香港科技大学（广州）
THE HONG KONG
UNIVERSITY OF SCIENCE AND
TECHNOLOGY (GUANGZHOU)

White Paper on the Red Bird MPhil Program

—The First Step Taken by Hong Kong University of Science and Technology (Guangzhou)

in Its Shift Towards a Transdisciplinary Talent Cultivation Paradigm

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PREFACE

This white paper serves as a reference book rather than a recounting of the personal stories or founding history behind the Red Bird MPhil Program (RBM Program for short). It offers an objective overview of the program's development, from its curriculum design and the admission of the first class in September 2022 to the present as the first graduates leave campus. The paper details the experiences, achievements, and ongoing obstacles encountered over these three years, as well as anticipated future challenges. It aims to provide valuable insights for those dedicated to advancing innovation in higher education and contributing to independent talent cultivation in China.

The Hong Kong University of Science and Technology (Guangzhou) has pioneered an academic and governance structure known as the "Hub-Thrust" model. This framework is designed to fundamentally dismantle traditional disciplinary boundaries, promote interdisciplinary integration, and establish new transdisciplinary clusters. This will lead to the creation of a precedent-setting, innovative and transdisciplinary university that pushes the boundaries of knowledge, drives innovation in science and technology, and cultivates a new generation of strategic leaders for the new era.

Historically, the interdisciplinary philosophy and practices pursued through our "Hub-Thrust" structure represent a continuous effort in human society. Well-known examples include the Dujiangyan irrigation system in ancient times, the Manhattan Project during World War II, China's "Two Bombs, One Satellite" program, large aircraft and high-speed rail projects, and the Hong Kong-Zhuhai-Macao Bridge. These endeavors show that assembling engineers with diverse expertise into a multidisciplinary team, where each member contributes their unique skills, has proven to be an effective approach for tackling complex and comprehensive systems engineering challenges. Scientific studies, depending on the nature of the problem, may involve scientists working individually on niche topics or require collective efforts to address major cross-disciplinary foundational or applied scientific questions. Similar to comprehensive and complex systems engineering projects, these collaborative studies benefit from bringing together accomplished scholars across various academic domains to share knowledge, learn from one another, and foster interdisciplinary integration. This approach enables exploration from multiple perspectives to uncover natural laws that remain beyond our current understanding.

At this point, you might be wondering: if history has shown that organized interdisciplinary scientific research and engineering innovation can thrive within existing academic and governance frameworks, why has the Hong Kong University of Science and Technology (Guangzhou) chosen to overturn these frameworks with the "Hub-Thrust" structure? How is this relevant for reforming higher education paradigms today? To answer, let's revisit the three core missions of a university: talent cultivation, scientific innovation, and social service. Talent cultivation—especially the development of leading talent with interdisciplinary expertise—comes first, but it is difficult to imagine achieving this through robust organizational actions or the model of pooling resources to solve major problems. Therefore, when we shift our focus on a university's mission from scientific innovation to talent cultivation, the question arises: what internal mechanisms must a university have to nurture transdisciplinary talent cultivation models and create an environment where these can flourish freely without external organizational intervention? The answer to this question is at the heart of the founding vision behind our unique "Hub-Thrust" disciplinary and governance structure. We believe that, beyond offering professors a more seamless platform for cross-disciplinary research, this structure holds forward-looking strategic value by offering a new viable path for cultivating transdisciplinary talent. Developing such talent requires individualized education, the freedom to choose one's major, and an inclusive environment that fully embraces individuality, which are fundamental elements for a university to nurture exceptional leaders.

The transdisciplinary degree program that we have envisioned equips graduates with both a broad, multidisciplinary knowledge base and distinctive professional expertise. They should also possess strong humanistic competences and versatile transferable skills. Achieving these educational outcomes is clearly beyond the scope of traditional teaching methods. Therefore, we must design and implement an entirely new training model and effective teaching methods that allow students, within a limited study period, to acquire disciplinary knowledge while also enhancing their comprehensive competences and transferable skills, thus advancing

knowledge and abilities in tandem. We believe that establishing an academic and governance structure free from traditional disciplinary boundaries is essential for achieving this goal in educational practices.

Our first step in applying the "Hub-Thrust" structure for talent cultivation was to create the RBM Program. This innovative graduate training program transcends traditional disciplinary boundaries, fulfills the mission of an innovative and transdisciplinary university, and strives to build a hub for independent talent development. It aims to provide a continuous supply of high-caliber technology leaders, outstanding innovative and entrepreneurial talent, and strategically minded management professionals to support China's strategy for innovation-driven, high-quality development.

Three years have passed in a flash. Looking back, our journey of establishing the RBM Program has not been without its challenges. We hit walls, stumbled, experienced confusion and doubt, and often had to renew our resolve to burn our boats and overcome obstacles. Now, as we complete the first full cycle of student training for the first class and see the development plans for the second and third cohorts becoming more systematic and structured, we feel it's time to compile this white paper to reflect on and summarize our educational practices in the RBM Program in a comprehensive and systematic manner.

In this white paper, we will delve into the content and details of our educational approach, the foundational logic behind these choices, and the expected outcomes based on the talent cultivation pathways of the RBM Program. We will also address the challenges and issues in our current practices. For example, why does the RBM Program employ a broad category-based admission process? How was the admissions mechanism established and evolved over time? Why did we design and execute it this way? Why aren't RBM Program students assigned to a specific major in their first semester? What is the rationale behind using a group project-guided graduate training model, and how are these projects generated? What is the relationship between a student's individual thesis project and their group project? Why is design thinking so highly emphasized? What are the roles and responsibilities of Academic Supervisors and Project Supervisors? How is the faculty team structured, and how are their contributions assessed and managed? How is the growth of students and the training of mentors evaluated through data-driven processes? What sets the College of Future Technology's Bridge Program apart from external business incubators? What are the post-graduation prospects for further study or employment? Within this white paper, readers will find our answers to these questions, as well as insights into the challenges and uncertainties we have faced along the way. We look forward to receiving feedback and sharing experiences with our readers in the future.

As I write this, even though there is still so much left unsaid, it's time to bring this preface to a close. Before wrapping up, countless names of those I owe heartfelt thanks to come to mind—colleagues, peers, leaders at all levels, students of the RBM Program, and my family. So many people have supported us throughout this three-year journey of building the RBM Program, far too many to list individually here. My deepest gratitude goes to each of you for your dedication, support, and companionship. I truly believe that without your contributions, the RBM Program would not be where it is today. Thank you to all the fellow pioneers of the RBM Program!

Wu Jingshen

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Founder of the RBM Program
Professor at the Thrust of Smart Manufacturing

EXECUTIVE SUMMARY

i. Overview

Hong Kong University of Science and Technology (Guangzhou) (hereinafter referred to as "HKUST(GZ)") is committed to cultivating "Transdisciplinary Leading Talent in Innovation and Entrepreneurship" as a response to the ever-changing, diverse needs in the future world. The cultivation of such talent, however, is facing the following two pain points. The first is that the current disciplinary framework poses an insurmountable obstacle to effective interdisciplinary communication and collaboration within the higher education system. Yet the fast development of science and technology requires education to blur the boundaries between different disciplines and achieve their in-depth integration and innovation. The lack of a favorable environment for interdisciplinary communication and collaboration within the education system is a challenge to the cultivation of leading talent for a new era. This is because it not only hinders the creation of a new knowledge system but also prevents students from establishing a transdisciplinary knowledge structure that enables them to adapt to the fast-changing world.

The second is that in traditional education for masters, knowledge transfer is significantly disconnected from the development of practical skills. The main problems are as follows. First, the current educational evaluation system emphasizes students' mastery of discipline-specific knowledge instead of their ability to apply knowledge in various situations. It should be noted that the key to their comprehensive development and tackling of complex workplace challenges in the future lies in improving their transferable skills. Second, there is a disconnection between theoretical knowledge and its practical application. Academic research tends to pursue theoretical depth and is unlikely to be translated into real-world problem-solving skills, causing a gap between what is taught and what is really needed. Third, lecturing is often the only teaching method for higher education. It provides students with "static" knowledge instead of "dynamic" skills and therefore fewer opportunities for them to put learning into practice. Fourth, despite their profound knowledge in a particular field, higher education teachers may lack experience in interdisciplinary teaching. This hinders not only the interdisciplinary integration of different courses but also the ability of a student to fully comprehend and apply knowledge. These challenges have made it difficult for students to adapt to the demand for synthetic innovation, as well as the uncertainty and industry complexity brought on by technological innovation.

To address the above two pain points, HKUST(GZ) has taken the bold first step in its shift towards a transdisciplinary talent cultivation paradigm by launching a problem-oriented, fully project-based transdisciplinary MPhil program, namely the Red Bird MPhil Program (hereinafter referred to as the "RBM Program").

This White Paper on the Red Bird MPhil Program (hereinafter referred to as the "White Paper") elaborates on HKUST(GZ)'s strategies and methods to innovate in talent cultivation through the RBM Program and also on the innovation framework of the program, including its design philosophy, implementation process, results and effects, and the problems and challenges it has encountered, as well as how it should be reviewed and iterated. This White Paper is mainly for HKUST(GZ)'s education community members participating in the RBM Program and education policymakers, education administrators, teachers, and potential candidates from across the globe, as well as all the others who are interested in HKUST(GZ)'s talent cultivation paradigm reform.

The RBM Program has admitted two classes of a total of 606 students since its official launch in 2022, and is currently recruiting the third batch. The creation of the White Paper at such a critical point is to record the program's journey of development and encourage the global education community to constantly participate in and reflect on the reform towards a transdisciplinary approach to higher education. The purposes of the White Paper are as follows:

· Making clear the vision, mission and core values of the RBM Program: This is to help all the stakeholders of the program gain a deep understanding of its educational philosophy and

overarching goal, thus ensuring consistency in advancing the reform towards transdisciplinary talent cultivation.

· Comprehensive review and reflection: The White Paper provides the teaching and administrative staff of the RBM program with approaches to systematically reviewing and reflecting on its design, implementation and effects. The program will be constantly iterated and optimized with its advantages crystallized, disadvantages assessed and practical experience summarized.

· Sharing practical cases and methodology: The White Paper shares the experience gained, methodology adopted, problems encountered, and lessons learned in the implementation of the RBM Program, hoping to foster a culture of innovation and constant iteration both within and outside HKUST(GZ) and benefit educational and other communities.

· Continuous improvement through exchanges and feedback: The White Paper establishes a continuous improvement mechanism based on exchanges with and feedback from stakeholders, in which the ideas, methodology and achievements of the RBM Program are shared to encourage stakeholders to join hands in its improvement. This is to make sure that the program always catches up with changes in the needs of students and in the global environment.

