Developing AI Applications Through International Partnership: An Experiential Learning Approach in Engineering Education

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Abstract

In recent years, interdisciplinary and cross-institutional collaboration in engineering education has become increasingly popular for students to apply technical knowledge in real-world contexts. This practice paper describes a joint initiative between the Innovation Academy, Faculty of Engineering, The University of Hong Kong (HKU) and Data Science Institute, Faculty of Science, University of British Columbia (UBC). In 2025 summer, the two institutions partnered to design and deliver a collaborative student project focusing on developing AI-powered museum tour guide applications. The initiative brought together two students from HKU and two from UBC, along with faculty advisors from both universities, in a program that combined experiential learning, cultural exchange, and project-based teamwork.

The collaboration was structured into three phases: an initial project kick-off at HKU, a remote continuation period at each student's home institution, and a concluding sprint in UBC. This structure allows students to benefit from immersive cross-cultural experiences, and also provides students with distributed teamwork experience. The "AI Museum Tour Guide" was selected because it aligns with both institutions' objectives by presenting AI, large language models (LLMs), and data science within a social context. By talking to the guide on the mobile phones, the system provides interactive answers to users' questions, which ameliorates the deficiencies of traditional pre-recorded audio tour guides.

The project cultivates students' technical and professional growth. Besides acquiring technical competencies in natural language processing and AI systems, the students were immersed in the intercultural environment when carrying out the project. Initial challenges, such as the different expectations for the project and the collaboration under significant time zone differences, provide the student with valuable learning opportunities. Students learned how to plan and work asynchronously, and also demonstrated effective communication skills through discussion about the project deliverables. These experiences enhanced their expertise and equipped them to succeed as professional engineers.

This paper will discuss three key dimensions of this initiative: (1) the design of the collaboration between HKU and UBC; (2) the process of developing the AI Museum Guide project between the two institutions and the UMAG; and (3) educational outcomes of this project and student feedback. By sharing this experience, we hope to contribute a replicable model for cross-institutional AI-focused collaborations in engineering education.

Introduction

The engineering education has undergone significant transformation in recent years, shifting from the traditional lecture-based courses towards experiential, project-based learning that emphasizes on solving real-world problems. This pedagogical change highlights the increasing importance of pairing technical skills with practical experience. The engineers in modern world should be able to navigate complex, interdisciplinary challenges while collaborating across disciplinary, institutional and cultural boundaries. As emerging technologies like artificial intelligence become more prevalent and integrated into engineering curricula, these experiential learning approaches shall simultaneously develop technical depth and collaborative capabilities.

HKU was established in 2020 with a mission to provide students with a makerspace and collaborative environment supporting innovative student projects. This initiative recognized that modern engineering education requires physical and intellectual spaces where students can experiment, innovate, and develop solutions to open-ended problems. The makerspace facilitates hands-on learning and peer collaboration, creating a learning environment where students can translate theoretical knowledge into tangible prototypes and working systems.

Building on this foundation, HKU launched its student internship program in 2023, expanding beyond internal projects to establish collaborative relationships with external partners across different departments and industries. This program was designed to bridge the gap between academic learning and professional practice by engaging students in real-life challenges with meaningful stakeholders. The internship projects provide students with opportunities to work on problems that have real-life impact, both within the university and in broader industrial contexts. Through these partnerships, students are introduced to professional workflows, stakeholder management, and the constraints and factors that influence engineering decisions in practical environments.

Cross-institutional collaboration has emerged as a powerful mechanism for enriching engineering education[1]. By partnering with institutions in different countries, students can be able to see and experience diverse perspectives and cultural contexts that would be impossible to see within a single institution. These collaborations provide students with authentic experiences in distributed teamwork and cross-cultural communication, which are increasingly essential in the world of globalization.

HKU and UBC jointly undertook the development of an international student collaborative project that would systematically integrate global perspectives into the engineering teaching and learning. Built on top of the student internship program in HKU, we extended the internship model from a local project to an international collaborative framework. This expansion maintained the core principles of experiential learning and real-world problem-solving while adding layers of complexity and richness through international partnership. The collaborative project was designed to pair student teams from both institutions, allowing them to work together on carefully selected engineering challenges that hold relevance in both geographical contexts.

