AI Meeting Assistants in English-Medium University Lectures in Hong Kong, China: A Double-Edged Sword for Student Perception

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Manuscript received May 30, 2024; revised June 17, 2024; accepted July 2, 2024; published September 14, 2024

***Abstract*—This study investigates the effectiveness of Artificial Intelligence Meeting Assistants (AIMAs) in enhancing student engagement and satisfaction in English-medium university lectures in Hong Kong, China. Otter.ai, known for its real-time transcription capabilities, was implemented in two mandatory English course sessions for first-year students. Student feedback was collected through post-lecture surveys. Preliminary analyses reveal an encouraging impact on the anticipated performance of students using the AIMA, with those in the AIMA group reporting statistically higher expected grades compared to the non-AIMA group. However, perceived instructor enthusiasm and communication skills and clarity of presentation are noted to be lower for the AIMA group. This research underscores both the potential benefits and challenges linked with AIMA usage in an academic context. By illuminating these aspects and identifying areas for improvement in AIMA implementation, this study contributes to bridging the gap between AI technology and its practical application in education.**

***Keywords*—Artificial Intelligence (AI), Artificial Intelligence Meeting Assistants (AIMAs), student engagement, lecture satisfaction, higher education, English-medium lectures**

I. Introduction

The increasing prominence of English as a language of instruction, even in regions where it is not the primary language, poses significant challenges for students. The Chinese University of Hong Kong (CUHK), a globally renowned institution with a diverse student body representing over 70 countries, is a prime example of this phenomenon. English-medium lectures can be particularly daunting for students whose native language is not English. This challenge is exacerbated by Hong Kong's Medium of Instruction policy, which creates a disparity between English Medium-of-Instruction (EMI) and Chinese Medium-of-Instruction (CMI) schools [1]. Students from CMI schools may have limited exposure to English, impeding their comprehension and engagement during university lectures.

Research confirms the detrimental effects of learning in a non-native language on academic performance, especially in the initial year [2, 3]. A recent survey conducted at CUHK involving 712 undergraduates and postgraduates identified language barriers as the primary difficulty faced by students [4]. Moreover, traditional teaching methods prevalent in Hong Kong schools, which emphasize memorization and exams, may hinder students' adjustment to the more flexible and intellectually stimulating curriculum at CUHK [4]. Some first-year students continue to rely on traditional approaches such as face-to-face lectures and note-taking, further impeding their engagement.

This study aims to address these challenges by examining the potential of Artificial Intelligence Meeting Assistants (AIMAs) to enhance student engagement and satisfaction during lectures. AIMAs are AI-driven tools that transcribe lectures, identify key topics, and provide summaries of transcripts. By alleviating the burden of note-taking, these functionalities enable students to concentrate fully on the lecture content and actively participate. Peverly *et al.* [5] emphasized the necessity of cognitive processes for effective note-taking and investigated the relationship between note quality and transcription. Cognitive load theory suggests that individuals can only process a limited amount of information at a time [6]. By automating note-taking, AIMAs can reduce this cognitive load, allowing students to focus more effectively on the lecture material. Additionally, according to self-efficacy theory, students who possess a strong belief in their ability to succeed are more likely to participate actively [7]. AIMAs can enhance student self-efficacy by facilitating better comprehension, leading to increased confidence and participation in discussions.

However, the effectiveness of AIMAs depends on both the capabilities of the software and user perceptions [8]. While existing AIMA tools offer a range of features and cater to diverse user needs, they may not be specifically tailored for lecture environments. This study aims to fill this gap by evaluating the feasibility and considerations of using AIMAs to support first-year students in transitioning to university-level English-medium lectures.

II. Literature Review

Artificial Intelligence (AI) has emerged as a transformative force in education, offering innovative tools such as chatbots and advanced communication platforms, while also enhancing academic skills [9]. The integration of Natural Language Processing (NLP) techniques and Large Language Models (LLMs) like Generative Pre-trained Transformer 4 (GPT-4) has furthered educational practices by providing personalized feedback and tailored curricula [10]. NLP involves the interaction between computers and human language, allowing machines to understand and respond to text or speech inputs in a meaningful way. LLMs,

like GPT-4, are sophisticated models trained on vast amounts of data to generate human-like text based on context. In this regard, many institutions have been considering the adoption of AI to support classroom teaching. For example, Chen *et al.* [11] delved into the possibilities, obstacles, effectiveness, and ethical considerations associated with employing chatbots as pedagogical aids in business education. Their findings revealed that AI chatbots have the potential to serve as interactive and attentive conversational learning aids, facilitating the instruction of fundamental concepts and the provision of educational materials. Huang *et al.* [12] likewise utilized AI-driven personalized video recommendations to enhance students' motivation and engagement in a systems programming course conducted within a flipped classroom framework. Their study demonstrated that the implementation of AI-driven personalized video recommendations led to notable enhancements in both learning outcomes and student engagement, particularly among those with a moderate level of motivation.