· Promoting transdisciplinary education: The White Paper advocates the advantages and importance of transdisciplinary education in addressing complex global challenges. By disseminating the innovative methodology of the RBM Program, the White Paper aims to open up a broader discussion on a global scale about the paradigm shift towards transdisciplinary higher education, so that more educational institutions may carry out similar reforms.

ii. Structure

The first chapter— "Introduction and background" explicitly states the ambition and significance of the RBM Program in advancing global innovation of education paradigms. It highlights the novelty of the transdisciplinary education methodology the program has adopted, and underlines that the program keeps exploring the cultivation of transdisciplinary leading talent in innovation and entrepreneurship who are able to adapt to future changes. The second chapter— "Admission mechanism" elaborates on how the RBM Program uses an adaptive talent selection strategy featuring both fairness and effectiveness to ensure that it is able to attract and identify potential transdisciplinary leading talent who meet the admission requirements of both HKUST(GZ) and the program. The third chapter— "Design principles and implementation mechanism of project-based learning" dives deep into the core philosophy that guides the design of project-based learning (PBL) and into the methodology to practice PBL, stressing that PBL is applied to narrow the gap between knowledge transfer and ability enhancement. This chapter also explains how the RBM Program uses its unique PBL model driven by the tackling of real-world problems to provide students with an immersive learning environment where they can develop abilities to identify and solve complex problems. The fourth chapter— "Proposal Quality Assessment (PQA)" answers how the PQA mechanism uses strict assessment of students' research proposals to not only support their academic progress but also ensure constant improvement of their transferable skills in the process of learning. The fifth chapter— "Curriculum design and innovation" discusses the curriculum design philosophy of the RBM program and how the curriculum system and its corresponding teaching methods are innovated with a view to preparing students for the diverse challenges they will face in the modern world. The sixth chapter— "Capacity building for teachers" focuses on the strategies and measures for the professional development of teachers participating in the RBM Program, and especially on how to promote collaboration between a Project Supervisor (PS) and an Academic Supervisor (AS), as well as how to acquire and apply innovative teaching methods. The seventh chapter— "Digital technology in PBL management and

quality assurance" showcases how digital technology is used to optimize the PBL management process for greater effectiveness and teaching improvement, in an effort to deliver personalized learning. The eighth chapter— "Design of transdisciplinary project-based experimental teaching" revolves around the learning-by-doing principle whereby labs and workshops are well designed to help students develop innovative thinking and practical skills. The ninth chapter— "The Bridge Program" reveals how such an innovative program provides students with comprehensive support to help them overcome entrepreneurial obstacles, with a view to translating their academic knowledge into business practices and laying a foundation for their growth into future industry leaders. With all the details from these chapters, the White Paper presents a panoramic view of how the RBM Program trains talent and showcases HKUST(GZ)'s solid progress in moving towards a transdisciplinary talent cultivation paradigm.

iii. Outlook

The RBM Program is not only a vivid example of the innovative development of higher education in China, but also expected to drive a global paradigm shift in higher education. It adopts an innovative PBL model that deeply integrates real-world problems into academic training, providing a platform for the comprehensive development of students. Under the PBL model, students will be transformed from passive receivers of knowledge into active problem-solvers and innovators. Through hands-on projects, students will acquire professional knowledge and technological capability, but more importantly, sharpen their communication and coordination skills through transdisciplinary teamwork, and develop systems thinking and strategic planning skills in the process of solving complex problems. As a result, students will be fully prepared for future uncertainties.

As drivers of scientific and technological progress and industrial upgrading in the future, students will use the skills and experience gained from the RBM Program to take center stage in a variety of fields. By adopting a constant review and social feedback mechanism, the program keeps improving the teaching contents and methods so as to ensure that they are always up-to-date and effective. These measures will enable graduates to take on important roles in scientific and technological innovation, industrial upgrading, and every aspect of social development. As the program proceeds, there will be a steady increase in its productiveness and the public recognition given to it. Looking ahead, HKUST(GZ) will continue advancing the paradigm shift towards transdisciplinary talent cultivation in an effort to stimulate innovation and improvement of talent training models in traditional research universities and to serve as a constant source of transdisciplinary innovators in different fields. Through educational innovation, HKUST(GZ) is committed to providing Chinese wisdom and solutions for global higher education to keep up with the times.

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INTRODUCTION AND BACKGROUND

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I. INTRODUCTION AND BACKGROUND

"China today is not fully developed. One important reason is that no universities follow a talent cultivation model for driving scientific and technological progress. They do not have anything unique or innovative and are unable to produce outstanding talent. This is a big problem," said Qian Xuesen, a prominent Chinese scientist, in 2005. This was later translated into the famous Question of Qian Xuesen—why cannot Chinese universities produce outstanding talent? This question has since then become a call for solutions to the bottlenecks of China's educational as well as scientific and technological development. As the world enters the AI era, the explosive growth and rapid iteration of knowledge pose new challenges for talent cultivation. Technological advancements have not only transformed how knowledge is stored and accessed but also shifted the educational focus from mere knowledge accumulation to ability development. However, while knowledge can be acquired and connected in almost unconstrained ways, abilities must be developed through a lengthy process characterized by a "clumsy period" and a "illustrious period" (as noted in the Great Learning: "He contemplated and studied the illustrious decrees of Heaven and was able to make illustrious his lofty virtue. This is how one made himself illustrious.").

Currently, the disconnect between knowledge transfer and ability enhancement presents a significant challenge for universities in talent cultivation. This gap not only hampers the development of innovative talent, as highlighted in the Question of Qian Xuesen, but also exacerbates the social issue of university graduates struggling to find employment while companies have difficulty recruiting qualified employees. Traditional teaching methods, which rely largely on one-way, passive reading assignments, lectures, and exams, are effective for imparting textbook knowledge but insufficient for preparing students to truly understand and meet the demands of real-world work environments and tasks. Moreover, these methods fail to nurture essential transferable skills for various situations, such as problem-solving, teamwork, and effective communication.

Amid intensifying global crises such as pandemics, food shortages, and energy crunches, alongside the emergence of disruptive technologies like AI, quantum computing, and new energy sources, traditional teaching models are facing unprecedented challenges like never before. Universities are struggling to produce the top-tier professionals urgently needed to drive scientific and technological innovation and industrial upgrading. In response to the fast-evolving and diverse demands of the future, HKUST(GZ) is dedicated to cultivating transdisciplinary leading talent in innovation and entrepreneurship and has set new standards for the knowledge, abilities, and competences they should possess.

Knowledge: T-shaped knowledge structure. Future-oriented transdisciplinary leading talent in innovation and entrepreneurship must possess a T-shaped knowledge structure. They must have a broad base of general knowledge across multiple disciplines, such as humanities, social sciences, arts, sports, science, technology, and engineering. More importantly, they should grasp the fundamental principles, underlying logic, and ways of thinking that define different fields, as well as their associated cultures and values—this is the essence of a liberal education. Additionally, future talent must master deep and cutting-edge knowledge in one or two specialized areas to potentially become pioneers. The T-shaped structure varies from person to person, shaped by factors such as individual interests, potential, and growth environment.

Abilities: internalization of transferable skills. Transferable skills, also known as competencies, refer to the ability of future talent to apply their knowledge to solve real-world problems. Given the rapid pace of knowledge iteration, future professionals must be passionate and self-directed lifelong learners who constantly acquire new knowledge in a structured manner throughout their lives and careers. They must also cultivate a comprehensive set of innovation abilities, with a focus on systems thinking, integrative thinking, and critical thinking, to explore disruptive products

and technologies in the interdisciplinary era of Industry 4.0. Accordingly, future talent must greatly enhance their communication and collaboration skills for interdisciplinary integration and effective teamwork. Practical, hands-on, and entrepreneurial abilities will determine whether they can creatively apply their acquired knowledge and skills to the workplace, solve problems and pioneer new industrial and value chains. Moreover, proficiency in digital and intelligent tools will enhance the central role of future talent in the algorithm age and position them well for opportunities as big data and generative AI accelerate.

Competences: immersive competence development. Competences shape the positive or negative value of knowledge application, as well as the direction and outcome of ability transfer. Today, global issues such as environmental pollution, climate change, energy shortages, and aging populations coexist with the new technological revolution. In response, future talent must cultivate the following four competences. First, a sound moral and ethical outlook. Technological innovation is a double-edged sword. When developing disruptive technologies, only people with high moral integrity can choose the right path at critical junctures of technological development. Second, a balance of humanistic and scientific literacy. Understanding the laws of nature, social development, and human evolution is essential to achieving physical and mental harmony. Third, a global perspective coupled with a strong sense of national duty. Future talent should be willing to shoulder social responsibilities and aspire to contribute to the welfare of humanity. Fourth, an entrepreneurial spirit marked by ambition and confidence. Only those bold enough to be pioneers and seize industry opportunities will be able to take the lead at the turning points of an era of great transformation. In its pursuit of an innovative talent cultivation paradigm, HKUST(GZ) is pioneering a transdisciplinary system to foster future leaders capable of developing disruptive technologies, creating groundbreaking industries, and shaping international standards.

I. TRANSDISCIPLINARY ACADEMIC ORGANIZATION STRUCTURE

The concepts of multidisciplinarity, discipline clusters, cross-disciplinarity, and interdisciplinarity, which have gradually emerged since the 20th century, have remained within the confines of traditional disciplinary frameworks, often leading to the “paradox of interdisciplinarity” in reform practices. Limited reforms within disciplinary frameworks have struggled to achieve true integration across disciplines, underscoring the pressing need for a systemic breakthrough in higher education paradigms that are deeply rooted in disciplinary systems. To address this, HKUST(GZ) has embraced the concept of “transdisciplinarity” to emphasize its commitment to breaking down disciplinary barriers and integrating various fields through organizational innovation while defining, interpreting, and creating a “transdisciplinary talent cultivation paradigm” from multiple dimensions. The process of naming, defining, and interpreting this concept goes hand in hand with the development of organizational models and the institutionalization of transdisciplinary organization innovations.

For HKUST(GZ), transdisciplinarity represents not only an educational and research approach that transcends traditional disciplinary boundaries but also a new organizational model and mindset in higher education. Unlike traditional interdisciplinary, multidisciplinary, or cross-disciplinary methods, transdisciplinarity goes beyond the mere combination or mutual influence of different disciplines but entails a deeper and systemic integration. First, from the perspective of knowledge management, transdisciplinarity breaks free from traditional disciplinary boundaries and enables the integration and restructuring of disciplinary knowledge and related skills through innovative organizational frameworks and departmental structures. Second, at the level of institutional culture, transdisciplinary practices at HKUST(GZ) center on organizational innovation that fosters an institutional culture promoting mutual penetration and integration across disciplines. This environment not only enhances systematic and innovative academic research but also creates fertile ground

for cultivating transdisciplinary talent capable of tackling future challenges. Third, transdisciplinarity does not confine knowledge creation and transfer to existing disciplinary frameworks. Instead, it fosters the development of new knowledge systems and research methodologies through interdisciplinary dialogue and collaboration. Therefore, transdisciplinarity signifies a "meta rethinking" of the organizational systems talent cultivation models, research methodologies, and even the epistemological and methodological aspects of higher education. It challenges educators to examine problems from a broader perspective while encouraging students and faculty from different disciplines to integrate and promote their learning with research and co-create knowledge in specific fields within a transdisciplinary organizational framework, mindset, and educational environment. This approach also involves exploring how to systematically apply that knowledge to address complex interdisciplinary challenges.