The summer 2025 collaboration between HKU and UBC centered on developing an AI-powered museum tour guide application, bringing together two students from each institution under the guidance of faculty advisors from both universities. This project was selected because it aligned with the objectives of both institutions and matches the expertise of the faculty members and the students. The AI museum guide project requires students to integrate knowledge across multiple domains, including natural language processing, large language models, recommendation systems, human-computer interaction, while also considering the specific context of museum visitors and cultural heritage communication.

This paper examines the design, implementation, and outcomes of this collaborative initiative across three key dimensions: the institutional partnership structure between HKU and UBC, the technical and organizational process of developing the AI museum guide with University Museum and Art Gallery, HKU (UMAG), and project and educational outcomes achieved through this experience. By documenting this practice, we aim to provide a replicable model for institutions seeking to develop similar cross-institutional, AI-focused collaborations in engineering education.

Related Work

Experiential learning has long been considered in the engineering education. Tembrevilla[2] conducted a systematic review to examine 220 studies from 1995 to 2020. It was found that experiential learning in engineering education operates under the self(student)-school-community framework, where students develop professional competencies through authentic engagement with real-world problems. Simultaneously, project-based learning (PBL) has served as a practical bridge between theoretical concepts and professional application. In the Lavado-Anguera et al.'s review[3], seven key pillars supporting PBL are identified, including technology, integrated curriculum, international focus, sustainability, multidisciplinary focus, simulation and professional environments. Built upon these work, our project integrates AI application development into an international collaborative framework that entails multiple pillars.

In this globalization world, the engineering training should help student build cross-cultural adaptability and problem-solving skills. Streiner and Besterfiled-Sacre conducted a survey on 301 engineering students who had international experience during college. The analysis revealed that international experiences in the form of internships, co-ops, and research abroad, produce substantial gains in students' global perspective. However, the study also showed that these types of international experiences were the least frequent among the surveyed population; most engineering students currently have little opportunity to access it. Traditional study abroad programs often face the barrier of high cost. Collaborative online international learning (COIL)[4] has emerged as a complementary approach for students to gain international experiences. Vasquez and Ramos' review study[5] showed that COIL activities during the COVID-19 pandemic could significantly boost cultural, technical and global competence of engineering students. Successful implementation of COIL involves many aspects, including motivation for students to learn from other students and cultures, and constant communication amog faculty and students. Hackett et al's experimental study[6] demonstrated that COIL helps student develop intercultural competence, measured by cultural intelligence[7] and multicultural personality model[8]. Our collaboration project extends beyond purely virtual collaboration by incorporating two intensive in-person phases at partner institutions, combining the immersive benefits of physical teamwork together with the accessibility of COIL.

The application domain of the AI museum tour guide represents an intersection between artificial intelligence and cultural education. De Carolis et al.[9] developed an AI-assisted virtual reality (VR) system for the National Archaeological Museum of Taranto, which allows visitors to interact online with virtual agents through natural language. The satisfactory user experience in their preliminary study suggests potential for expanding this approach into a more complete system. Alaasar and Mekawey[10] implemented a deep learning-based recommendation systems that personalize museum visitor experiences through intelligent content curation. Our project was conducted in a similar domain, with the emphasis on education values where students design and develop such systems through partnerships with museum stakeholders.

Institutional Collaboration Framework

The partnership between HKU and UBC was structured around a three-phase model designed to balance immersive cross-cultural experiences with practical distributed teamwork. This framework is designed as modern engineering project increasingly requires professionals to collaborate across geographic and cultural boundaries. This international experience will be a valuable component as a part of the student internship. Table 1 summarizes the timeline of the collaboration.