In addition to its broader implications for education, AI technologies are reshaping English lectures, enriching learning experiences through diverse approaches. Despite English emerging as a predominant international language for instruction in many countries [13], students with English as a non-native language often face challenges in comprehension and note-taking [14]. Notably, Peverly *et al.* [5] emphasized that effective note-taking necessitates various cognitive processes. Students must comprehend verbal material, utilize language comprehension skills and background knowledge, retain information in working memory, prioritize essential content for transcription, and sustain attention throughout the lecture or reading session. AI interventions offer promising avenues to support student learning in this regard. For instance, AI technologies can generate lecture scripts and summaries [15], and speech-to-text recognition coupled with translation capabilities aids comprehension [16]. Innovative tools like smartpens assist students, particularly those with learning disabilities, in producing high-quality notes [17]. Research on the benefits of digital note-taking methods presents a nuanced picture. While Sun and Li [18] reported significantly higher scores among students who recorded notes digitally, Artz *et al.* [19] found that the impact of digital note-taking on student performance may not be statistically significant.

Despite the significant strides made in exploring AI's benefits and potential shortcomings in education, there remains an evident gap in the literature. The current focus tends to either promote AI's near-term benefits or address potential shortfalls, overlooking the long-term and nuanced implications for student engagement in the learning process. Specifically, there is a lack of comprehensive exploration on the impact of AIMAs in improving student engagement and satisfaction. This gap serves as the motivation for this study, which aims to explore the potential of AIMAs in enhancing student engagement and comprehension, particularly in a university context.

III. Methods

To investigate the potential of AIMAs in boosting student engagement and comprehension within a university setting, we performed a controlled experiment. The experiment focused on an English communication for university studies course targeted at first-year students. Designed to refine the language skills necessary for academic success, this compulsory course is for first-year students who have achieved a minimum proficiency level of 5 in the Hong Kong Diploma of Secondary Education (HKDSE) or its equivalent. The HKDSE is a standardized examination in Hong Kong with performance levels ranging from 1 to 5, and the top levels being 5* and 5** [20]. A level 5 in HKDSE indicates a relatively high proficiency in English, roughly equivalent to an average overall band score of 7.41 in the International English Language Testing System (IELTS) [21]. Additionally, successful completion of this course is a prerequisite for advancing to Level Two and Level Three courses within the curriculum. The course curriculum emphasizes developing academic writing skills, including summaries and essays.

We selected two large sections (hereinafter: Class A and Class B) of the course, both taught by the same instructor, to ensure consistency. Prior to the experiment, we confirmed similar English proficiency levels among students in both sections by analyzing their recent mid-term assignment scores (no significant difference, p=0.17 >0.05). Besides, the students in both classes all came from the Faculty of Business Administration, eliminating the effect of their domain knowledge. A coin toss determined which class (Class A or Class B) would integrate AIMA into their learning environment for a four-week period. Both Class A and Class B usually met with the instructor twice a week.

The AIMA used for this study is called Otter.ai. Otter.ai is a widely recognized AI meeting assistant renowned for its live note-taking capabilities and the generation of summaries. It employs advanced NLP techniques to transcribe spoken language into text in real-time, ensuring high accuracy by continuously learning from a vast dataset of voices and accents. This technology enables Otter.ai to understand context, recognize various speech patterns, and adapt to different accents, making it a versatile tool for diverse user groups. Key features include speaker identification and summarization, which extracts and highlights key points from discussions. These capabilities make Otter.ai an efficient and powerful transcription and summary tool [22]. Its selection for our study was based on its popularity and endorsement by multiple recommendation websites as one of the best AIMAs to try in 2024 (e.g, [23])

In Class A, the instructor informed students about using Otter.ai before each lecture and activated it during class sessions. Otter.ai recorded and transcribed the lectures in real-time. Towards the end of each lecture, Otter.ai generated summaries highlighting key points. The instructor then leveraged these summaries to deliver a concise lecture review for students. Additionally, the AI-generated notes were uploaded to the university's Learning Management System (Blackboard) for student reference.

Class B served as the control group, experiencing the same course curriculum without the use of the AIMA. The instructor delivered lectures in the same manner as Class A, but without activating any AI recording or transcription tools.