1. DYNAMIC ACADEMIC ORGANIZATION STRUCTURE CENTERED ON THE "HUB-THRUST" MODEL

HKUST(GZ) has adopted a two-tier "Hub-Thrust" academic organization structure, which serves as the core of its organizational innovation and the key to its transdisciplinary talent cultivation paradigm reform. This structure is best known for its problem-oriented dynamic flexibility. Unlike traditional academic structures rooted in specific disciplines and research areas, this dynamic structure is designed to address pressing current issues and foreseeable future challenges. It aims to meet national priorities, safeguard public health, tackle cutting-edge technological challenges, and address the demands of human survival and sustainable development. As such, HKUST(GZ) has established four Hubs—Systems Hub, Society Hub, Information Hub, and Function Hub—based on a long-term, stable framework of human society. These Hubs function as academic management units with a relatively stable organizational and personnel structure, designed to organize and connect different disciplines and fields without disciplinary boundaries. Each Hub encompasses four "Thrusts" (see Figure 1-1), which serve as the basic units for talent cultivation and research within a specific field. While the Hubs remain stable, the dynamic problem-driven Thrusts are designed with a "shelf life". Each Thrust is established to pool resources and tackle major issues within its respective field. For example, the Smart Manufacturing Thrust under the Systems Hub aligns closely with the national policy highlighted in the report to the 20th National Congress of the Communist Party of China to "advance new industrialization and work faster to make China strong in manufacturing". Similarly, the Carbon Neutrality and Climate Change Thrust was established in February 2023 to support the strategic goal outlined in the same report to "work actively and prudently towards the goals of reaching peak carbon emissions and carbon neutrality". The university will continuously reassess its Thrusts based on the evolving major needs of the region, the nation, society, and the global community to ensure that the structure remains relevant and adaptive.

Figure 1-1 Transdisciplinary academic organization structure

2. EDUCATION ECOSYSTEM STRUCTURE DRIVEN BY "TWO COLLEGES AND ONE INSTITUTE"

To cultivate transdisciplinary leading talent in innovation and entrepreneurship, it is crucial to strike a good balance between liberal and professional education and ensure a seamless connection between broad foundational knowledge and cutting-edge expertise. This helps resolve the inherent tension between producing "generalists" and "specialists". HKUST(GZ) has embraced a talent development approach that integrates liberal and professional education, and designed its liberal education system based on a "broad foundation, deep specialization" strategy. Under this system, undergraduate students spend their first two years and master's students their first semester without declaring a specific major, which encourages interdisciplinary learning. Undergraduate students are exposed to a diverse range of common core courses, including humanities, social sciences, ideological and political studies, arts, sports, and foundational STEM courses. Master's students benefit from a six-month transition and exploration period to explore professional development paths based on their personal interests and career goals. This educational model not only emphasizes the interconnectedness of knowledge and methodologies across disciplines but also fosters personalized learning paths. By fostering diversity and inclusiveness in education, it enables students to find a balance between broad foundational knowledge and in-depth specialized study, which lays a solid foundation for cultivating transdisciplinary leading talent in innovation and entrepreneurship.

To implement the concept of "integrating liberal and professional education" at the undergraduate level, HKUST(GZ) has adopted a "2+2" undergraduate training model, where students typically begin their specialized courses in various "Hubs-Thrusts" starting from their third year. Before selecting a major, students belong to the College of Education Sciences, which was established in February 2023. As the primary organizational unit responsible for undergraduate education, the College of Education Sciences oversees the first two years of students' academic experience by providing a broad learning platform that offers common core courses in humanities, social sciences, arts, psychology, and sports, as well as foundational STEM courses. The College is organized around several key pillars: the Pillar of General Education, Pillar of STEM Education, UG Teaching Labs, Pillar of Cognitive Sciences, and Pillar of Language Education. These pillars help students explore a wide range of foundational knowledge and enhance their comprehensive understanding of diverse fields, along with the cultures, values, and ways of thinking that underpin them.

Also founded in February 2023, the College of Future Technology oversees the training and management of all MPhil students at the university, and implements a comprehensive PBL model through its Base of Red Bird MPhil, Lab of Future Technology, and Red Bird Maker Space. The Base of Red Bird MPhil is responsible for designing and implementing the MPhil program, known as the RBM Program. This program adopts a transdisciplinary, problem-oriented PBL model to cultivate interdisciplinary, innovative, engineering-savvy and intelligent leading talent. Its talent cultivation model emphasizes cross-disciplinary collaboration to promote continuous industry-education education and cooperative education while supporting engineering practices that are deeply rooted in, serve, and spearhead industries. As a platform that drives talent cultivation, the RBM Program leverages multidisciplinary research projects, often derived from real-world industry challenges, to train students. Additionally, the program is guided by a diverse team of versatile and talented supervisors, including industry professionals. Upon admission, each student is assigned a Project Supervisor, who guides them in exploring transdisciplinary projects throughout their master's studies. After six months of academic exploration and mutual selection, students confirm their Academic Supervisor, whose Thrust expertise determines their academic specialization. Under their Academic Supervisor's guidance, students participate in transdisciplinary projects with a strong focus on their specialized skills. Industry Supervisors are invited by the Project Manager based on the project's progress to help students stay abreast of industry trends and real-world demands while guiding them in integrating project management and execution into real-life situations.

The Red Bird Maker Space, an innovative teaching space created by the College of Future Technology, is one of the central educational facilities at HKUST(GZ). It serves as a resource platform supporting the university's efforts to reform its higher

education paradigm, featuring four maker classrooms and five themed labs. The design and management of this space adhere to the principle of "individualized education that centers on each student's growth" to provide open learning and discussion areas, as well as multidisciplinary and multi-format practice venues. The Red Bird Maker Space facilitates a wide range of teaching activities, including team projects, practical courses, workshops, and competitions, while promoting transdisciplinary learning through innovative practices that cultivate sustained innovation capabilities and enhance industry-academia integration. For instance, the Sustainable Smart Life Competition, hosted by the Red Bird Maker Space, provides participating teams with equipment and technical support from five Red Bird workshops. This competition encourages students to design innovative solutions for campus life under the themes of sustainability and smart living, and promotes the creation of a greener, more livable, and smarter campus. The Lab of Future Technology aims to create an ecosystem that fosters student innovation and entrepreneurship by developing incubation projects and providing a comprehensive resource-rich platform. Through a student-centered approach, the Lab strengthens collaboration between academia, government, and various stakeholders (including enterprises, research institutions, and investment funds) and promotes close links between education and industry to foster the integration of academia, industry, and research. It also promotes the transformation of innovative ideas and technologies into practical solutions through a complete chain of "knowledge creation—technology development—achievement transformation".

In this fully PBL environment, Academic Supervisors, Project Supervisors, student teams, and industry professionals engage in continuous interaction, where intensive information exchange, resource complementarity, and knowledge creation take pace constantly, forming a "vortex" of innovation. Here, teachers, students, and industry professionals are educators, learners, knowledge creators, and technology innovators, thus redefining industry-education and science-education integration. Through multi-party collaboration, ambiguous industry issues are clarified, real-world problems are solved, and the pace from knowledge creation to technology development is accelerated, thereby shortening the technology transfer cycle. In this transdisciplinary PBL process, master's students work alongside teachers and classmates from diverse academic backgrounds, as well as industry professionals, to jointly tackle real-world problems. This educational model not only fosters multi-dimensional knowledge exchange and sharing but also accelerates the transformation from theory to practice. Through the RBM Program, HKUST(GZ) has closely aligned academia with industry, created an innovation environment rich in interaction and resource sharing, and deepened industry-education and science-education integration.

Under the transdisciplinary paradigm, teaching support organizations play a critical role in ensuring instruction quality and building a unified teaching culture across the university. In September 2022, HKUST(GZ) established the Institute for Education Innovation and Practice (IEIP), whose core function is to ensure an effective closed loop for education and teaching policies, form formulation, implementation, evaluation, and research to revision. IEIP fulfills several key roles. First, it is responsible for researching and formulating teaching policies, which includes developing and implementing teaching standards, educational system policies, and strategies for assessing teaching quality. It also manages faculty and teaching evaluations for teacher growth portfolios and ensures continuity and consistency in educational policies to promote ongoing improvement in teaching quality. Second, IEIP is tasked with building teaching support systems. It supports the design of both undergraduate and graduate courses, including assistance with online course design and recording. This function not only directly influences teaching method innovations but also equips faculty with the necessary resources and technical support to effectively drive pedagogical reform. IEIP is also charged with IT infrastructure development to ensure reliable, smooth, and efficient teaching innovation and practices in a digital environment. Third, IEIP is responsible for providing teaching training and resources. By designing and implementing a teacher training system, offering training resources, and establishing teaching innovation awards, it continually motivates faculty to innovate their teaching methods and content. Fourth, IEIP promotes educational innovation by managing the university's teaching website, operating new media platforms, and expanding networks of teaching experts. Through these channels, IEIP actively fosters teaching innovation and creates and promotes a vibrant teaching culture both on campus and beyond to enhance its overall influence. Fifth, IEIP conducts academic and institutional research in the field of teaching. It systematically collects and analyzes education and teaching information and data through "living labs". By conducting action research and institutional studies on teaching activities

and education policies, it ensures that education and teaching research is grounded in practices and can provide practical guidance for teaching. The effective functioning of these five roles is essential for developing the teaching culture and an institutional environment that prioritizes teaching. This helps support the flexible and orderly mobilization of university-wide resources, facilitate the planning and implementation of talent cultivation paradigm reforms, and foster an immersive teaching culture focused on "individualized education that centers on each student's growth".

IEIP, the College of Education Sciences, and the College of Future Technology together form the core of HKUST(GZ)'s education ecosystem (see Figure 1-2). Within the academic organization structure of HKUST(GZ), they serve as the driving force behind innovations in the transdisciplinary talent cultivation paradigm. The effective collaboration of these "two colleges and one institute" plays a pivotal role in institutionalizing transdisciplinary organization innovations and continuously enhancing the effectiveness of reforms in the transdisciplinary talent cultivation paradigm.

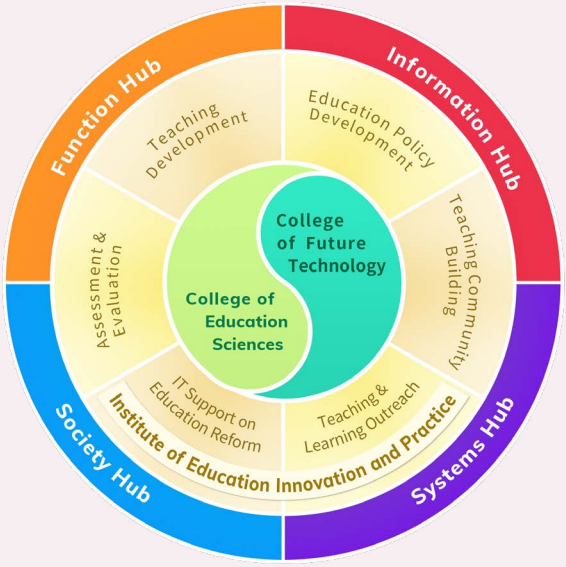


Figure 1-2 Education ecosystem structure driven by "two colleges and one institute"

II. RBM PROGRAM: THE FIRST STEP IN IMPLEMENTING THE TRANSDISCIPLINARY TALENT CULTIVATION CONCEPT

Currently, both domestic and foreign universities are exploring and innovating talent cultivation models. For example, the Massachusetts Institute of Technology launched the New Engineering Education Transformation (NEET) program in 2017, and China's Ministry of Education announced its first batch of 612 "New Engineering" research and practice projects in 2018. These programs emphasize multidisciplinary and multi-stakeholder PBL as a means to shift the focus from discipline-oriented education to one driven by industry needs, from specialization to cross-disciplinary integration, and from adaptive services to proactive leadership. However, most PBL initiatives focus on undergraduate education, with few attempts at reforming graduate education. How can graduate courses avoid becoming mere replicas of undergraduate curricula? How can they better reflect the interconnectedness and internal logic between courses? How can they integrate the latest research findings and cater to the trend of science-education integration? Addressing these questions through PBL is essential for discovering effective pathways for cultivating innovative talent.

