedback in large-scale online course with Artificial Intelligence-enabled evaluation', Studies in Educational Evaluation, 77, p. 101250. doi:10.1016/j.stueduc.2023.101250.

Lo, C.K. (2023) 'What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature', Educ. Sci., 13, 410. https://doi.org/10.3390/educsci13040410

Mei Hui Lim & Vahid Aryadoust (2022) 'A scientometric review of research trends in computerassisted language learning (1977 – 2020)', Computer Assisted Language Learning, 35:9, 2675-2700, DOI: 10.1080/09588221.2021.1892768

Nadan, J.S., Walton, A., Tabaei, B., Bryant, C.E. and Shah, N. (2024) 'Disruptive innovation in effective learning systems: the impact of personalised instructor-created software-aided assessments to increase retention and knowledge', International Journal of Innovation Science, Vol. 16 No. 1, pp. 19-42. https://doi.org/10.1108/IJIS-09-2022-0182

Nassuora, A.B. (2022) 'Applied Artificial Intelligence Applications in Higher Education Institutions: A Systematic Review', Webology, 19(3). http://www.webology.org

Ocaña-Fernández, Y., Valenzuela-Fernández, L.A. and Garro-Aburto, L.L. (2019) 'Artificial intelligence and its implications in higher education', Purposes and Representations, 7(2), pp. 536–568. doi: 10.20511/pyr2019.v7n2.274

O'Neil, C. (2016) 'Weapons of math destruction: How big data increases inequality and threatens democracy', Crown.

Prinsloo, P. and Slade, S. (2017) 'Big Data, Higher Education and Learning Analytics: Beyond Justice, Towards an Ethics of Care', Big Data and Society, 4(1), pp. 1-10. https://doi.org/10.1177/2053951717730446

Rosé, C.P., Wang, Y., Cui, Y., Arguello, J., Stegmann, K., Weinberger, A. and Fischer, F. (2019) 'Socially-aware conversational agents: The case for social analytics in conversational AI', IEEE Intelligent Systems, 34(5), pp. 18-28.

Seo, K. et al. (2021) 'The impact of artificial intelligence on learner–instructor interaction in online learning', International Journal of Educational Technology in Higher Education, 18(1). doi:10.1186/s41239-021-00292-9.

Selwyn, N. (2019) 'Should robots replace teachers? AI and the future of education', Polity Press.

Sychev, O., Anikin, A. and Prokudin, A. (2020) 'Automatic grading and hinting in open-ended text questions', Cognitive Systems Research, 59, pp. 264-272. https://doi.org/10.1016/j.cogsys.2019.09.025

Tsivitanidou, O. and Ioannou, A. (2020) 'Users' Needs Assessment for Chatbots' Use in Higher Education', Central European Conference on Information and Intelligent Systems. Varazdin. Retrieved from ProQuest1.

University of London Worldwide. (2020) 'Annual Report'. [Online] Available at: [URL].

Wu, W. (2021) 'Retracted Article: An Intelligent Computer System for Assessing Student Performance', International Journal of Emerging Technologies in Learning (iJET), 16(02), pp. 31–45. doi: 10.3991/ijet.v16i02.18739

Yao, X. (2022) 'Design and research of Artificial Intelligence in multimedia intelligent questionanswering system and self-test system', Advances in Multimedia, 2022, pp. 1–8. doi:10.1155/2022/2156111.

Zawacki-Richter, O., Marín, V.I., Bond, M. and Gouverneur, F. (2019) 'Systematic review of research on artificial intelligence applications in higher education – where are the educators?',

International Journal of Educational Technology in Higher Education, 16(39). https://doi.org/10.1186/s41239-019-0171-0

36

37