

# Barriers to Embrace Multidisciplinary Learning Experience in Interior Architecture Design Module

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## ABSTRACT

A multidisciplinary learning experience is an approach to curriculum integration which values the ideas of collaboration across multiple disciplines in response to the Fourth Industrial Revolution (4IR). The 4IR has effectively widened the division between fields in which graduates are expected to perform desired skill and knowledge. This paper aims to determine the barriers encountered by the Interior Architecture Students embracing the multidisciplinary learning experience with students from other discipline. Through an explanatory case study approach, the emergence of approach curriculum comprised of three programmes in the built environment at a private university will be presented. The paper concludes with reflective writing addressing the barriers faced by the Interior Architecture students during the multi-learning experience. Findings of the study revealed the majority of students identify communication, time-management, responsibility, attitude, and teamwork as the most significant barriers encountered by Interior Architecture students in the implementation of the MLE approach in the Design Studio module. Developing strong communication skills, allocation in managing the time, team player roles and responsibility are essential trait that must be constantly fostered. These findings help to assist interior architecture educators in developing courses that integrate various disciplines and provide academics with a deeper understanding of the conceptualisations and practices of the multidisciplinary learning experience concept approach by identifying the barriers that hinder its implementation.

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## INTRODUCTION

Educational settings would be reassessed in terms of how knowledge is presented and accepted, particularly in higher learning institutions, in order to satisfy the expectations of the IR4.0 labour market. This is notably the case in the context of higher education. For Interior Architecture students to be effective in the construction environment, it is crucial for them to participate in collaborative projects that simulate real-life situations. These projects should involve experts from different disciplines who can contribute their specialised knowledge, concepts, approaches, and ideas. Collaboration between expert is necessity in design-related professions since this field are multifaceted to draw clear boundaries between parties. It also highlights the opportunity to revamp higher education approach to better prepare students for future obstacles. The knowledge acquired involves utilising technology to deliver education, changing the educator's role, educating individuals in a digitally interconnected society, and imparting future-ready life skills. Acquiring a complete education and cultivating the necessary skills for success necessitates the acquisition of all forms of knowledge.

In the twenty-first (21<sup>st</sup>) century, a crucial educational method is to foster complex problem-solving skills through the integration of diverse knowledge from different fields in a multidisciplinary environment. Utilising a multidisciplinary approach in higher education enhances students' design creative thinking, self-confidence, and fosters collaboration across several disciplines during problem-solving in real-world projects. The expected skills cover complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgement and decision making, service orientation, negotiation as well as cognitive flexibility. An explanatory case study investigation is necessary to examine the multidisciplinary learning experience approach and identify the issues and barriers encountered by students who participated in the experience. Therefore, the research questions are (a) How do interior architecture students at higher learning institutions evaluate and experience their collaborative learning in a multidisciplinary learning experience setting? (b) What issues and challenges do students encounter in a multidisciplinary learning experience setting?

## LITERATURE REVIEW

### Multidisciplinary Learning Experience (MLE)

Multidisciplinary collaboration is an inevitable result of changing and developing knowledge areas which aims to give students a thinking approach that works in multiple layers in design education. Multidisciplinary collaboration is a team of persons with diverse professional backgrounds and skills working together to achieve a shared goal (Tang & Hsiao, 2013). This conceptual learning approach is vital to the sustainable education since the approach develop students' awareness critical thinking, and problem-solving abilities to address real-world issues (Doulanari et al., 2021). A real-life skill ought to be integrated into project delivery at higher education institutions to help students grasp the concept of a multidisciplinary environment and enhance collaborative learning in order to tackle complex issues. Consequently, it enhances the development of aspiring professionals' imaginative abilities and expands their outlook on future possibilities.

Multidisciplinary learning experience (MLE) is a sustainable education approach which capable to enhance students' knowledge, critical thinking, and skills to address real-world issues (Doukanari, et al., 2020), in which students are working closely with other parties across the discipline to design the project outcome. Engaging in multidisciplinary work and collaborating across many networks appears to motivate students to think innovatively and take initiative, while also fostering a sense of accountability for their actions and learning. Creating a multidisciplinary learning experience (MLE) by combining modules from different subjects requires careful planning and extensive discussion to ensure the seamless delivery of the program. Design education ought to further emphasise the significance of diverse cooperation and cultivate

students who can excel in their professional design careers. Nevertheless, collaborating across different disciplines presents barriers (McKenney & Reeves, 2019).

A multidisciplinary design project is regarded as a valuable and beneficial experience in design education, providing students the chance to think differently and the ability to develop innovative project outcomes (Joachim & Petra, 2004). In many phases of the methods for developing innovations, multidisciplinary collaboration appears to be advantageous. It develops creative skills and makes it possible to combine diverse, previously unrelated thoughts into increasingly innovative concepts and to find answers for challenging issues (Hero, 2019). Students enrolled in design studio program should be prepared to seek out and observe real-world situations. The problem-seeking phase is only applicable to advanced design studios (Soliman, 2017). With implementation of the MLE approach adopted in design education able to nurture the collaboration skills which is crucial in developing a workforce that can compete on a global scale in the job market (Heikkinen & Isomottonen, 2015). Each member who participated in the MLE approach must manoeuvre through uncertainty in order to generate creative responses. Additionally, they determined that learning experiences are not rigid, as both team spirit and student attitude greatly impact how students respond to hard situations that arise from the multidisciplinary setting experience.