The RBM Program implements a comprehensive and problem-oriented PBL model that addresses three key areas where humanity faces or will face significant challenges: "future medical and healthcare technology", "sustainable living", and "intelligent industrialization". Driven by the critical needs of social development and the national strategies for innovation-driven development and self-reliance and strength in science and technology, the program aims to resolve pain points in social development and overcome industry bottlenecks. It leverages multidisciplinary research projects as a lever for cultivating talent. Through its fully PBL system, the program explores a transdisciplinary talent cultivation paradigm

focused on individualized education that centers on each student's growth, and creates an environment for future strategic engineers and scientists to thrive, discover their potential, and enhance their capabilities. As the first step in implementing the transdisciplinary talent cultivation concept, HKUST(GZ) welcomed 266 and 347 students in September 2022 and 2023, respectively, as part of the first and second classes of the RBM Program. Throughout the problem-driven and transdisciplinary PBL process, these graduate students have collaborated with Project Supervisors, Academic Supervisors, and Industry Supervisors from diverse disciplines, fields and organizations, as well as peers from different majors. Together, they have explored their interests, unleashed their potential, and gradually defined personalized career paths.

The transdisciplinary PBL model of the RBM Program offers several advantages and features (see Figure 1-3). First, the program's admission model integrates a short-term challenge camp, known as RBCC, which offers a pre-experience of PBL to attract and select students. It also employs a broad category-based admission process without limiting applicants based on their disciplines, and adopts both an "application review system" and a "recommendation review system". To maximize the discovery, recruitment and selection of innovative talent, the university offers an appeal process for unsuccessful candidates in addition to the regular admission process, ensuring that potential talent is not overlooked. Second, unlike many universities that treat PBL as a supplement to traditional disciplinary training, the RBM Program represents a complete transdisciplinary project-based education initiative. Upon admission, students are not assigned to a specific major or supervisor; instead, they choose from three major pathways based on their interests, educational background, and career aspirations. Third, while the RBM Program is an MPhil program, it encourages students to explore diverse career development paths. The first pathway focuses on nurturing academic researchers capable of conducting original research. After the first semester, students select their Academic Supervisors (primary and secondary supervisors to broaden their academic development) and identify their focus areas within the Hub-Thrust of their primary supervisors. This marks the beginning of a scholarly journey for those interested in academic careers. The second pathway is designed to cultivate outstanding entrepreneurial talent. In line with HKUST's tradition of supporting faculty and student entrepreneurship, students interested in starting a business can treat their team projects as groundwork for their entrepreneurial ventures. With the guidance of Project Supervisors, students can form startup teams and access entrepreneurial resources to enhance their chances of success and potentially incubate their projects. The third pathway aims to develop innovative professionals who secure a desired job. The university offers diverse industry training opportunities and assigns each student an Industry Supervisor. These industry resources not only enrich students' practical experience but also broaden their employment options after graduation.

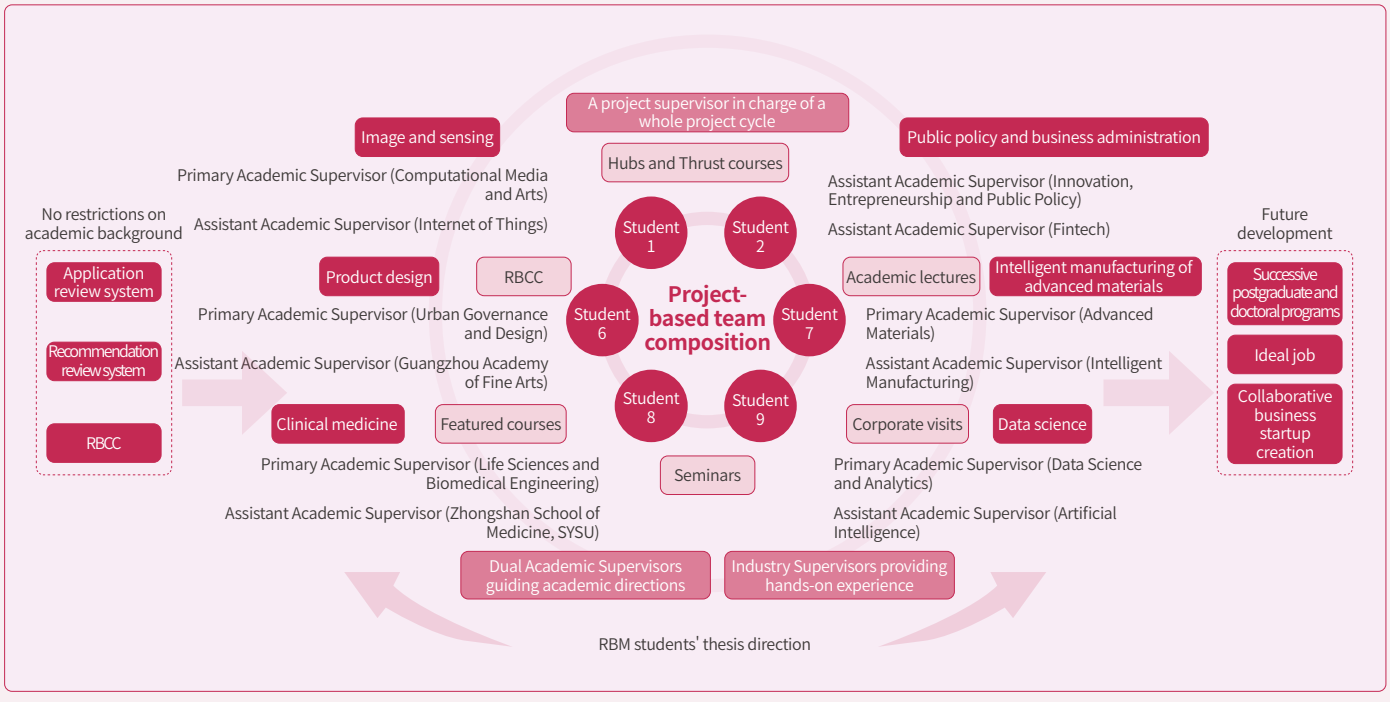


Figure 1-3 The talent cultivation model of the RBM Program (with a project group as an example)

ADMISSION MECHANISM

02

II. ADMISSION MECHANISM

Recruiting innovative talent who aligns with the transdisciplinary talent cultivation philosophy and adapts well to the fully PBL model is the first step in ensuring the quality of talent cultivation in HKUST(GZ)'s RBM Program. Therefore, it is urgent to explore a suitable and effective graduate admission mechanism. As China begins to promote the development of substance in higher education, the primary challenge in cultivating innovative talent lies in the "dual dilemma of how students select universities and majors that meet their individual needs and how universities and major programs select candidates that align with their unique educational characteristics". To address this dilemma, HKUST(GZ)'s RBM Program has integrated the adaptive talent selection concept into its admission process by balancing fairness and effectiveness in every aspect, which exemplifies a transdisciplinary paradigm. This chapter will explore how HKUST(GZ) ensures the selection of potential talent that meets the RBM Program's requirements by applying the adaptive talent selection concept, which balances fairness and effectiveness, alongside three types of admission channels.

I. THE ADAPTIVE TALENT SELECTION CONCEPT THAT BALANCES FAIRNESS AND EFFECTIVENESS

1. COMMON ISSUES IN CURRENT ADMISSION MECHANISMS

In China, graduate students are mainly recruited through the national unified admission exam and the recommendation-based exemption system. The national unified exam requires candidates to score above the national cutoff in the preliminary test to qualify for a university's independently organized re-examination. The recommendation-based exemption system allows universities to recommend outstanding graduating undergraduate students for direct admission into master's programs, bypassing the entrance exam. The Ministry of Education sets the proportion and number of students eligible for recommendation at each university. Additionally, the application-based assessment system, which is widely adopted internationally, is primarily used for selecting doctoral candidates in Chinese universities. In this system, applicants' materials are first reviewed by the target college, and those who pass the initial screening proceed to an interview conducted by a panel of professors, who then decide on admissions.

However, these admission mechanisms have faced criticism regarding their effectiveness and fairness. In terms of effectiveness, the admission thresholds for the national entrance exam and the quotas for the recommendation-based exemption system are centrally determined by the government, leaving individual universities with little control over their admission scale. This leads to a mismatch between the number of available slots and the actual needs of the universities. Moreover, the standardized exam format does not fully cater to the specific requirements of all disciplines. For instance, the heavy emphasis on subjects like advanced math, political studies, and English fails to assess applicants' abilities in their respective fields of study. Additionally, the brief interviews during the comprehensive re-examination phase often become mere formalities at many universities and struggle to identify potential talent. From a fairness perspective, while the application system enhances the autonomy of universities and supervisors in admissions, its fairness is compromised by various situational factors. From a game theory standpoint, most universities have vague selection criteria for the application system, and the power of universities and supervisors is not properly regulated or constrained. This has accelerated the privatization of authority, increased application costs, and created an

unequal elite elimination mechanism. Furthermore, implicit biases exacerbate the unfairness of the application system. In China, the application system, characterized by academic elitism, often discriminates against applicants based on the prestige of their universities. In the United States, the application system faces widespread criticism for its fairness concerning gender, race, and nationality. Additionally, under market-driven logic, disparities in family, social, and economic status, as well as market intervention, affect both the fairness and efficiency of the application system. Examples include applicants falsifying their identities to obtain extra privileges during exams and parents hiring intermediaries to embellish their children's applications, both of which undermine the fairness and effectiveness of the selection process.

Moreover, regardless of the admission system, universities often struggle to identify potential innovation leaders due to their reliance on convergent thinking and disciplinary paradigms. The emphasis on test scores in unified admission exams and academic performance in the application system highlights a preference for convergent thinking. This approach focuses on how well applicants master existing disciplinary paradigms with depth, precision, and detail to select followers of established academic norms. There is insufficient emphasis on divergent thinking even in interviews for recommendation-based exemption and application systems. While some interviews feature questions without fixed answers, they still revolve around established academic domains and rarely explore more challenging transdisciplinary topics. The brief interview sessions and limited interaction formats also make it difficult to assess cutting-edge thinking that transcends traditional paradigms. As a result, it becomes challenging to identify candidates with innovative thinking, diverse skill sets, and development potential, especially future leaders suited for the transdisciplinary talent cultivation paradigm.

2. ADMISSION PRINCIPLES OF FAIRNESS, IMPARTIALITY, AND TRANSPARENCY THROUGH EVIDENCE-BASED SELECTION

In China, ensuring equal opportunities and procedural fairness has always been paramount in all admission and examination systems. The national unified admission exam is widely respected for its emphasis on assessing learning ability, which aligns with the public's demand for fairness and impartiality. In light of both the pros and cons of traditional admission mechanisms, the RBM program adheres to the following guiding principles in its admission process:

(1) Collective decision-making

HKUST(GZ) employs a committee-based collective review process to minimize individual bias. Each review committee comprises scholars from various disciplines within the university, and applicants are assessed at different stages based on aggregated evaluations and recommendations from multiple reviewers. The committees engage in multiple rounds of discussions to reach a consensus on the talent selection criteria. The primary goal of these discussions is to establish comprehensive evaluation principles. Committee members are required to use transdisciplinary criteria to identify the most suitable candidates rather than favoring those with the highest grades or most academic publications. Lastly, a rolling admission process is adopted with multiple rounds of material and interview re-evaluation for candidates who were not selected in previous rounds. This approach reduces the risk of overlooking talented candidates due to the overall preferences of specific review groups or intense competition within a single application batch.