Table 1: Timeline of the Cross-Institutional Collaboration

Time	**Activity**
6 months prior	Monthly planning meetings between HKU and UBC faculty to discuss logistics and recruitment.
1 month prior	Online meet-and-greet for students and mentors to introduce the project scope and milestones.
Early June (Phase One)	**Kickoff at HKU:** Students gathered to design technical architecture, establish workflows, and consult with UMAG curators.
June to August (Phase Two)	**Remote Continuation:** Distributed development with weekly online meetings and asynchronous communication.
Mid-August (Phase Three)	**Concluding Sprint at UBC:** Final system testing, visit to the UBC museum, and delivery of the final presentation.

Preparation and Team Formation

Six months before the start of the student exchange, HKU and UBC had monthly online meetings to discuss logistics and the project for students to work on. In the meetings, we established that four students (two from each institution) will participate in this collaborative project. Both institutions will recruit their respective students to work on the project. At HKU, we selected student interns who have been working on GenAI projects during semester time to participate in this collaboration project. One student had completed the second year of a computer engineering program, and the other had finished the first year of general engineering and was about to enter the computer science major. In UBC, they recruited students to work in their summer programs, and selected students to participate in this project among those who had been recruited based on their background and interests. One student had recently graduated at the time of joining the project, while the other had just completed the third year of study.

The project would be structured into three phases. In the beginning of the project (early June), all the students met in HKU to set the project plan. This is followed by the remote continuation phase where students work in their home institutes and communicate remotely. Finally, students gathered at UBC to complete the project and deliver their concluding presentation.

A critical issue in cross-institutional partnerships is to select a project topic suitable for students with different academic backgrounds. UBC deliberately includes non-STEM students in their programs, whereas HKU selects interns from STEM students. This diversity required flexibility in identifying a topic area that could accommodate both student groups. In our case, the students work on the "AI Museum Tour Guide" project, which provided sufficient technical depth for STEM-focused students while remaining accessible through its social and cultural context for students with varied backgrounds.

Phase One: Project Kickoff at HKU

The initiative began with an intensive kickoff period at our institution in early June, when both institutions began the summer break. All four students met in HKU to establish the foundation of the project. This phase allows students to build interpersonal relationships and establish trust before transitioning to remote work, which increases the effectiveness of subsequent remote collaboration.

One month prior to the project kickoff phase, an online meeting was held between the students and the mentors at both institutions to meet and greet. In this meeting, the mentors introduced the project to the students, including the topic for them to work on, milestones for the project, and the logistics of students in UBC visiting HKU. This enabled students to prepare in advance and provided an opportunity to acquire relevant skills before they gather at HKU.

The university–museum connection was established as UMAG incorporates technology into its activities, which aligned well with the university's museum studies courses and their emphasis on bringing technology into museum operations. During the project kickoff phase, students worked closely to develop the technical architecture and establish the workflow. For example, they designed the database schema and set up the database on Microsoft Azure, created a GitHub repository to store the code, and prepared the server environment for future deployment. Most importantly, after completing the detailed design, students met with UMAG to pitch their ideas and inquire about museum operations. In this meeting, the UMAG management team provided domain expertise, offering students valuable insights from a curator's perspective.

Phase Two: Remote Continuation

Following the kickoff, students returned to their respective home institutions for a remote continuation phase. This phase presented the most significant challenges but also offered the learning opportunities in distributed collaboration. Students faced substantial time zone differences that required careful planning and asynchronous work strategies.

The students continued their work based on the collaboration framework established in the previous phase. They scheduled weekly meetings to update the work progress and discuss upcoming plans. When project challenges emerged that required clarification from teammates at the partner institute, they communicated through messaging apps to accommodate the significant time zone differences. In this phase, students learned to make expectations explicit rather than assuming shared understanding, to overcommunicate when working remotely, to build in redundancy and documentation to prevent information loss, and to remain flexible and adaptive when technical or logistical issues arose.

Faculty mentors played crucial supporting roles during this phase. Mentors in both institutes conducted regular check-ins with students at their respective institutions and provided technical and academic guidance to the students while they are developing the projects. The mentors also maintained their own cross-institutional communication to ensure student support needs and to plan for the student activities for the concluding phase.