### **Concept of Multidisciplinary Learning Experience (MLE)**

This paper focuses on the multidisciplinary learning experience concept assembled within the built environment realm by connecting a series of modules to solve a complex problem or project. Multidisciplinary learning experience (MLE) is the term used to denote the type of education approach that entails more than one discipline. In this approach, the collaborative learning experience is formed through cooperation between modules from several academic disciplines, mandating that collaborating students form a multidisciplinary team to solve real-life project in contrast to the typical method executed separately by the single discipline. The MLE approach intends to expose students to collaborative learning that is rooted in hands-on experience in order to help them attain the important skills cited by the Future of Jobs Report which stated analytical thinking and creative thinking remain the most important skills in 2023 (Zahidi, 2023). Moreover, graduates need to be equipped with the skills of critical thinking, communication, collaboration, and creativity to be successful in the twenty-first century job market. High quality of multidisciplinary approach frequently led to effective communication and interactions (Nigel & Anita, 1995). Multidisciplinary learning experience occurs when academics from various fields collaborate with students in the higher education. Higher education curricula have been integrating cooperative learning in order to enhance students' intellectual and social skills (Meijer et al, 2020). The purpose of this paper is to investigate the issues and challenges in embracing the multidisciplinary learning experience through collaborative learning in design education experienced by interior architecture students through reflective writing.

### **Collaborative Learning (CL)**

The collaborative learning is a process whereby a group (or groups) of individuals learn from each other by working together to solve a problem, complete a task, create a product, or share one's thinking (Laal & Laal, 2012). The phrase CL captures a variety of educational strategies including shared intellectual activity, from small group projects to the more focused type of group work. In group-structured collaborative learning (CL), the students gather to jointly plan and distribute the work. Each student is in responsibility of their own individual work, as well as the team's overall effort. The student in the CL environment faces social and emotional challenges as they listen to a variety of perspectives and are compelled to explain and defend their viewpoints (Laal & Laal, 2012). The collaborative learning design framework established (Hei et al., 2016) offers a broad structure for facilitating multidisciplinary learning. However, a more specific framework with procedures is required to direct academics and students.

The concept of CL provides a method of interacting with peers, present and debate ideas, exchange diverse views, and explore various conceptual frameworks. The ability to collaborate successfully and efficiently involves practicing decision-making fluency and willingness while demonstrating respect for diverse teams. These traits are necessary to attain shared objectives (Darmuki & Hidayati, 2019). Student acceptance and value towards collaborative design projects as a part of their educational experiences go beyond their worth as mirrors of real-world situation (Mathews et. al, 2022). The inclusion of group collaborative learning in the curriculum will promote a multidisciplinary approach that unifies work and facilitates more effective cooperation. It can also offer a platform for investigating team structures and collaborations and achieving better student outcomes.

Diversity and the collaboration of multidisciplinary teams are essential to the effective completion of interior design projects. Interacting with clients, colleagues, and experts and actively contributing to their thoughts and perspectives is a vital component of a job (Abdallah, 2022). A number of researchers have asserted that advanced cognitive abilities and technical methodologies in design education can only be obtained by incorporating students from other fields of study. Engaging stakeholders in the design process is a key aspect of collaborative learning, since it allows them to actively contribute to fixing technical challenges that arise throughout project development.

### **Integrate the 4Cs into Multidisciplinary Learning Experience (MLE)**

The twenty-first century learning skills are often called the 4C's: includes (1) Critical Thinking and Problem Solving; (2) Creativity and Innovation; (3) Communication; (4) Collaboration (Mathews et. al, 2022) (Astuti and Aziz, 2019). The descriptors of each skill are described in Table 1.

Table 1. 4Cs Learning Skills descriptors in the 21<sup>st</sup> century

21 <sup>st</sup> Century Skills	Descriptors
<b>Critical Thinking and Problem Solving</b> Critical thinking is looking at problems in a new way and linking learning across subjects and disciplines	(1) Identify the problem (2) Define the context (3) Numerate the choices (4) Analyse options
<b>Creativity and Innovation</b> Creativity is trying new approaches to get things done, innovation, and invention	(1) Think creatively (2) Work creatively with others (3) Implement innovation
<b>Communication</b> Communication is about sharing thoughts, questions, ideas, and solutions	(1) clarifying the purpose or intention of a message in relation to audience, context or culture (2) considering perspectives, emotions and experiences when seeking shared understandings (3) decoding and interpreting ideas or information shared through verbal or non-verbal formats (4) expressing ideas or concepts using appropriate language, conventions or protocols, (5) demonstrating respect and responsibility when communicating with others
<b>Collaboration</b> Collaboration is about working together to reach a goal and putting talent, expertise, and smarts to work	(1) sharing responsibilities and supporting others to achieve a common goal, (2) demonstrating sensitivity to diverse cultures, audiences or contexts when working with others, (3) reciprocity and trust exhibiting sharing ideas or roles, (4) valuing accessibility, compromise and the contribution of others to nurture positive working relationships