(2) Objective data

By incorporating the perspectives of various stakeholders such as the RBM Program's policymakers, executors, reviewers,

applicants, and employers, HKUST(GZ) is identifying quality indicators that shape transdisciplinary graduate training while enhancing the objectivity of action- and behavior-based indicators for the project observation stage. Leveraging generative AI, the university is developing a matching model to predict the alignment between applicants' achievements, as reflected in their application materials, and the developmental potential required for the RBM program. Data model results serve as a useful reference for reviewers to better implement the "holistic review-based and competence-oriented" principle during team project evaluations and personal interviews. The adoption of more intelligent and systematic methods for assessing innovative talent will also enhance the efficiency and consistency of graduate admission decisions.

(3) Standardized procedures

HKUST(GZ) has established a transparent, fair, and impartial admission mechanism that upholds procedural justice. First, it has developed a regular application review process consisting of "application material review – team project observation – personal interview", supplemented by special admission channels like RBCC and the recommendation review system. All three channels follow standardized procedures for making admission decisions in line with clear and systematic guidelines. Second, the admission process follows an evidence-based selection approach, incorporating multidimensional evidence at each stage to minimize the risk of misjudging candidates. Last, HKUST(GZ) upholds science-based admission decision-making by creating a comprehensive set of scientific and standardized evaluation tools for every piece of evidence. This ensures that decisions rely on a consistent set of tools and criteria. By formalizing and refining the significant qualitative and subjective elements of traditional admission processes, the university minimizes subjective arbitrariness, rent-seeking, and personal bias during material review and interviews.

(4) Double-blind random matching of reviewers and applicants

HKUST(GZ) adheres to a double-blind random matching system between reviewers and applicants to ensure the fairness and impartiality of its admission process and outcomes. On the day of the team project assessment, both reviewers and applicants are randomly assigned into groups through a draw. Once the drawing is completed, the assessment begins immediately, eliminating any opportunity for prior or private contact between reviewers and applicants. This prevents reviewers from consciously or unconsciously considering factors such as applicants' universities, test scores, or majors, ensuring that evaluations are based solely on their overall abilities and competences. In traditional admission processes, reviewers often make assumptions about a student's potential based on their universities, majors, grades, English proficiency, research proposals, and recommendation letters—factors which studies have shown to lack predictive validity for decision-making. The double-blind process removes preconceptions about applicants' previous academic achievements and focuses on an objective and fair evaluation based solely on the real-time abilities and competences demonstrated through their behavior.

(5) Avoiding intermediary meddling

HKUST(GZ) has also taken steps to mitigate the risks of market-driven information asymmetry and market interference in its admission process. First, during the material review stage, the weight assigned to "mastery of language" is capped at a relatively low percentage (5%-20%) to minimize the influence of intermediary companies that assist applicants in polishing their application materials. Second, the project observation questions are made public in advance to eliminate the risks of influence peddling or information rent-seeking from leaks and reduce external interferences caused by differences in family economic backgrounds. Since these questions have no standard answers and responses vary across individuals, disclosing them in advance encourages applicants to develop critical thinking, set higher and more forward-looking goals, and take innovative leaps from a new starting point. Additionally, HKUST(GZ) has introduced an appeal process for applicants who have concerns about the fairness of the admission procedure to file official appeals. These appeals are reviewed by an independent appeal committee to ensure fairness and impartiality throughout the admission process.

3. ADMISSION CRITERIA FOR TRANSDISCIPLINARY TALENT SELECTION

(1) Ensuring transdisciplinary backgrounds and diversity in educational/disciplinary backgrounds through material selection and three types of admission channels

HKUST(GZ) also emphasizes diversity in applicants' skill sets and openness to various future development paths in its admission mechanism. First, applicants are given the flexibility to choose between a master's or direct PhD program based on their abilities and interests. The admission criteria do not require applicants to have a clearly defined academic specialization or career trajectory at the application stage. Second, varied scoring dimensions and indicators are applied at different stages of the selection process, from material review, and project observation to personal interview. The system assigns different scoring weights to applicants from various disciplinary backgrounds to fully recruit talent with diverse skill sets. Third, HKUST(GZ) has incorporated a "recommendations by Thrust supervisors" option during the material review stage into its recommendation review system to avoid inadvertently filtering out potential candidates based on factors such as their universities or disciplines.

Additionally, unlike traditional graduate admissions, which are typically aligned with specific academic disciplines, HKUST(GZ) adopts a transdisciplinary talent cultivation paradigm that emphasizes diversity in disciplines in its admission mechanism. During the material review stage of the regular admission process, the university has established an evaluation matrix that refines the assessment of qualitative materials. First, applicants are categorized into eight major discipline categories: science, engineering, liberal arts, arts, design, business, management, and medical science. Different weightings are assigned to 11 abilities based on the applicant's discipline. Second, reviewers score each applicant's materials in the system according to these 11 abilities while also noting any exceptional qualities observed (open-ended criteria). Last, after scoring, each reviewer provides an overall recommendation rating for the applicant's material review stage. The committee then consolidates both the subjective and objective scores to determine whether the applicant proceeds to the interview stage.

(2) Assessment of comprehensive competences through team projects

The project observation introduces a situational model of teamwork, where the review panel conducts Situational Judgment Tests to evaluate applicants' behavioral responses during the team project. A challenge task phase is incorporated into the team observation situation to assess competences in defining, deconstructing, and solving problems. Each student group designs a challenge task on site, which is then randomly assigned to other groups. To ensure feasibility, each group must complete both the task assigned to them and the one they proposed. These engaging challenge tasks are designed to stimulate applicants' divergent thinking, systems thinking, and innovation abilities. Meanwhile, applicants' resilience, stress management, and adaptability can be further observed in this uncertain challenge situation. The team project observation phase also takes disciplinary diversity into account. Each student group is observed throughout the process by two randomly assigned reviewers to evaluate teamwork, communication, and other skills. The reviewers closely monitor task progression and completion in the group activity setting with a thorough assessment of each applicant's various soft skills such as leadership, teamwork, communication, planning, execution, creativity, and self-management.

(3) Assessment of transdisciplinary thinking and perspectives through personal interviews

HKUST(GZ) has introduced innovative reforms to its graduate admission interview process. Unlike traditional personal interviews that primarily evaluate applicants' academic performance, this process embraces the "holistic review-based

and competence-oriented" approach. Applicants are required to give a 5-minute personal presentation, explaining their chosen field of study in response to major challenges that humanity faces or may face in the future, as well as their reasons for pursuing an MPhil degree. A panel of three faculty members from different disciplines will then conduct a 10-minute Q&A session, posing broad-ranging questions based on the presentation. Applicants are assessed and scored on their overall performance during their presentation and Q&A, and a recommendation rating is given. In this many-to-one interview setting, applicants are evaluated on a wide range of skills, including their breadth of knowledge, communication skills, integrative thinking, and strategies for dealing with unexpected challenges. A key aspect of implementing this ability-oriented interview process is the questioning ability of the review panel. Their questions must not only assess the applicant's current achievements, but also be creatively integrative, divergent, and challenging enough to further gauge the applicant's potential.

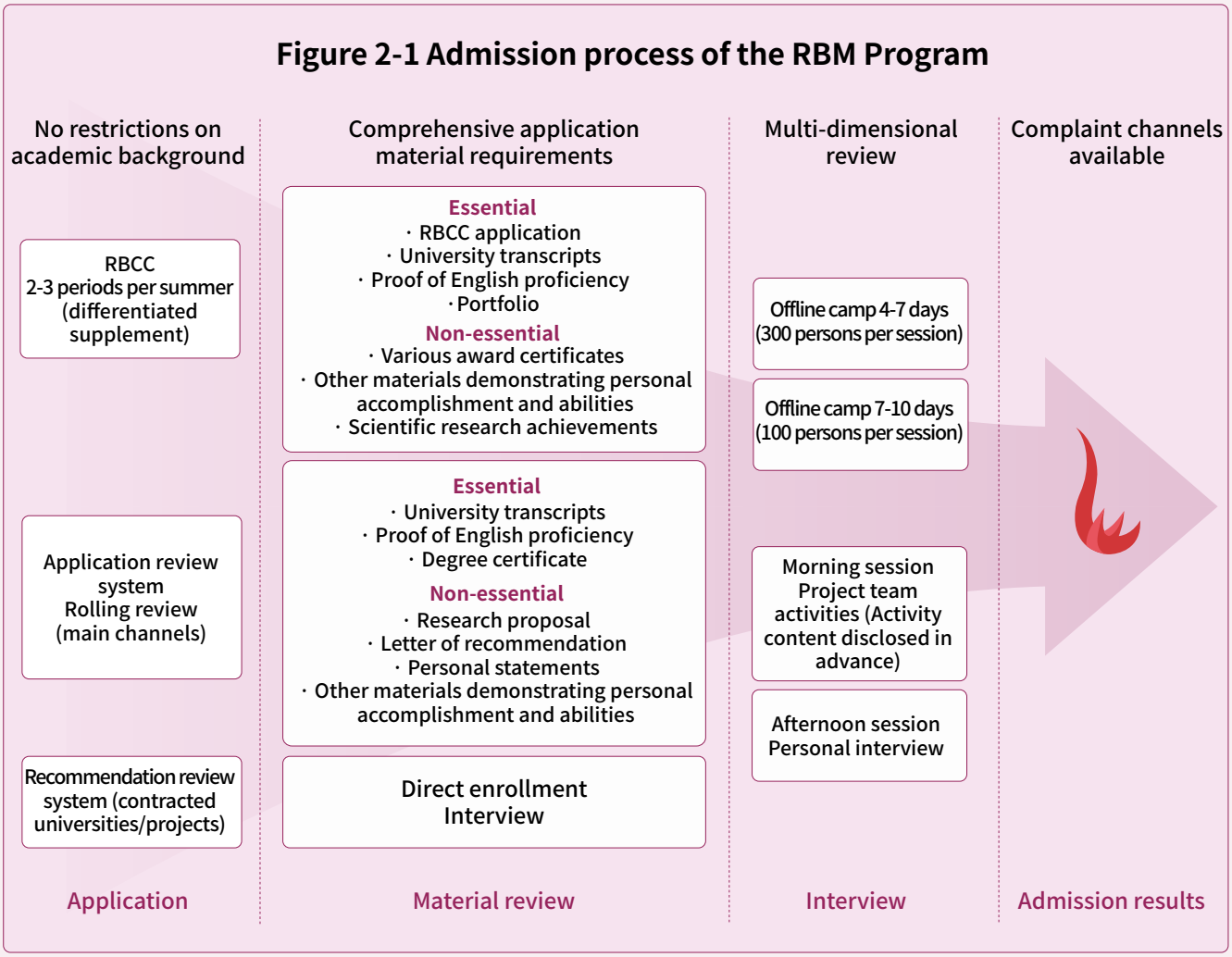
II. THREE TYPES OF ADMISSION CHANNELS FOR INCLUSIVITY OF DIVERSE STUDENT BACKGROUNDS

Following an in-depth discussion of the principles of fairness, impartiality, and transparency in the admission process, this section examines how inclusivity of diverse student backgrounds is achieved through three types of admission channels.