To control for potential order effects, the schedule of Class

A and Class B was counterbalanced. This means that on some days, Class A had the first lecture of the day, followed by Class B. On other days, the order was reversed, with Class B having the first lecture and Class A following. This approach helps ensure that any differences in student engagement are not simply due to fatigue or other factors associated with lecture order.

To evaluate the effectiveness of the AIMA, both classes participated in voluntary surveys after each lecture. The surveys employed 5-point Likert-scale questions to assess student satisfaction and engagement across four key aspects: instructor's clarity of explanations, instructor's enthusiasm and communication skills, learning interest, and overall satisfaction (see Table A1). Students responded using a range of options from "Strongly Disagree" to "Strongly Agree.". In addition to these Likert-scale questions, students were also required to indicate their expected grade for the course, choosing from options ranging from A to C and below. They were also asked to fill in their background information. The questionnaire mirrored the university's standard Course and Teaching Evaluation Questionnaire, ensuring the data's reliability and validity.

This study adhered to ethical guidelines to ensure the protection of participants' rights and well-being. Prior to the commencement of the experiment, ethical approval was obtained from the Survey and Behavioral Research Ethics Committee of the first author's affiliated university. Informed consent was secured from all participants, who were briefed on the study's purpose, procedures, and their right to withdraw at any time without penalty. Confidentiality was maintained by anonymizing survey responses and ensuring that no personal identifying information was collected or disclosed. Additionally, participants were assured that the use of AIMA in classes was strictly for research purposes and that the recorded data would be used solely for this research.

The data analysis utilized independent samples t-tests to compare student perceptions between Class A (with AIMA) and Class B (without AIMA), aiming to assess the statistical significance of the mean differences between the two independent groups. A significance level of $p < 0.05$ was established for all t-tests. To mitigate the increased risk of type I error due to multiple comparisons, a Bonferroni correction was applied, adjusting the significance threshold to 0.0125 (0.05/4). Additionally, a chi-square test was conducted to compare the frequencies of students' expected grades between Class A and Class B, with an acceptable probability level set at $p < 0.05$ for this test.

IV. Results and Discussion

A. Results

In Class A, with 20 students registered, an average of 17 students participated in the survey at the end of each lecture. Similarly, in Class B with 19 registered students, an average of 17 students participated at the end of each lecture.

As illustrated in Table 1 and Figs. 1–2, the study revealed intriguing patterns. Students in Class A, utilizing AIMA, reported significantly lower perceived clarity in instructor explanations (mean = 4.18, SD = 0.61) and instructor enthusiasm and communication skills (mean = 4.22, SD = 0.60) compared to Class B (no AIMA) (means = 4.51 and 4.58, SDs = 0.55 and 0.50, respectively). These disparities were statistically significant (p-values < 0.001), indicating robust differences between the two classes.

However, despite these variations, there were no significant differences in overall satisfaction (means = 4.07 for Class A vs. 4.17 for Class B, SDs = 0.59 and 0.60, respectively; $p = 0.221$) and learning interest (means = 4.02 for Class A vs. 3.86 for Class B, SDs = 0.62 and 0.93, respectively; $p = 0.135$).

Students' expected grades also differed between the two classes, as shown in Fig. 3. A chi-square test revealed a statistically significant relationship ($p = 0.000 < 0.001$) between using AIMA and the expected grades. Students in Class A (with AIMA) had a higher frequency of A-grade expectations and a lower frequency of B-grade expectations compared to Class B (without AIMA).

Table 1. Analysis Results of the Independent Samples t-tests

Key Aspect	Class A (With AIMA)	Class B (Without AIMA)	T-Value	Statistically Significant
Instructor's Clarity of Explanations	4.18	4.51	−3.96***	Yes
Instructor's Enthusiasm and Communication Skills	4.22	4.58	−4.59***	Yes
Learning Interest	4.02	3.86	1.50	No
Overall satisfaction	4.07	4.17	−1.23	No

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

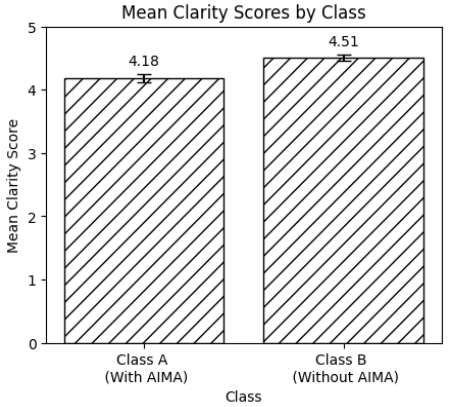

Fig. 1. Mean clarity scores by class. (Error bars stand for one standard error of the mean (SE).)