Source: Astuti & Aziz, 2019

Students must actively develop and enhance their talents and learning abilities with the 4Cs. All of these abilities are essential for creating a workforce that can compete on a global scale in the job market and foster working experience where the multidisciplinary learning environment provides the necessary

skill and talent. Creativity exhibits a strong interconnection with several of the aforementioned skills. Adaptability, teamwork, leadership, and interpersonal skills are necessary for today's socially interactive innovation. The ability to connect with others and have a capability for communication and collaboration is becoming increasingly important in today's innovative workforce. Future education must generate results that encompass skills and abilities that align with the current expectations and requirements.

To adhere to the spirit of real-world simulation, the challenges' formed should require students to synthesise and assess information from all relevant domains (Greenhill, 2010). The learning impediment should be addressed from a range of perspectives or subject areas. Real-world problems and concerns provide students with the opportunity to engage in inductive and deductive reasoning in which critical thinking deploy in the MLE setting approach. They also allow students to compare and contrast different aspects and reach conclusions based on thorough analysis. Industry players highlight students who demonstrate proficiency in problem-solving, work well in teams, and exhibit an infectious level of enthusiasm for their work.

## METHODOLOGY

Incorporating multidisciplinary process into education from other various departments can be daunting (Pratt & Mark, 2012). To transform the conventional faculty-centric engagement into this MLE approach will need lots of attention and groundwork from all the key players involved in the field from the planning stage to the implementation project. This explanatory case study method concentrates on a degree programme at a private university in Malaysia. To answer questions like "what," "why," and "how" a phenomenon was affected by the context within which it was positioned," an exploratory case study approach is relevant to be employed (Baltter et al., 2012). In order to conduct the study, multiple instances of the case study were carried out used throughout three consecutive semesters to embrace the multidisciplinary learning experience setting within the built environment field.

Table 2. Three semesters implement the multidisciplinary learning experience

Semester	Field of study	Project	Duration
2021 - March	Architecture, Interior Architecture, Quantity Surveyor	Office Design	15 weeks
2021 - August	Architecture, Interior Architecture, Quantity Surveyor	Office Design	15 weeks
2022 - March	Architecture, Interior Architecture, Quantity Surveyor	Office Design	15 weeks

Source: Authors, 2023

Explanatory case study research involves assessing a small set of variables across a small number of cases (Baltter et al., 2012). The mixture of lectures, discussions, collaborative learning and self-reflection is found plausible in multidisciplinary setting education in the field of architecture, engineering and construction (Linder & Marshall, 2003). If learning is the process of increasing the intricacy of one's knowledge of a phenomena, then introducing variance is a required but necessary factor. In order to acquire explicit contextual appreciation, reflection on this diversity is also essential (Linder & Marshall, 2003). The objective of the research is to assist educators in establishing the best alignment and procedures in adopting the multidisciplinary learning experience approach as well as to disclose students' notions of the chosen learning approach through structured reflection. The reflections are produced by the students after they have finished their learning and have assessed their strengths, weaknesses, and needs. In their written reflections, students review how they feel about the course topic and the teaching/learning methods (Sliogeriene, 2012).

The study uses descriptive qualitative methods that focus analysis of the data obtained, namely the reflection data gathered from the structured questions in the reflective writing designed in Table 3 to assist in gathering information on student's perceptions, experiences and reactions in regard to the barriers faced

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in the MLE setting. The evaluation of collaborative learning was limited to the Interior Architecture students' reflective writing in the closure of MLE implementation. Reflection has been used to develop and assess the processes like challenges, collaboration features, suggestion and satisfaction towards the MLE implementation in the design studio module. The critical reflective approach's ability to transcend and engage with difference in that various knowledge, ideas, hypotheses, feelings, and theories can be ascertained reflectively from a variety of positions is one of its most valuable characteristics stated by Osmond & Darlington (2005).

Table 3. List of the structured questions on reflective writing

Item	Content
1	What features of the collaboration with other schools revealed to be the most advantageous or valuable in multidisciplinary learning experience setting?
2	What are the challenges that you encountered while collaborating with other schools?
3	What would you recommend to enhance the multidisciplinary learning experience between schools?
4	How delighted have you been with the multidisciplinary teamwork together?

Source: Authors, 2023

The reflection is useful to evaluate their experience in adopting the multidisciplinary learning experience setting project. Since March 2021, eighty-nine (89) students of Interior Architecture students have registered for the multidisciplinary learning experience (MLE) module over three conservative semesters. A comprehensive list of semester intake taking into consideration gender reflection is provided in Table 4.