1. DESIGN PRINCIPLES OF THREE TYPES OF ADMISSION CHANNELS

HKUST(GZ) has, as of June 2024, conducted nearly 30 rounds of MPhil student admissions to select and integrate potential innovation leaders for the transdisciplinary project-based MPhil RBM Program. This has evolved extensive explorations and innovations in admission philosophy and principles, implementation procedures, and evaluation mechanisms. There are mainly three types of admission channels: the application review system, the recommendation review system, and RBCC (see Figure 2-1). The application review system is the regular channel, with around 7 to 10 rounds of rolling admissions taking place each year from July to the following July. It notably includes interviews that assess applicants primarily based on their abilities and competences. About 14% of the students are admitted through the recommendation review system, primarily academically outstanding students from partner universities or programs. These applicants can skip the material review and proceed directly to the interview stage, alongside those from the application review system. RBCC, a differentiated supplementary channel, accounts for approximately 20% of total students recruited through the three types of channels. Three summer camps are held annually from June to August, each lasting 11 to 17 days.

Figure 2-1 Admission process of the RBM Program



(1) Application review: primary admission channel

In the prevailing admission model characterized by academic elitism, a student's university often becomes an important, if not decisive, factor in determining eligibility for further education. This practice has been widely criticized for its lack of fairness and its limited effectiveness in predicting a student's knowledge, abilities, and competences. The RBM Program at HKUST(GZ) takes a different approach by not restricting applicants based on their university or discipline, which is a prerequisite for effectively selecting talent under the transdisciplinary talent cultivation paradigm reform. The "material review – team project observation – personal interview" process, which gathers multidimensional evidence, constitutes the "Recruiting Funnel" for the regular admission channel at HKUST(GZ). The material review and screening stage ensures that the academic background and experiences of shortlisted applicants align with the MPhil program's requirements. The Situational Judgment Tests of team projects help identify potential candidates suitable for the PBL model that emphasizes transdisciplinary teamwork. The holistic review-based and competence-oriented personal interviews can further validate a candidate's comprehensive competences, such as language skills, innovative thinking, systems thinking, and enterprising spirit.

(2) Recommendation review: preventing talent exclusion due to a "one-size-fits-all" screening mechanism

The international academic community has been exploring how to balance meritocracy with inclusive diversity by introducing

supplementary channels to the regular admission process to provide underrepresented groups with affirmative action opportunities. To avoid mistakenly screening out potential candidates during the material review stage due to university or discipline indicators, HKUST(GZ) has established a recommendation review system to select outstanding applicants from partner universities or programs. Additionally, the "recommendations by thrust supervisors" channel has been integrated into the material review process as part of the recommendation review system. This allows faculty members across disciplines to re-evaluate applications that initially did not qualify for an interview and uncover exceptional talent who may have been overlooked due to standardized selection criteria. The recommendation review system serves as an innovative supplement that integrates both behavioral observation and academic performance assessments. By observing and evaluating student behavior, this process overcomes the limitations imposed by standardized criteria on applicant abilities and addresses their relative disadvantages in the material review stage, thus facilitating the identification and cultivation of outstanding talent.

(3) RBCC: providing opportunities for "unconventional and extraordinary talent"

HKUST(GZ) has also established a special admission channel through RBCC to attract and select candidates who may come from average universities but align with RBCC's PBL model and possess extensive project experience and competition awards, such as from the "Internet+" Innovation and Entrepreneurship Competition, the Challenge Cup, the China Undergraduate Mathematical Contest in Modeling (CUMCM), and design competitions. RBCC is an innovative educational practice designed to enhance the comprehensive abilities and competences of university students. It provides a miniature experience of transdisciplinary PBL to matchmake with potential innovation leaders. RBCC includes online camp courses that train students in design thinking, systems thinking, and transdisciplinary thinking while guiding them to identify real-world social problems by focusing on "human needs". It encourages creative thinking through teamwork and the exploration of various solutions. Offline, RBCC organizes project-based camp activities where participants from different educational and cultural backgrounds freely form teams, define project goals, and allocate tasks. Under the guidance of professional supervisors and teaching assistants, participants engage in hands-on activities to tackle real-world problems and challenges. Before the camp concludes, students present their team projects and give individual reports, which are evaluated by a panel of experts. Teaching assistants also assess participants' overall performance throughout the camp, and outstanding students are granted admission to the RBM Program. Through these team project-based activities, students will gain insights into the opportunities and challenges brought by rapidly advancing science and technology, recognize the key role of transdisciplinary collaboration in changing the world, and consider the application potential and ethical implications of transformative technologies from fresh perspectives.

2. ADMISSION PROCEDURES AND CURRENT IMPLEMENTATION

The previous section has offered an in-depth analysis of the philosophy and design principles behind the admission mechanism, including how to balance fairness and effectiveness, and explored how the three types of admission channels foster the inclusivity of diverse student backgrounds. Building on that foundation, this section will further examine the practical measures taken to innovate the current admission mechanism, the challenges encountered, and discuss how to optimize admission strategies to better meet the educational needs of the RBM program.

(1) RBM Program Class 1 (2022-2023 fall) admission practices

① Overall data

Despite the challenges posed by COVID-19, RBM Program Class 1 exceeded its original admission target of 250 students and enrolled a total of 268 students after conducting seven rounds of selection and interviews.

Out of 1,652 applicants, about 54% passed the selection of materials, and the percentage of applicants who were finally accepted through the interview and review was about 23%. The majority of the new students (about 98%) came from the Chinese mainland, while 2% students were from other countries. In terms of gender distribution, about 63% of the students were male and 37% were female. The ratio of male to female is nearly 3:2. Regarding educational backgrounds, about 21% of the new students held graduate degrees, while 79% students held undergraduate degrees. Regrading the undergraduate background, about 62% students came from Project 985 universities, Project 211 universities, and Double First-Class universities. Additionally, about 23% students graduated from overseas universities and Chinese-foreign cooperative universities. The remaining 15% students came from other universities. In terms of undergraduate majors, the proportion of students in science & engineering, business, management, liberal arts, art & design, and medical science is 63%, 13%, 9%, 6%, 5% and 1%, respectively, and about 2% in other majors.

② Basic system for Class 1 admissions

A. The admission committee mechanism

Following a resolution by the HKUST(GZ) Operation Management Meeting, the RBM Program has adopted an individual application-committee review system to recruit outstanding candidates globally. In a departure from the traditional disciplinary divisions in MPhil program admissions and training, the RBM program opts for broad category-based admissions without limiting applicants to specific majors or requiring them to select supervisors in advance. The program operates on a rolling admission basis throughout the year and selects candidates based on merit.

The admission process for the RBM Program is organized by the Vice President (Teaching & Learning) Office (VPTLO) and coordinated by the Fok Ying Tung Graduate School (FYTGS). To ensure compliance, fairness, and efficiency during the admission process, VPTLO has established a two-tier working committee structure within the university: the Steering Committee and the Selection and Interview Committee.

The Steering Committee is primarily responsible for formulating admission policies and criteria, as well as making significant decisions. The inaugural committee is comprised of eight senior professors and chaired by Vice-President (Teaching & Learning). The committee is tasked with developing annual admission policies and development plans, ensuring that the admission process aligns with the university's development goals and educational philosophy. It also oversees the admission mechanism to ensure fairness and efficiency, addresses major issues encountered during the admission process, and guides the Selection and Interview Committee in meeting its annual admission goals.

The Selection and Interview Committee is tasked with executing the annual admission process and managing the specific tasks involved in each selection and interview round to meet the university's admission targets. The first Selection and Interview Committee consists of 29 faculty members mainly from Hubs and Thrusts organized into three subcommittees led by the committee chair, with each subcommittee also selecting its own chair. Additionally, a committee coordinator is appointed to coordinate the work of all subcommittees. During each admission round, this committee evaluates applications or interviews applicants in groups based on the admission policies and criteria established by the Steering Committee. Each application is assessed by at least three committee members, and qualifications for interviews or admission recommendations are determined through consensus reached in committee meetings. The decision-making process is collective, and any exceptional cases where consensus cannot be reached are escalated to the higher-level Steering Committee for resolution.

B. Clear application and admission procedures

To better meet the requirements for evaluating and selecting transdisciplinary innovative talent, the RBM Program has established clear application procedures. The application process features the following four innovative elements:

a. The program departs from the conventional master's degree admission model, which relies on unified entrance exam scores, and adopts an independent application review system that aligns with international admission practices. Any individual can apply directly through the official admission channel of HKUST(GZ) by filling out the application form and uploading supporting materials to complete the online application process.

b. The program adopts a university-wide recruitment model that enables broad category-based admissions without imposing restrictions on specific majors, universities or GPA requirements. As a result, applicants are not required to contact potential supervisors in advance or select a specific major. Instead, they simply need to submit all materials that can demonstrate their abilities and experiences, including but not limited to their four-year university transcripts, literary works in English or Chinese, design portfolios, letters of recommendation from work or internships, certificates of major international or national competition awards, entrepreneurial competition awards, community service certificates, club service materials, and curricula vitae. This approach provides applicants with greater flexibility to focus on showcasing their strengths and comprehensive abilities without being limited by their choice of major or the preferences of supervisors. Additionally, a complete set of personal application materials will help facilitate subsequent comprehensive evaluations.

c. The program has defined three themes for the application process: future medical and healthcare technology, sustainable living, and intelligent industrialization. Applicants must choose one of these themes for the interview stage and prepare a personal statement that explains their reasons for selecting it. This approach encourages applicants to think about their future development while helping evaluators gauge their grasp of the program and their personal growth needs to assess how well they fit with the program. Moreover, this open-ended question is the only prompt for the interview, which is publicly announced in advance without a predetermined answer. This allows applicants to prepare thoroughly and express themselves freely in a fair and equitable manner. The interview organizer also need not worry about potential question leaks.

d. The program has made the research proposal and recommendation letter optional rather than mandatory in the regular application process. If applicants decide not to submit these documents, it will not directly impact the review of their subsequent materials. This innovation encourages independent and authentic submissions from applicants. To minimize interference from intermediaries and other market factors, the committee has designated these two materials as “non-mandatory”. Additionally, evaluators will ask targeted questions during the interview process to help ensure the authenticity of the materials submitted and provide an objective assessment of the applicants.

C. Implement multi-dimensional material selection criteria

Unlike the conventional admission mechanism, the RBM Program employs a multidimensional, multi-agent evaluation method based on the comprehensive personal application materials submitted by candidates. This approach is characterized by the following three key features:

a. The scoring criteria are central to multidimensional material evaluations. To objectively assess the application materials and effectively select candidates, the committee has developed detailed evaluation criteria that take into account the diverse backgrounds of applicants. The scoring indicators primarily include GPA, math ability, mastery of language, specialty core courses, lab courses, capstone/design project, internships, community service, student clubs, major international/national competitions, college of first degree, and college of second degree. Each scoring indicator is graded on a scale of 100, with different weights assigned based on broad major categories, such as science, engineering, liberal arts, arts, design, business, management, and medical science. For example, math ability carries a higher weight in science, while mastery of language is more heavily weighted in liberal arts. Capstone/design works are emphasized for applicants from arts or design backgrounds, and clinical internships are prioritized in the medical field. The application materials are evaluated in a quantitative and objective manner by aggregating scores across multiple indicators with varying weights.