Phase Three: Concluding Sprint

The collaboration concluded with a final intensive sprint at UBC in mid-August, bringing the team together for project completion and delivery. This phase allowed students to work side-by-side once again to ensure smooth project completion by addressing issues that were difficult to address remotely. During this period, the students also conducted comprehensive system testing and refining the system, and prepared and delivered the final presentation that marked the conclusion of the project.

Reciprocally, the concluding phase at UBC allowed students from HKU to experience the culture and working practices of their partner institution. Students from HKU also have a chance to exchange ideas with the mentors and scholars in UBC, gaining diverse perspectives on their project work. They also visited the museum at the UBC. Even though the museum there is not our partner for this project, the students explored how to extend and generalize their solutions beyond UMAG. This immersive experience enriched the student experience by combining the technical project work with cultural exchange and planning about future applications.

Student Support and Mentorship

The collaborative project was structured to balance student active learning with appropriate guidance. At HKU, we focused on cultivating the students' independent problem-solving skills rather than prescriptive instruction. At the beginning of the project, mentors established clear objectives and deliverables for the project, but did not provide specific technical solutions or implementation details. Students were given the freedom to propose their own architectural designs and to select the appropriate technologies to achieve the project goals. The mentors would discuss with the students to evaluate their proposals and evaluate trade-offs between different technical options to justify the design decisions. Given the compressed two-month project timeline, mentors also offer strategic guidance to ensure each project is aligned with its objectives by helping students prioritize tasks and allocating time effectively across different project components.

The cross-institutional collaboration allowed students to learn from the mentors in both institutions. When students visited their partner institution during the kickoff and concluding phases, they received direct guidance from mentors at the host institution, meanwhile maintaining continuous communications with their primary mentors at their home institutions. This arrangement exposed students to different mentoring styles and technical perspectives, which enriches their learning experience through diverse viewpoints.

Project Specification and Collaboration with External Partners

In this collaborative initiative, the students work on a project under the topic "AI Museum Tour Guide". The selection of this project was based on multiple factors, including technical complexity appropriate for undergraduate students, relevance to both institutions' strengths, impact on social good that aligns with the goals of both institutions, and feasibility to complete the project within a two-month period.

AI and large language models are the technological domains that both institutions have identified to be important for students to develop relevant skills. Under this initiative, the museum tour guide application provided an ideal context for students to expose themselves to these technologies because it required integration of multiple skills including natural language processing, conversational interface design, information retrieval, and recommendation systems. In addition, the museum guide would also require students to attend to user experience and collaborate with domain experts such as museum curators to gain insights into visitor backgrounds and needs.

In many museums, small plaques, written information on the walls, and audio guide are typically used to introduce exhibits to visitors. In the project specifications, we asked the students to improve the experience of museum visitors by building an interactive AI tour guide. We did not have strict requirements regarding what to be achieved, but gave some examples to the students. For instance, visitors may initiate a conversation by scanning a QR code on the small plaque with a mobile phone. They will then be able to ask questions to the AI tour guide through a microphone or by typing in the text box. The system will reply with the answer in both audio and text, supplemented with images related to the question if possible. We also considered allowing visitors to take a photo and ask questions about it, but excluded this feature from the project due to concerns about completing it within the given time frame.

The above examples present several technical challenges to students. To guarantee the accuracy of the response, there should be some highly reliable data sources, which require the domain experts to help identify those. Since the chatbot delivers answers in both text and images, students must design systems capable of handling multimodal data effectively. Furthermore, the application must maintain reasonable response times, even when tasks involve speech recognition and complex processing, to ensure a smooth user experience. Through tackling these challenges, students gain practical experience in applying AI technologies to real-world problems.

Partnership with UMAG

Establishing a partnership with a museum allows the students to consult experts on the domain-specific questions, which is essential to the success of the project. Prior to the start of the project, HKU reached out to UMAG to explore possible collaboration as they have had several initiatives on the adoption of AI in the museum. We then arranged a preparation meeting to discuss the project.

In the preparation meeting, mentors in HKU presented the project idea and asked the UMAG about the resources available to assist the students in building the project. UMAG was able to share some books that they previously published based on the exhibits. These high-quality data sources provide students with the required data for the development of the AI museum tour guide. UMAG was also able to assign an intern in the Arts programme to work closely with the student when the project began.