Table 4. Numbers of Interior Architecture students enrol for the MLE module

Semester	Total	Male	Female
2021 - March	32	10	22
2021 - August	31	11	20
2022 - March	26	11	15

Source: Authors, 2023

The study received ethics approvals from the private institutions to conduct the research while integrating the concept into the curriculum. Individual written informed consent was obtained from each participant who agreed to take part in the study prior to the commencement of the semester. All information obtained from the study participants was kept confidential. All study procedures were performed in accordance with the ethical guidelines and principles set by the university.

## Research Design

This study presents a multidisciplinary innovation project that serves as an educational approach that integrates courses of study with practical applications in the real world. The collaboration of professionals from the built environment fields involves various disciplines, including engineering, architecture, urban planning, construction, interior design, and quantity surveying. However, collaboration was limited to only three programs due to the restricted selection of programs available at the private institution in the applicable field of study. Under those limitations, three (3) modules from the built environment disciplines programme, particularly Architecture, Interior Architecture, and Quantity Surveying, worked together as a multidisciplinary team to design an office building development project based on a real-life setting shown in Figure 1. The presence of participants from various disciplines across all stages of the design process might prevent the need for redesigns and unforeseen alterations, hence facilitating a more sustainable and rational plan for the building phase for intended project.

The MLE partnership necessitates a thorough collaboration agreement to attain the intended output. Students from certain disciplines collaborate in the setup shown in Figure 1, working together for fourteen (14) weeks over the semester using project-based tasks to facilitate the learning process.

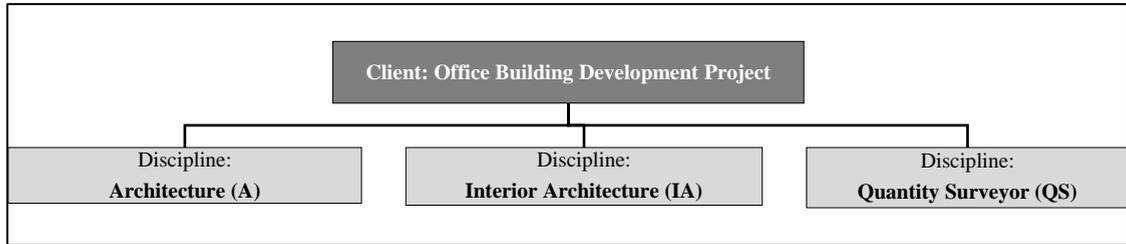


Fig. 1. Multidisciplinary team for collaborative learning project

Source: Authors, 2023

A team of diverse students with varying academic backgrounds and skills collaborate to achieve common goals and objectives through multidisciplinary collaboration. Students were exposed to several fields, encouraged to push the limits of their own field, and developed a more profound comprehension of their position and significance in collaborative learning environments. The project intended to establish an office development project design shown in Figure 1, participated by various built environment disciplines at the private institution.

This paper presents the MLE project, which provides a pedagogical approach that integrates conceptual understanding with practical application in the built environment field. Consultants from various disciplines contribute essential expertise to develop the office project, while lecturers serve as facilitators during the project's implementation. Each discipline needs to develop their abilities, comprehension, and proficiencies to achieve the project's result. The discipline's body of knowledge was defined in Table 5 to assist in delivering MLE. The duties and responsibilities of the three programs - Architecture, Interior Architecture, and Quantity Surveyor, demonstrated in the manner of a real-world setting project that necessitates collaboration and discussion in order to attain the intended objective of the office development.

Table 5. Multidisciplinary team performing specific discipline knowledge with the expected goals for the collaboration

Discipline team	Roles and Responsibility	Goals
Architecture (A)	Develop a three-dimensional Building Information Model (BIM) model that incorporates relevant information on building components and material qualities related to office design based on client's brief.	Collaborate as a team to create aesthetically pleasing architectural designs of an office buildings with sustainable materials and strive for technical excellence by means of Building Information Model (BIM) software that fit to client's requirement.
Interior Architecture (IA)	Propose the interior design concept scheme for an interior office with novel accents based on client's brief.	Engage in teamwork to develop an aesthetically pleasing interior design concept for office buildings leveraging sustainable materials that fit to client's requirement.
Quantity Survey (QS)	Estimate the expenditures and financial implications of the suggested office design plan based on client's brief.	Participate in a team to evaluate the costs and financial consequences of the proposed office design which satisfies the client's requirements.

Source: Authors, 2023

**Alignment Process**

In order to collaborate in the MLE setting, collaborating module lecturers must come to an understanding of each other's perspectives on the goal, module's learning outcome, the assessment tasks, <https://doi.org/10.24191/bej.v21i1.920>

the design and selection of any relevant multidisciplinary projects, and other pertinent information. The collaborating module leaders are obligated to notify all parties involved in the engagement of the collaboration agreement described above at least two weeks prior to the start of the semester describe in Phase 1 in Table 6.