Table 2-1 Score sheet for application material selection (example)

能力指针 Ability Indicators	申请人背景 Background of the Applicant							
	理科 Science	工科 Engineering	文科 Liberal Arts	艺术 Arts	设计 Design	商科 Business	管理 Management	医科 Medical
绩点 GPA	15%	15%	15%	15%	15%	20%	20%	20%
数学能力 Mathematical Ability	20%	15%	5%	5%	10%	5%	5%	6%
语言文字综合能力 Mastery of Language	8%	5%	20%	10%	5%	20%	20%	5%
专业核心课成绩 Specialty Core Courses	10%	10%	15%	10%	8%	12%	12%	10%
实验课成绩 Lab Courses	5%	8%	1%	1%	5%	0%	0%	10%
毕业设计 / 作品及成绩 Capstone/Design Project	10%	10%	15%	20%	20%	10%	10%	10%
企业 / 临床实习表现 Internship Perforance	3%	8%	6%	6%	8%	10%	10%	20%
社会服务活动 Community Service	2%	2%	4%	4%	2%	4%	4%	2%
学生社团活动 Student Clubs	2%	2%	4%	4%	2%	4%	4%	2%
国内国际大赛成绩 Major Int'l/National Competition	20%	20%	10%	20%	20%	10%	10%	10%
本科毕业院校 College of 1st Degree	5%	5%	5%	5%	5%	5%	5%	5%
	100%	100%	100%	100%	100%	100%	100%	100%

b. The evaluation method is crucial for achieving a multidimensional and comprehensive assessment of application materials. Each complete application is evaluated by three or more reviewers from diverse backgrounds, who consider various factors such as major matching, theme selection, and interdisciplinary assessment. After integrating the evaluation results from multiple reviewers, a consensus is reached through discussions at various levels, including review groups, subcommittees, and the committee, to determine the applicant's eligibility for an interview. In addition to assigning a quantitative total score based on multiple indicators, each reviewer provides a recommendation rating for each application, categorized into four tiers: “strongly recommend”, “recommend”, “neutral” and “do not recommend”, along with clear justifications for their assessments. The subcommittees then conduct a comprehensive review based on the scores and evaluations from groups of three or more reviewers, balancing assessments from each reviewer (vertical assessment) with comparisons of an applicant's assessments across multiple reviewers (horizontal assessment) to determine the overall rating of the application materials. This rating is then submitted to the committee for review. The Selection and Interview Committee ranks the review results of individual subcommittees and balances horizontal comparisons between them. Special cases are discussed

individually and voted on by all members, leading to a unified comprehensive evaluation. In instances where the Selection and Interview Committee fails to reach a consensus, the committee chair will escalate the matter to the higher-level Steering Committee for final review and decision-making. This process emphasizes a holistic view of the applicant's performance both within and outside their field of study. By balancing multiple reviewer perspectives and employing a rigorous, multi-tiered committee decision-making system, the program strives to provide a more objective and comprehensive assessment of each application.

c. During the material selection stage, a year-round rolling screening mechanism is employed. Specifically, applicants who are not admitted in a given round will be placed on a waiting list, with no limit on the number of rounds. Multiple rounds of material selection will continue until the end of the current admission cycle. Applicants on the waiting list who receive recommendations from the committee will participate in interviews alongside those selected in the regular batch, without distinction. By comparing outcomes from previous application rounds, this approach enables repeated and thorough screening of outstanding candidates, thereby preventing talent mis-assessment and loss.

D. Online interview

Personal interviews for admission to the RBM Program Class 1 were conducted entirely online due to the severe impact of COVID-19, but the multidimensional, multi-agent evaluation process was maintained to ensure a comprehensive assessment of applicants. This was accomplished through the following three measures:

a. The interviews primarily took place as one-to-many online sessions. Applicants began with a 5-minute oral presentation explaining their reasons for pursuing the master's degree based on the PPT they had prepared around the sub-theme selected in their application materials. This was followed by a 10-minute open question session, during which three or more reviewers asked questions on a wide range of topics. Finally, the reviewers scored the applicants based on their overall performance within the 15-minute timeframe. The interview was conducted in a mix of Chinese and English. For Chinese-native applicants, the oral presentation could be delivered in either language. If the presentation was in Chinese, the Q&A session would be entirely in English, and vice versa. For applicants whose native language was not Chinese, the entire interview was conducted in English. Through open-ended questions and flexible language options, applicants could fully showcase their abilities without language barriers. The one-to-many interview format also effectively reduced the risk of subjective bias from the reviewers.

b. The interview scoring criteria were designed with multiple evaluation indicators, including presentation perspective, language skills, narrative logic, knowledge breadth, infectiousness, self-confidence, Q&A performance, observation, curiosity, and PPT design. Each indicator was scored on a scale of five (ranging from disappointing to outstanding). This scoring standard and method facilitated a thorough evaluation of an applicant's overall capabilities beyond specialty expertise. By balancing the collective opinions of different reviewers, the rigorous multi-level collective decision-making system could ensure an objective and comprehensive interview assessment.

Table 2-2 Score sheet for interview

能力指针 Ability Indicators	突出 Outstanding	5	4	3	2	1	失望 Disappointing	用几个关键词描述一下你给出这个分数的依据 Disappointing Your Basis for Giving This Score (Key Words)
演讲视角 Perspective								
语言表达 Language Skills								
叙事逻辑 Narrative Logic								
知识面 Knowledge Breadth								
感染力 Infectious								
自信心 self-confidence								
答问能力 Q&A Performance								
观察力 Observation								
好奇心 Curiosity								
PPT 版面设计 PPT Design								
你观察到的其它特殊 / 优异品质 (请简述): Other Unique Qualities Observed(Brief Description):								

c. To ensure the authenticity and rigor of the online interviews, the RBM Program added specific requirements for the interview conditions. For instance, applicants were required to present identification documents before the interview to verify their identities. The interviews were conducted in real time using the ZOOM platform, with the entire process recorded for future review and traceability. Applicants were also required to prepare two camera-equipped devices: the first positioned in front for a head-on view and the second placed at the back or side to capture the full setting.

E. Other admission channels

a. Professors may recommend promising but insufficiently trained doctoral applicants for admission to the RBM Program. Many professors from various Thrusts identified some high-potential doctoral candidates who, due to their inadequate academic training, were unable to be directly admitted as doctoral students at our university. To prevent the loss of excellent candidates, professors strongly recommended that such applicants be recruited into the RBM Program. Since both the doctoral program and the RBM Program follow the university's unified application review criteria, and share similar evaluation processes, the Steering Committee and the Selection and Interview Committee reached a consensus: if applicants

receive unanimous recommendations from three or more professors based on the interview CRITERIA of the RBM Program during the doctoral interview process, they may directly transition to the application review process for the RBM Program. Once the Selection and Interview Committee confirms that their materials have passed the review, they will be eligible for admission recommendation. Professors must submit score sheets, interview records, and application materials that highlight a candidate's strengths and explain why direct doctoral admission is not feasible. Such recommendations will undergo strict review, with a cap on available spots. This special admission channel can effectively attract talent while fully engaging professors in the RBM Program's recruitment efforts.

b. Applicants who have received formal admission letters from overseas universities and wish to transfer their offers may enter the RBM Program. In accordance with relevant documents from the Ministry of Education and in response to social demands, HKUST(GZ), as a collaborative educational institution between the Chinese mainland and Hong Kong, Macao, and Taiwan, has launched a temporary independent admission round, known as offer transfer, to support Chinese students who are unable to study abroad due to the impact of COVID-19. Applicants must have received formal admission letters from overseas universities and meet the basic admission requirements set by our university as well as the standards established by the Selection and Admission Committee. Those who fulfill these criteria can proceed directly to the interview, which follows the same standards and format as the application review system. Applicants who pass both the interview and committee review will be recommended for admission to the RBM Program. This temporary recruitment channel has effectively addressed the difficulties faced by some outstanding students seeking to study abroad, demonstrated our university's commitment to social responsibility, and attracted a pool of exceptional candidates to the RBM Program.

③ Issues and areas for optimization in Class 1 admission practices

First, lack of uniform scoring criteria. Due to the diverse backgrounds of applicants and the complexity of evaluation indicators, different reviewers may have varying interpretations and assessments of the same applicant's abilities and potential, leading to discrepancies in scoring outcomes.

Second, differences in reviewers' understanding. The reviewers may lack training in the innovative educational philosophy of the RBM Program and may revert to traditional evaluation methods, which could impact the quality of candidate selection.

Third, limitations of online interviews. Online interviews failed to capture the subtle behaviors of candidates, lacked authenticity and validity, and were susceptible to network issues, making it difficult for some candidates to perform at their best.

Fourth, heavy review workload. Comprehensive evaluations of each application required multiple reviewers to assess the materials, and the multi-tiered decision-making process further increased the workload, placing considerable pressure on both the reviewers and the admission administrative team.

To address these issues, the following measures should be implemented for the Red Bird Program Class 2. First, reviewers should undergo systematic and professional training to ensure they fully understand the innovative educational philosophy and the importance of comprehensive evaluation, thereby maximizing consistency in evaluation criteria. Second, a supervision and feedback mechanism should be established to enhance oversight and review of the evaluation process and outcomes. This will ensure adherence to procedures, accuracy in evaluations, and fairness and transparency in reviews. Input from both applicants and reviewers regarding the evaluation process should be collected to continuously optimize the selection process. Third, a diversified evaluation approach should be adopted, incorporating a variety of interview formats, specific case analysis, and practical projects to comprehensively examine applicants' abilities and potential. Last, computer-assisted technology should be leveraged to develop an admission scoring assistance system, thereby reducing workload and improving efficiency.

(2) RBM Program Class 2 (2023-2024 fall) admission practices

① Overall data

The 2nd cohort of RBM Program fulfilled its annual admission target and enrolled a total of 347 students. Out of 3,555 applicants, about 37% passed the selection of materials, and the percentage of applicants who were finally accepted through the interview and review was about 14%. The majority of the new students (about 99.7%) came from the Chinese mainland, while only one students were from other countries. In terms of gender distribution, about 61% of the students were male and 39% were female, which is similar with the last cohort. Regarding educational backgrounds, about 11% of students held graduate degrees, while 89% students held undergraduate degrees. Regrading the undergraduate background, about 74% students came from Project 985 universities, Project 211 universities, and Double First-Class universities. Additionally, about 11% students graduated from overseas universities and Chinese-foreign cooperative universities. The remaining 15% students came from other universities. In terms of undergraduate majors, the proportion of students in science & engineering, business, medical science, management, liberal arts and art & design is 65%, 15%, 7%, 5%, 3% and 3%, respectively, and about 2% in other majors.

② Iteration of the admission system for Class 2

A. Changes in the admission committee mechanism

The second Selection and Interview Committee has expanded to 47 members and added a fourth subcommittee to the three subcommittees from the first session. Each of the original three subcommittees is led by a chair and a vice-chair, with one chairperson required to be a senior member from the first session. They are tasked with organizing and implementing the annual admission process according to the admission policies and criteria. The newly formed fourth subcommittee consists of 9 members, including 5 associate professors or higher, and is directly overseen by the chair of the Selection and Interview Committee. This subcommittee primarily focuses on reviewing applications that have passed the recommendation review process, as well as handling other special matters.