In the project kick-off phase, students in both HKU and UBC also met with the director, curators and the staff in the UMAG. This meeting provided the students with a valuable opportunity to engage with the collaborators from the museum collaborators, and it also served as a chance for students to communicate with people with different professional backgrounds. During the meeting, students presented a more detailed project plan, which generated interest from the UMAG and prompted several questions. One example topic was how to address inquiries beyond the scope of the museum's materials provided. This challenge led students to explore ways to integrate web searches into their application while ensuring the results remained reliable. UMAG also reminded that some exhibits have overly general titles, such as a single word like "Plate" or "Vase". This highlighted the need for students to develop a way to process exhibits that share the same generic name in user queries.

In the remote continuation phase and the concluding sprint phase, the communication between the students and the UMAG shifted to online format. The collaboration remained strong despite the distance. Through email communication, museum staff provided support by working closely with the students, including assisting with data labeling, validating the information, and answering museum-related questions. Towards the completion of the project, the students shared the prototype of AI tour guide with the UMAG team and incorporated their feedback to refine the system. After the summer, HKU continued to collaborate with the UMAG on further development, even though the students from the UBC were no longer actively involved.

In 2025, our partnership centered on a single museum located near HKU. As the project timeframe was short, we were only successful in establishing partnership with one museum. Ideally, our goal is for each student team to partner with a domestic museum as it offers several advantages. For example, students demonstrate higher interests as they feel more connected to a local museum, and local partnerships facilitate more frequent in-person interactions with stakeholders. Most importantly, different museums may have distinct needs and priorities, which we view not as a problem but as a pedagogical strength. This approach allows both student groups to work within a shared topic area while addressing different specific requirements. Such flexibility is particularly variable in cross-country collaborations. Nevertheless, the two teams worked on different parts under this topic to foster collaboration, leveraging the backgrounds, skill sets, and interests of the students instead of having them compete against each other.

Project and Educational Outcomes and Student Feedback

In this 2.5-month project our initial plan was for all students to collaboratively develop a single deliverable for the AI Museum Tour Guide project. During the early planning phase, the students proposed a more distributed approach. They jointly designed the backend database and processed the data during the project kickoff phase, while each institution would work on a separate deliverable under the same topic. Students from HKU focused on developing the interactive AI tour guide as originally planned, while the team from UBC worked on creating an AI-assisted tool to help museum volunteers prepare materials and organize tours. This idea was also supported by the UMAG and the mentors from both institutions, as it not only expanded the scope of the collaboration but also generated outputs that were both interesting and practical for the museum.