Table 6. The alignment process of the multidisciplinary delivery

Phase	Process Delivery	Status	Alignment
One	1. Set Multidisciplinary Learning Goal Objectives		3 weeks before semester commence
	2. Form Multidisciplinary Team and Modules Collaboration	Equal Partnership Servicing	2 weeks before semester commence
	3. Schedule Common Slot	Scheduling department to establish slot in time table	1 week before semester commence
	4. Initiate Project	Collaborators to discuss project outcome	1 week before semester commence
Two	5. Establish Module Agreement	Learning Outcome Assessment task Project Scope and Deliverables Roles and responsibility Meeting Frequency Meet-up Communication Platform Documentation Platform Engagement Timeline	Week 1
	6. Setting Group and formation team		Week 1
	7. Validate Agreement	Establish agreement	Week 2
Three	8. Implement Multidisciplinary Project	Project Briefing Interim Critique 1 Interim Critique 2	Week 1 Week 7 Week 12
	9. Final Output	Presentation	Week 14
	10. Reflection	Reflective Writing	Week 15

Source: Authors, 2023

An effective alignment established in order to successfully execute the approach. In order to smoothen the process and foster a shared knowledge of the project requirement, the designated time slots in the student's timetable are designed to promote communication and collaboration between the parties involved, including the students and the lecturers. In addition to soft skills, it is evident that digital technological abilities must be addressed in order to facilitate communication among participants in the MLE setting. Indeed, the real-life process of designing, constructing, managing and maintaining project requires several individuals in the built environment professionals' field to work together to achieve the desired project outcomes using an appropriate platform. In reality, such professionals include architects, designers, quantity surveyors and construction project managers working hand in hand through several meetings and discussion progressively to perform the required task.

The main obstacle encountered during implementation is the need to effectively communicate and collaborate across different fields. The hurdle arises from various factors, such as disparities in commitment levels of members, occasionally stemming from various levels of ambition and workload distribution (Thian, 2022). However, lecturers also face challenges while adopting this strategy, particularly when the team consists of persons from diverse disciplines (Lien, 2020). Therefore, a more practical procedural framework is required to facilitate the implementation of transdisciplinary learning by utilising the generic cooperative learning framework.

The study was participated by students from three disciplines namely Architecture, Interior Architecture and Quantity Surveyor who collaborated in the development of office project supervised by the lecturers. Since the roles and responsibilities within the three disciplines are connected in real-life

practices and integrated in the industry setting, these programmes were chosen to represent the built environment field in the multidisciplinary learning approaches and to experience the MLE process delivery. In a real-life context, Architects, Interior Designers, and Quantity Surveyors communicate closely to fulfil specific demands stipulated by clients in this construction field. Additionally, it can provide a platform for examining team structures and interactions, ultimately leading to improved student results while working in a team.

The alignment among three collaborators established by endorsing the module agreement on the 1st day of the meeting. A shared understanding between collaborating modules from different disciplines and successful collaboration are the goals of validating the module agreement. The module agreement specifies the expected learning outcome, assessment task, project scope and deliverables, responsibilities and duties of each discipline, meeting frequency, communication and documentation platform, as well as the timeline for discipline engagement to accomplish the task shown in Phase 2 of Table 6. This will ensure a meaningful communication with all parties concerned.

### Delivery

The MLE group met and started working on the project in accordance with the client's specifications after the module agreement was established. As for this study, the development of the office project was initiated for the multidisciplinary learning experienced where the three disciplines have agreed to perform discipline specific knowledge to execute the project to reach desired result in 14 weeks duration as depicted in Figure 2. All the stakeholders were gathered for the joint briefing in the first week. The group was then fairly formed in line with each student's enrolment in the module, which may vary semesterly depending on the program's intake. The entire number of students enrolment is evenly distributed based on students' preferences to assure an effective learning process that considers their individual skills, workload distribution, and allocated roles and duties. A maximum of five people can be put in the same group when workers are separated by discipline to increase productivity.

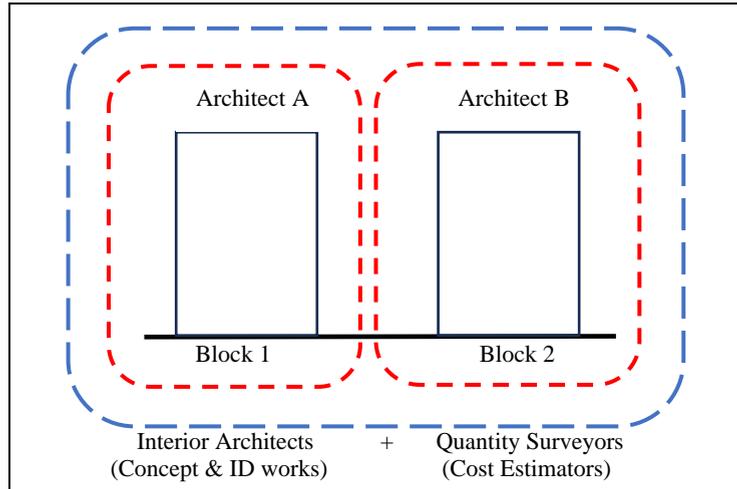


Fig. 2. The multidisciplinary team

Source: Authors, 2023

The module agreement must be reviewed and validated by each team member of the particular discipline after the formation of the group. Guided by the respective lecturers, students carefully peruse the

roles and responsibility of the participating disciplines, including the aim and method of collaboration stated in the module agreement.