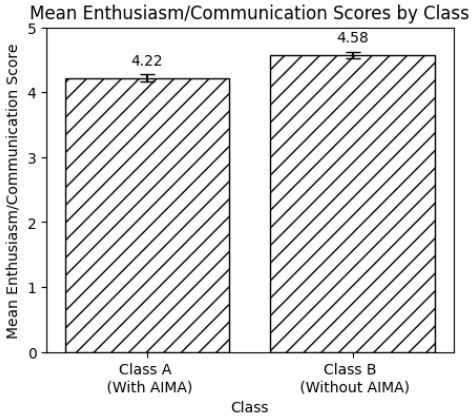

Fig. 2. Mean enthusiasm/communication scores by class. (Error bars stand for one standard error of the mean (SE).)

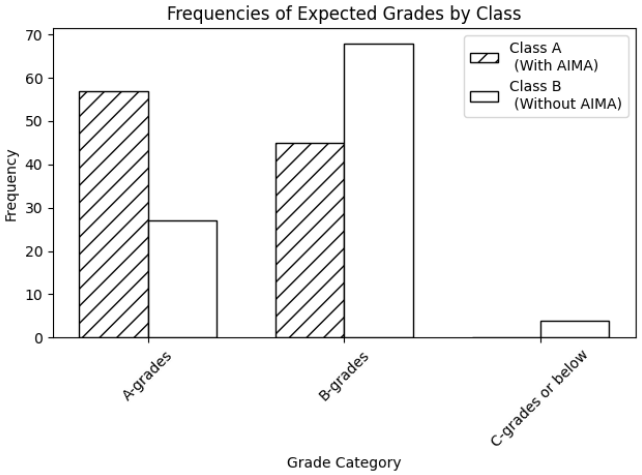

Fig. 3. Frequencies of expected grades by class.

B. Discussion

This study offers intriguing insights into the impact of using an AIMA, in classroom settings. While AI-generated lecture summaries have been traditionally viewed as beneficial, as outlined by [24], the implementation of such a tool might carry unintended consequences. Its integration into the classroom functions as a double-edged sword, evidenced by the reported lower levels of perceived clarity in instructional explanations, along with decreased instructor enthusiasm and communication skills within Class A, which utilized AIMA.

One possible explanation for these diminished ratings could be the disruption of the delicate balance between instructor and student interaction. Walsh and Li [25] underscore the pivotal role of classroom dialogue, interaction, and collaboration in maximizing language learning outcomes. Dialogic teaching, which encourages conversational exchange, could boost student engagement and learning outcomes in English-as-a-second-language classrooms by fostering collaborative interaction and idea development between teachers and students [26, 27]. However, the introduction of AIMA in the classroom may have inadvertently fostered a more formal, microphone-centric environment, impeding the natural flow of communication. This shift from direct teacher-student communication to a more indirect mode, centered around capturing clear audio, may have hindered student engagement, particularly for quieter students susceptible to microphone anxiety. Cox [28] identified microphone anxiety as a barrier to technology-enhanced in-class discussions, further highlighting its potential impact on classroom dynamics and perceived communication skills.

The lower perceived clarity of instructions may stem from multiple sources. The necessity for clear microphone speech might have affected the instructors' natural speech cadence, thereby impeding student comprehension during live classes [29]. Additionally, the awareness of being recorded might have induced a more cautious delivery, potentially diminishing dynamism. While recording can incentivize instructors to enhance clarity and organization, it may also lead to a more structured but less spontaneous teaching style [30]. Moreover, the instructor's unfamiliarity with AIMA could have posed additional challenges, such as difficulties in capturing audio from video content. Furthermore, the imposed switch in students' listening habits due to the available lecture recordings may have had harmful effects on their perception of the teacher's clarity. As students grew aware of the upcoming summary, they might have become complacent, paying less attention to the lectures' intricate details that might have been left out in the summaries [31]. This involuntary shift of focus could affect their understanding, contributing to a distorted perception of the lesson's clarity.

Nonetheless, it is worth noting that while the students in Class A rated their instructor lower in terms of clarity and communication, there was no significant difference in the overall satisfaction and learning interest between the two classes. This is an interesting observation and implies that while AI implementation might have slightly hampered the traditional classroom dynamics, it did not critically affect the core learning experience or student interest in the subject. This could be due to the compensatory advantage of AI-generated notes, which might have given students in Class A an extra layer of study materials, hence the interesting observation in overall satisfaction and learning interest despite the lower clarity ratings.