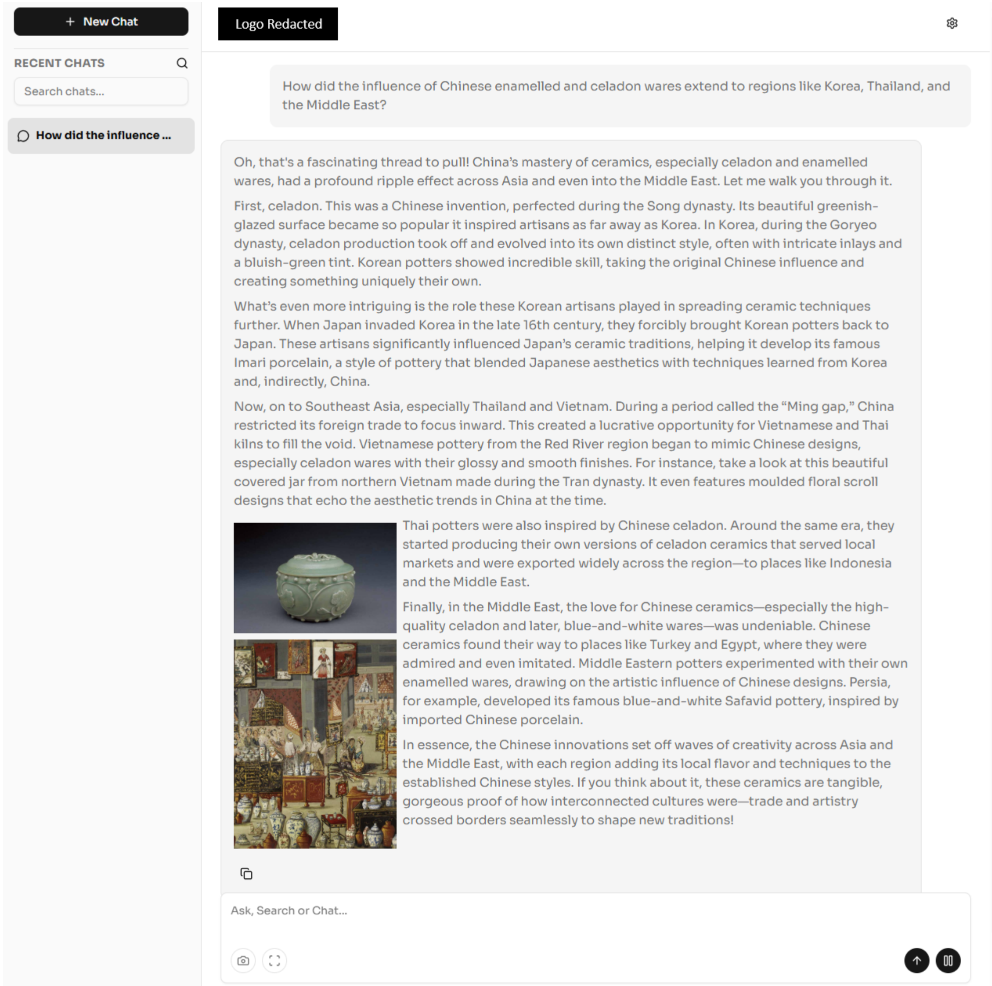

Figure 1: Screenshot of the AI Museum Tour Guide developed by the students

Additionally, it would be significant challenging to develop a single shared deliverable due to the 9-hour time difference. Despite the separate deliverables, the team still needs to communicate on updating the technical infrastructure and working on further data processing when they work in their home institutions.

The project concluded with a final presentation held at UBC, which also marked the completion of the summer internship program for UBC. The presentation was attended by faculty from both HKU and UBC, the students at UBC, as well as project stakeholders. During the presentation, the two teams presented their respective deliverables. The students from HKU gave a live demonstration of the interactive AI tour guide, and showcased its ability to engage users in natural conversation and provided multimodal information about museum exhibits. Figure 1 shows the screenshot of the tool developed by our student. The UBC team introduced their AI-assisted tool designed to help museum volunteers efficiently prepare tour materials and customize content based on visitor profiles. Both teams successfully presented a fully functional working prototype, which demonstrated not only their technical achievements, but also the problem-solving and cross-institutional collaboration developed through this international partnership.

Education Outcomes

Through this collaborative project, we aim for our students to achieve the following goals:

[Practical Experience] Gain practical experience developing AI applications by integrating skills in natural language processing, large language models, information retrieval, and human-computer interaction. Build independent problem-solving skills by designing system architecture and selecting appropriate technologies. Apply theoretical knowledge into a tangible prototype by applying engineering principles to solve a real-world problem for an external client.

[Project Management] Develop project management capabilities by learning to prioritize tasks, allocate time effectively, and adjust project scope to meet objectives within a fixed timeline.

[International Collaboration] Develop the ability to collaborate effectively in an international team with different cultural norms and working practices. Learn to manage projects across significant time zone differences by using asynchronous communication, careful planning, professional tools and workflows and detailed documentation.

[Stakeholder Communication] Acquire communication skills by meeting with external partners to define requirements, pitch ideas, and incorporate domain-specific feedback. Practice bridging interdisciplinary knowledge gaps by working with individuals from different professional backgrounds, such as museum curators and arts interns.

These objectives aim to prepare students to become adaptable professionals who can effectively apply technical knowledge to solve problems in the internationalized environment. Through this experience of working with real clients and interdisciplinary, international teams, students develop communication, project management, and problem-solving skills for effective professional practice that are essential in future careers.