The implementation of the MLE collaboration, start with each discipline to take note on the deliverables displayed in Phase 3 of Table 6 and details information stated in table. The weekly schedule was designed to keep track of the anticipated results for each discipline. Even if the common slot has already been assigned by the module leader at the beginning of the semester, the MLE team will have to define meeting frequency on a weekly basis in terms of days and times for the participating students to collaborate as teamwork. The periodic discussions help to resolve any emergent issues that require for expertise from a specific discipline knowledge to draw a conclusion. Establishing meeting times and intervals ahead could be advantageous, especially to encourage students working in teams to communicate when faced with difficulties (Thian, 2022). When the submission deadline for the assessment is approaching, more frequent meetings might be anticipated particularly with the module leader or the industrial partner (if applicable).

Frequent communication promotes discourse among various disciplines, allowing for collaboration on real-world projects and establishing effective deliverables and interactions. For the study, the weekly deliverables highlighted in Table 7 justified the task clearly so that all the discipline teams in the MLE setting involved are able to perform accordingly in timely manner. All the involved stakeholders, including the quantity surveyor, interior architect, and architect, were able to use their specialised knowledge in a collaborative learning team to design the office project.

Table 7: The weekly schedule and deliverable task for the office project delivery

Field/ Group	W 1	W 2	W 3	W 4	W 5	W 6	W 7	W 8	W 9	W 10	W 11	W 12	W 13	W 14
Archite- cture (A)		Develop- ment	Layout Plan	CAD Drawing	Sections Elevations	3D Model		Clash Detection	3D Rendering	Performance Analysis			Anima- tion	
Interior Architecture (IA)	Divide into groups													
	Join briefing													
	Concept	Mood Board Concept	Material Board	Developme- nt of Ideas	Space Program- ming Finishes Schedule		Interim Crit 1: Schematic Design	Schematic Drawings	3D Drawing	3D Representation		Interim Crit 2: Design Development	Mon- tage	Final Presentation
Quantity Surveyor (QS)	Inception	Specification	Design Build- ability	Cost Estimates	Cost Expendit ure			Analysis	Life Cycle	Strategies: Optimum Solution			Final Costin g	

Source: Authors, 2023

The MLE setting incorporated the 4Cs skill projected in the twenty-first century skill characters: (1) Critical Thinking and Problem Solving; (2) Creativity and Innovation; (3) Communication; (4) Collaboration. Students are capable of applying critical thinking to a challenging situation. Additionally, students have the opportunity to discuss their opinions, arguments, and ideas as well as the difficulties they encountered when trying to solve a design issue. They also get to experience a variety of situations in which they must decide which of several possible solutions are the best for their group. Students who are only exposed to one discipline during their education may have a tendency to think exclusively within that discipline. The joint meeting was scheduled three times in a semester commencing to keep track of the work accomplished as it was intended.

## Communication and Engagement

For this study, a few digital platforms were used in the study to facilitate collaborative learning, including the WhatsApp group platform, the Zoom meeting platform for communication while Google docs to record the minutes meeting regularly. MLE members also encourage to work together to perform well as a unit and to freely share thoughts, ideas, and prior learning while developing the progress of work. The MIRO platform has been used for the group documentation weekly updates and brainstorming. To nurture the maturity of the students in multidisciplinary learning setting, series of seminars and event related to the approach will be essential to attend. To ensure that the team members' enthusiasm is maintained, the lecturers and supervisor should undertake regular motivational sessions especially to those who really need the extra support and guidance. In timely manner, it is recommended to have dialogues among MLE team in resolving their issues and disputes. Students who are working collaboratively must be guided progressively to comprehend how their collaboration could be utilised to solve multidisciplinary problems that required expertise from other collaborating disciplines. For this study, three meetings have been scheduled on Week one, Week seven, and Week twelve to track the progress work of each discipline. The selected three-week period is intended to monitor the on-going performance of each collaborator's work and resolve any discrepancies and issues that arise during the project's development as describe in Table 8 before the final presentation on the Week 14.