Additionally, in terms of expected grades, despite the areas where AIMA may not have enhanced the learning experience, it is possible that having access to AI-generated summaries fostered student confidence, as they provided an additional resource for course review and assignment preparation. Students might have felt more confident about their understanding of the lecture content, leading to the perception of potentially higher grades.

Overall, the integration of AIMA tools in educational settings appears to be a double-edged sword. On the one hand, it can potentially provide valuable learning aids like lecture summaries. On the other, if not properly managed, it can disturb the traditional, interactive teaching-learning process. Thus, the key lies in mastering the balancing act: incorporating such technology in a way that augments rather than impedes the learning experience, which might necessitate a gradual, educated approach and training from educators' and students' side.

V. Limitations and Future Research

While this study offers valuable insights into the impact of AIMAs on student engagement and satisfaction, several limitations highlight the need for further exploration. As a preliminary investigation with a limited sample size, the findings may not be broadly generalizable. Future research should involve larger samples across multiple institutions and disciplines to provide a more comprehensive understanding. Additionally, the focus on student perceptions through surveys might not capture the full scope of AIMA's impact. Including qualitative data from interviews or focus groups with both students and instructors could offer a more holistic view of how AIMAs influence teaching styles and classroom dynamics.

Future research should also explore strategies for effectively integrating AIMA tools into teaching practices, comparing the effectiveness of different AIMAs, and examining their impact on student learning outcomes and

classroom dynamics. Investigating the combination of AIMAs with active learning strategies could further enhance student engagement and knowledge retention. Moreover, the ethical implications of AIMA use, including student privacy, data security, and potential biases within AI algorithms, should be a focus to ensure responsible implementation.

By addressing these limitations and pursuing these research directions, we can gain a deeper understanding of how AIMAs can be effectively harnessed to improve the learning experience for all students.

VI. Conclusions

This study sheds light on the nuanced impact of AIMAs on student engagement and satisfaction within a university setting. Specifically, the use of Otter.ai in an English communication course for first-year students revealed both promising benefits and notable challenges. Students using the AIMA reported lower levels of perceived clarity in instructor explanations and reduced instructor enthusiasm and communication skills compared to their counterparts without AIMA. These findings suggest that while AIMAs can offer valuable resources like AI-generated summaries, they might also disrupt traditional classroom dynamics and impede direct teacher-student interactions.

Despite the lower ratings in clarity and communication, there was no significant difference in overall satisfaction and learning interest between the two groups. This indicates that the AI-generated notes may have provided a compensatory advantage, potentially enhanced student confidence in understanding of the lecture content and contributed to a perception of higher expected grades. These results underscore the dual nature of AIMAs: they can serve as effective learning aids but may also introduce challenges if not properly integrated into the classroom environment.

Looking forward, future research should explore larger and more diverse samples across multiple institutions and disciplines to enhance the understanding of AIMAs' impact. Additionally, incorporating qualitative data through interviews or focus groups with both students and instructors could also provide a more comprehensive understanding of AIMAs' role in education. Lastly, investigating strategies for effectively integrating AIMAs into classroom settings could help maximize their benefits while minimizing potential disruptions. This study serves as a stepping stone towards more informed and strategic integration of AI technologies in education, ultimately aiming to enhance student engagement and comprehension in diverse learning environments.

Appendix

Table A1. Constructs and measurement items in the questionnaire

Construct	Item
Instructor's Clarity of Explanations	• The teacher presented in a clear manner. • The teacher used relevant examples to assist my learning.
Instructor's Enthusiasm and Communication Skills	• The teacher was enthusiastic about teaching. • The teacher encouraged active participation in class. • There was effective communication between teacher and students.
Learning Interest	• The course was interesting. • The course was stimulating. • The course enhanced my knowledge in this subject.
Overall satisfaction	• Overall, I am satisfied with the course. • Overall, I am satisfied with the teacher's performance.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Alex Pak Ki Kwok was responsible for the conceptualization, methodology development, formal analysis, validation, original draft writing, review and editing. Yao Hing Wong contributed to the methodology development, investigation, validation, and review and editing of the manuscript. Kwong Cheong Wong and Chee Hon Chan provided research guidance and contributed to the review and editing of the manuscript. All authors have approved the final version of the manuscript.

Funding

This research was funded by the Funding Scheme to Enhance Student Engagement and Address Student Learning Needs (Supported by Teaching Development and Language Enhancement Grant 2022-25), grant number 4171072.

Acknowledgment

The authors wish to thank the students in ELTU1002 (AT and AY) for involving in the experiment.

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