Student Feedback

After the completion of the summer collaboration, we conducted an interview with the students from HKU to gain insights into their learning process and experiences derived from this international collaboration. Specifically, we asked students to reflect on what they learned from the project and the unique benefits of this collaboration that they could not experience at HKU alone. Besides technical and project management skills, students also mentioned the distinct institutional structures and mentorship approaches provided them with different learning opportunities that could not be replicated in a project conducted locally.

Students mentioned substantial differences in organizational structures between the two institutions. In HKU, students worked in a maker space environment with 30 other fellow students daily, whereas in UBC, they worked in a smaller group with around eight members with a more flexible work style and independent scheduling. In addition, students also experienced different supervisory and mentorship models. Mentors at HKU were lecturers whose focus was on facilitating student learning through hands-on experience. In UBC, mentors were data scientists who have been working on industry-level projects with different partners. Students from HKU gain exposure to the rigorous standards and demanding requirements typically encountered in real-world industrial settings. Apart from the mentors in both institutions, the external partner, UMAG also provided professional opinion from domain-specific perspectives. This three-way mentorship structure complements each other, providing students with well-rounded guidance.

Students also reflected on the temporal differences in project planning and execution. As HKU selected participating students from the interns who had been working in HKU during semester time, they had the opportunity to begin preparatory work before the official start of the program, such as investigating the technical infrastructure to be used in the project. Consequently, they were building the architecture of the system starting day one during the kickoff phase. The UBC team had less time and had to plan their project in this phase as well. After laying the groundwork, they could begin efficient implementation. This showed the advantages of staggered project timelines across different teams, and demonstrated that effective groundwork and accelerate subsequent development. Another distinction about the timelines is that UBC operated under a fixed summer schedule that required delivery of a prototype by the end of the internship, while HKU allowed students to deliver a milestone and continue the work during semester. This arrangement allows students to compare how planning varies depending on the time frame. When working on short-term projects, they should choose practical and attainable goals. For longer-term projects, students are encouraged to aim higher, set several objectives, and set priorities among those tasks.

Exposure to different environments also broadened students' perspectives. While the collaborative project focused on implementing the AI tour guide for UMAG in [Our University], students from HKU also had opportunities to visit larger museums and cultural sites in UBC. This experience made our students think about how similar AI tools can support different types of exhibitions, for example, integrating geolocation features for a larger museum or outdoor exhibitions. Students reflected that such exposure challenged them to think beyond the immediate project goals, and consider adaptability of their designs.

Overall, students agreed that international partnership provided a valuable opportunity to experience diverse working cultures, mentorship styles, and management practices. They reported that this collaboration "not only enhances [their] studies in computer science and artificial intelligence but also equips [them] with practical skills that will benefit [their] research at HKU as well as [their] future career", which is an experience that local projects within an institution alone could not have offered.

Future Plan and Conclusion

Building on this successful collaboration, HKU and UBC plan to continue this international partnership model in the following years. While this AI museum tour guide project demonstrates the viability of this framework, we will explore different application domains to be jointly determined by both institutions based on the mutual research interests and technical strengths. An enhanced vision for future collaborations will expand the partnership structure, with both HKU and UBC identifying a local industrial partner to work on the same topic. This would allow students to engage with stakeholders in both geographical contexts, and students would gain deeper insights into how global problems can be adapted to local contexts.

In conclusion, the international partnership between HKU and UBC exemplifies a highly effective model for modern engineering education, which successfully merges AI development with cross-cultural, project-based learning. The three-phase framework enabled students to work in different modes of collaboration. Through designing and implementing the AI Museum Tour Guide and the

AI-assisted tool for museum volunteers, students gained practical experience with large language models, information retrieval, and user-centered system design in close collaboration with a real museum partner. In addition to the technical capabilities acquired in developing the tool, this project provides a multifaceted educational experience where students need to communicate with stakeholder, manage projects, and adapt to different mentorship styles. This collaboration serves as a compelling and replicable model for how academic institutions can train globally competent engineering students equipped with technical skills and collaborative abilities that are necessary in this interconnected professional world.

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