Table 8. The set joint meeting schedule

Week	Phases	Descriptor	Outcome
1	Phase 1	Client's Brief	Each collaborator comprehends the client's needs and requirements as outline in the brief
7	Interim Crit 1 Phase	Schematic Design	Collaborators submits a design proposal that aligns with the project's scope of work and addresses any discrepancies associated with the project. The expected of works by each collaborator as outline in Table 7
12	Interim Crit 2 Phase	Design Development	Collaborators emphasise the hurdles that exist during the design development phases. The expected achievements of each collaborator are outlined in Table 7
14	Final Phase	Presentation	The design proposal is presented to the client as outline in the brief
15	Reflection	Reflective Writing	The barriers while implementing the MLE journey expressed in the reflective writing for future enhancement

Source: Authors, 2023

Every student has the possibility of completing the propose scheme on track if they obtain enough support and encouragement throughout the phases. Once each discipline participated in the final presentation to the client on Week 14, the constructive MLE collaboration drew to an end. The MLE team that met the client's expectations satisfactorily will be notified of the result on the event day.

## FINDINGS

### Implementation of Reflective Writing in MLE Experience

The primary data is derived primarily from the reflective writing findings, which concentrated on the eighty-nine respondents of the Interior Architecture students since the establishment of the MLE in the March 2021 semester. The reflective writing was carried out in week fifteen following the completion of the fourteen-week of the MLE approach. Qualitative data was gathered mainly in word format based on the structured question design according to the theme presented in Table 9. The interpretation of respondents experiencing the MLE setting conveyed through reflection and was analysed randomly using the descriptive qualitative method analysis. To ascertain the barriers encountered by the Interior Architecture students in

adopting the MLE approach in design studio module, a summary of the reflection was transcribed in accordance to 4C skillset criteria depicted in Table 9 below.

Table 9. Theme words occurred randomly generated on student's reflection based on gender categorised according to the 4Cs

Question	Themes	Male	Female
What features of the collaboration with other schools revealed to be the most advantageous or valuable in multidisciplinary learning experience setting?	Critical Thinking and Problem Solving	creativity, eye-opener, self-improvement, logic	maturity, ice-breaking, knowledge, talent, rejection
What are the challenges that you encountered while collaborating with other schools?	Creativity and Innovation Communication	software skill, negotiation, solution grouping, silent, introvert, tolerate, precise, loud, confusion, teamwork, cooperation, attitude, responsible	productivity, valuable, ideation, glimpse frequency, listener, confident, spirit, clear, hiccups, time-management, workload, attitude,
What would you recommend to enhance the multidisciplinary learning experience between schools?	Collaboration	Yes	Yes
How delighted have you been with the multidisciplinary teamwork together?	Collaboration	responsibility, delegate, accountability, respect, leadership, friendship	bonding, contribution, networking, spirit, manners, bonding, smart-work, support

Source: Authors, 2023

### Students' Responses through Reflective Writing

Students working in multidisciplinary teams are able to recognise the distinctiveness of their discipline in comparison to others and value their own specialised knowledge. They are compelled to explore perspectives from various disciplines, stepping out of their comfort zone. The later part can be seen as both demanding and rewarding (Besch & Olsson, 2016). The challenges were divided into five themes for the purpose of categorising them, based on the narratives collected in the reflective writing. The findings depicted are summarised for the negative barriers based on the random sampling reflection stated in Table 10 for the purpose of future improvement.

Table 10. Summary of barriers faced by the students based on gender while experiencing MLE

Barriers	Male	Female
Communication	Difficult to receives good and clear instructions from each discipline to execute the project  Students would be more receptive to discuss their thoughts and accepting constructive criticism when they are connected  Students will communicate and establish solid relationships through communication  One way of communication, listen without action taken  Language barriers are a frequent obstacle when interacting with international students	Poor verbal and nonverbal communication skills in order to perform well in collaborative learning group  Late instructions and inadequate communication both contribute to delays  It is crucial that the students enhance their ability to communicate since dispute frequently results in difficult circumstances that can negatively affect the working team  Complicated in delivering information to deliver appropriate task  Choosing the appropriate tools and medium for discussion poses a challenge
Time-Management	The majority of female respondents thought that the male students are partially responsible for the issue with the time management  Poor time management	Hustle rather than effectiveness: performing an abundance of tasks without attaining the intended outcomes  Lack of motivation to complete the task due to overlapping task

	Incompetent to complete task due to insufficient time	Limited time allocated for the common slot to meet and discuss during the MLE session
	Male students are capable of completing the assignment, delays rarely occur	The ability to use time wisely and productively helped to the successful implementation of the MLE with fewer hiccups
Responsibility	Some of the male respondents stated that women are more dedicated and responsible when performing their duties compared to male.  Some teammates believed that the students disregarded their given responsibilities and deliberately turned against the team rather than supporting it.	Responsibility empowers you with the ability to be accountable for your own actions, to think critically, to perform efficiently under pressure, and to handle big and modest jobs with ease.  Less attention is paid to the leader/supervisor, and they pay less thought to and attention to the work at hand.
Attitude	Student lack of dedication to the assigned task and disregard instruction given. They hardly participated in discussion, always be silent, prefer to be the observer rather than contribute ideas. Poor attendance and participation during discussion.	Some students do not really fully commit to the task at hand and take instructions lightly. Lack of maturity in dealing with people from different background of studies to achieve project goal. Absence of interest, attention, and full of distractions
Teamwork	The majority of respondents felt that teamwork is crucial factor for collaborative learning to be aligned.  Reluctant to form a working team for the implementation as the procedure can be prolonged to achieved desired goal. Limited trust exists among team members.	A decent team is one in which every member contributes the special talents and strengths in order to reach a common objective. Daily absence of accountability for completing tasks in accordance with assigned routines.  Occasional disagreements between students may result from the fact that each individual is endowed with a unique preference and personality.

Source: Authors, 2023

## DISCUSSION

The summary of the reflective writing depicted based on the random's reflection stated. Both male and female students agreed that the multidisciplinary experience is beneficial yet challenging throughout the semester, providing them with such a unique learning curve. The male students described communication as a barrier factor in adopting the MLE approach. It is challenging for them to acquire specific project directions from each discipline involved. Students would be more receptive to discuss their thoughts and accepting constructive criticism when they attached in team. Some team player only listening without action and while interacting with the international students often involves language barriers.

Barriers in time management caused by varies origins were commonly faced. As for the female students, some of them expressed that they perform many tasks without achieving the desired results and rarely feel demotivated to complete the task. However, diversity on the creativity and innovation are valuable and some students are more productive in delivering task assigned, yet it frequently results in conflict. The female students conveyed their concerns with the presence of irresponsible people within the group, as some refused to participate in the specified duty, resulting in an increased workload for the leader. Certain students demonstrate a lack of wholehearted dedication to the given task and treat instructions with flippant attitude. Most respondent expressed the belief that teamwork is a crucial component for achieving alignment in collaborative learning. Intermittent conflicts among students can arise due to the inherent diversity in their preferences and personalities.

The multidisciplinary learning experience setting is generally acknowledged as an effective learning approach and a developing paradigm for the twenty-first century as a sustainable learning education. The MLE cooperation process will have a significant impact on the teaching and learning process in the near

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future as a creative way to nurture graduates' capabilities and skillset as well as to assist the growth of future professionals' inventive talents and extend their perspective on what the future holds. The established process flow and alignment have a clear overview of multidisciplinary learning experience (MLE) setting implementation. The approach has proven significant to be adopted and its journey recorded successfully implemented after three conservative semesters at the private university in Malaysia. Most multidisciplinary teams inevitably encounter a number of the barriers identified during their practical and execution. Working as a team across discipline able to nurture student's skillset readiness demanded in industry. For institutions that are having difficulty implementing cross-faculty multidisciplinary learning, the suggested flow may be of great assistance. The study examined five categories of hurdles that interior architecture students face when engaging in multidisciplinary practice, which must be addressed to ensure a seamless delivery process as suggested in Table 11.

## RECOMMENDATIONS

The study discovered that students' reflective writing revealed five barriers while they were experiencing the multidisciplinary learning experience approach during the fourteen-week study programme. This approach could be classified sustainable education as it strengthens students' knowledge, critical thinking, and skills in handling real-world problems. Yet, multidisciplinary experiences come with challenges. Managing time and issues arising from different backgrounds of studies are common instances. Flexibility may stimulate creativity and innovation, although it often results in dispute. In order to stay pertinent, notably in the field of design education, academic in the higher learning institution is recommended to navigate this method in the project delivery of the design module. To overcome the challenges, further attention and wider support by all team players in all aspects of communication, time-management, responsibility, attitude and teamwork as highlighted in Table 11.

Table 11. Strategy to address the barriers in adopting future MLE setting.

Barriers	Recommendation for future improvement	Alignment in MLE setting
Communication	Adapting to multiple communication styles via various platform/medium between individuals with diverse preferences, hence enhancing the efficacy and efficiency of communication while working in a team	Establish medium/platform that facilitate efficient discussion to communicate effectively in team physically or virtually
Time-management	Utilise time management tools to proactively schedule and anticipate the expected deliverables for the project	Apply the SMART goals: Specific, Measurable, Attainable., Relevant, Time-bound
Responsibility	Assign coach to advise and encourage the working responsible	Assign mentor-mentee to support the growth of the individuals
Attitude	Optimise productivity and streamline efficiency for all team player	Team productivity tools that assess the individual achievements of each team member.
Teamwork	Encouraging the discussion of all team players while keeping the capacity to make the ultimate choice for the team	Regular discussion in order to cultivate a positive trust

Source: Authors, 2023

The study identified numerous significant obstacles that require further investigation for future research, including academic involvement, industry engagement, the significance of implementation, and academics' technological proficiency in terms of having access to the latest communication tools.

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## CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

## AUTHORS' CONTRIBUTIONS

Norji Nasir carried out the research, wrote and revised the article. Kamal Rabah conceptualised the central research idea. Norji Nasir provided the theoretical framework. Norji Nasir and Kamal Rabah anchored the review, revisions and approved the article submission.

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