To ensure fairness and impartiality in the admission process, an appeal channel has been introduced for the RBM Program 2nd Cohort, which allows the Selection and Interview Committee members to handle appeals from applicants who were not granted admission eligibility. The committee will decide collectively whether a re-evaluation will take place. Cases where the Selection and Interview Committee fails to reach a consensus will be directly submitted to the higher-level Steering Committee for review and decision-making.

B. Automated pre-selection mechanism for material selection

To address the significant increase in material selection workload due to a surge in applications, the Steering Committee has implemented an “automated pre-selection” mechanism for the RBM Program Class 2, based on a reasonable assessment of the data. The scoring system is designed to automatically screen application materials according to predefined rules. Applications that meet the established criteria will proceed to the formal material selection stage, while those that do not will be placed on a waiting list for the next selection round. The pre-selection rules primarily consider the QS ranking of the applicant's first-degree university and GPA. Different GPA thresholds are set for various QS ranking tiers.

In addition to the pre-selection mechanism, a “Thrust recommendations” system has been introduced. Applicants who do not qualify through the automated pre-selection will be placed on a waiting list, where the committee will coordinate with professors from various Hubs and Thrusts to screen candidates based on the RBM Program's selection criteria. This measure targets applicants whose universities and GPAs may not be highly ranked but whose majors are either unique or highly regarded, along with outstanding performance both within and outside their fields of study. If an applicant receives joint

recommendations from three or more Thrust professors, along with detailed justifications for their recommendations, they will be granted eligibility for a recommendation for same interview with the nomal batch of applicants. Each Thrust strictly limits the number of recommendations to 12, and this mechanism also follows a rolling selection principle.

In summary, the combination of "pre-selection + material selection" improves the process of identifying the most qualified candidates. The "Thrust recommendations" system complements well the fixed-rule pre-selection mechanism to better select candidates with development potential. This approach not only aligns with widely accepted talent evaluation criteria but also facilitates the selection of exceptional candidates by providing applicants from diverse backgrounds and performances with a fair opportunity to compete.

C. Replacing online interviews with offline interviews

With the end of the COVID-19 pandemic, offline interviews resumed for the RBM Program Class 2. Such interviews are crucial for the full-time MPhil program admission process at HKUST(GZ), aimed at implementing a transdisciplinary project-based innovative talent cultivation model that fully explores student potential and selects candidates with outstanding abilities, competences, and academic performance. The interview consisted of two main parts: the first was a project group activity designed to assess the applicant's adaptability to transdisciplinary integration, including the comprehensive qualities and abilities demonstrated in collaborative situations (such as teamwork, communication, and innovation); the second was a personal interview, conducted in a high-pressure environment with multiple reviewers, to evaluate the applicant's academic expertise, specialty literacy, overall capabilities, and ways of thinking. To ensure transparency and fairness in the interview process, detailed information regarding the group activities, schedule, requirements, and scoring criteria was published online before each round of interviews. Additionally, specifics of the offline interview arrangements were clearly outlined in the interview invitation emails to eliminate any information discrepancies among applicants, ensuring that every participant could prepare adequately in advance.

a. Project group activity

The activity centered around creating a watercraft. Groups of about five members were tasked with building a functional watercraft within a specified timeframe using the basic materials provided (such as cardboard and cans). The vehicle should be able to transport "cargo" (coins, LEGO bricks, etc.) and "passengers" (3D-printed red bird models) across an indoor pool at the interview site (Highbay). Propelled by a blower located on the shore, the vehicle should efficiently carry its cargo and passengers to the opposite side.

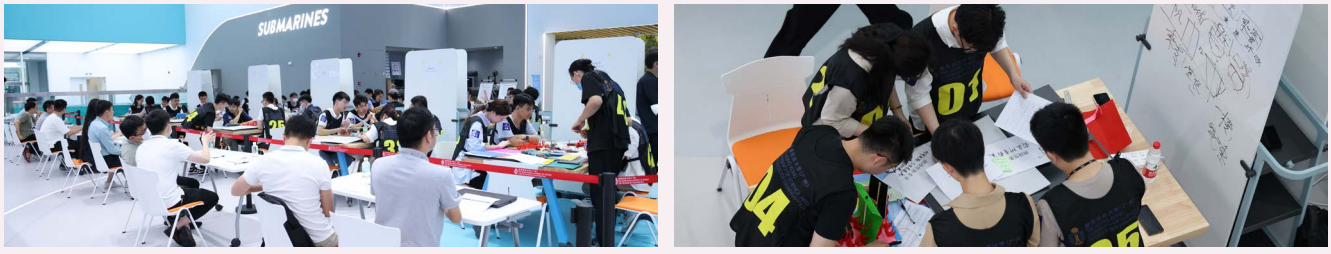


Figure 2-2 Project group activity during the offline interview for the RBM Program

The activity was structured in two phases. Applicants must arrive at the designated interview site on time. After signing in, they were randomly assigned to groups by drawing lots and provided with materials, which they must verify against a checklist. During the 50-minute first phase, each group designed and built their watercraft. Once completed, all groups tested their creations and recorded the results. Following the testing, groups must discuss and design a challenge for other teams, which involved a task that posed a specific difficulty to the watercraft (e.g., modifying its structure or functionality). Challenges were randomly assigned through a draw before the second phase of building and testing began. Upon completing the second test,

each group would present their work and participate in peer evaluations. During these evaluations, group members scored each other using the same evaluation form as the reviewers, and these scores were used as one of the reference points for the Selection and Interview Committee's final decision.

The on-site scoring for this activity evaluated four ability dimensions (leadership and teamwork, communication skills, planning, execution and creativity, and self-management) with three rating levels (needs improvement, meets expectations, and outstanding). The reviewers were randomly paired, two per group, to observe the entire process for each group. They should take detailed notes on each applicant's performance according to the scoring criteria. After listening to the group presentations, the reviewers would finalize their scores for the group activity on site, which served as a second reference point for the Selection and Interview Committee's decision-making process.

Table 2-3 Score sheet for the group activity in the RBM Program offline interview

Indicator	Developing	Competent	Outstanding
Leadership & Team Collaboration	Tend to be decisive in approach and does not tend to compromise or give in when his/her suggestions or opinions lead to disagreement within the team. Exhibit low efficiency in executing assigned tasks and do not reflect on his/her own performance or proactively seek solutions when facing problems or objective factors.	Tend to remain silent during team project execution and listen more than speak during team communication. Be able to collaborate well with other team members in the team project, support each other, and show mtual respect for each other's needs and opinions. Be able to complete the assigned work on time.	Be able to play a leadership role in the team project, organize team members, assign tasks, guide the development of project plans, coordinate internal differences within the team, and enable the project to be planned and executed. The team members recognize his/her leadership abilities. Be able to collaborate well with other team members in the team project, support each other, and show mutual respect for each other's needs and opinions. Be able to complete the assigned work on time.
Communication Skills	Not proficient at using concise language, appropriate tone, and logical expressions to express his/her viewpoints.Lack patience to listen to other team members' complete statements and tend to use emotional and volatile tones during conversation. Weak ability to use tools such as whiteboards, Post-its, and sketches for communication.	Be able to use appropriate tone and articulate his/her views clearly. Be patient to listen to other team members and maintain a calm tone during conversation. Have basic skills in using tools such as whiteboards, Post-its, and sketches for communication.	Be able to use concise language, appropriate tone, and clear logical expressions to express views and opinions. Actively participate in team discussions, carefully listen to other members' opinions, respect different viewpoints and ideas, and can absorb inspiration from others' remarks. Be proficient in using tools such as whiteboards, Post-its, and sketches to express ideas and suggestions more effectively.
Planning, Execution & Creativity	Lack understanding regarding assigned tasks,significant randomness in the project production process, change frequently in task execution plans,a weak sense of time concept have resulted in significant delays in team projects and a low level of completion in the final deliverables.	Understand the tasks assigned and have a weak logical planning in executing them leads to lower scores. Demonstrate a certain level of execution capability and completing the assigned tasks to a basic extent contributes to moderate scores. Effectively execute team- approved solutions is valued, but not fully leverage personal creativity results in lower scores.	Demonstrate the ability to quickly comprehend the overall objectives of team projects and the tasks assigned to oneself. Execute tasks with thorough planning, logical approach, and exhibit strong execution capabilities, successfully accomplishing the assigned responsibilities. Effectively unleash personal creativity and propose innovative and feasible solutions. Skillfully summarize lessons learned and provide suggestions for improvement and optimization.
Self-Management	Failure to regulate one's emotions and mindset when faced with unexpected challenging tasks undermines team cohesion and collaborative spirit, leading to a negative impact on team members. This lack of emotional control diminishes the team's ability to collectively address the unforeseen situation and hampers his/her capacity to devise effective solutions.	When facing unexpected challenging tasks, a lack of initiative and creativity, as well as difficulty in effectively balancing completing the current plan and addressing the needs of the sudden challenges, results in lower scores for contributions to the team's response to unexpected tasks.	When faced with unexpected challenging tasks, demonstrating the ability to remain calm, regulate emotions, and provide encouragement and support to team members contributes to higher scores in team cohesion and collaborative spirit. Additionally, showcasing personal creativity by proposing innovative and feasible solutions, promptly adjusting plans and scheduling, allocating resources effectively, and taking decisive actions also leads to higher scores.

b. Personal interview

The personal interview followed the same theme as the online interview. Applicants were required to prepare a PowerPoint presentation based on the theme they selected from the three options in their application materials. During the interview, they must present their reasons for pursuing the master's degree and participate in a live Q&A session.

The interview was conducted by panels of three or more reviewers who questioned and evaluated each applicant. After delivering a 5-minute oral presentation, the applicant was required to answer questions from the reviewers on a broad range of topics during a 10-minute Q&A session. The interview was conducted in both Chinese and English as the same requirement of on-line interview. The whole interview is recorded and videotaped

The final score for the interview was determined by the applicant's overall performance. Reviewers assessed the applicant during the 15-minute session using four ability indicators: presentation, presentation performance, Q&A performance, and personal charisma. Each indicator carried a different weight in the final score. Based on this comprehensive assessment, reviewers assigned one of four recommendation levels: strongly recommend, recommend, neutral, or not recommended. The score from the personal interview served as the third reference for the Selection and Interview Committee's decision-making process.

Table 2-4 Score sheet for the RBM Program's offline personal interview

能力指针 Ability Indicators	得分 /100 分制 Score/Centesimal	权重 Weights
演讲内容 (演讲视角，叙事逻辑，PPT 版面设计等) Presentation (Perspective,Narrative Logic,PPTDesign,etc.)		30%
演讲表现 (语言表达，语速语调，神态举止等) Presentation Performance (Language Skills,Speed& Tone,Expression & Manners, etc.)		20%
问答表现 (理解能力，回答水平，互动交流等) Q&APerformance(ComprehensionAnswer,Interaction Communicationetc.)		30%
个人魅力 (知识面，感染力，自信心，观察力，好奇心等) Personnel Fascination (Knowledge BreadthInfectiousConfidence, Observation Curiosity, etc.)		20%
总分 **Score**		100%
评级 (强烈推荐，推荐，居中，或不推荐) **Rating** (Strong Recommendation,RecommendationBorderline,or Not Recommend)		/
面试意见 : Comments for Interview:		

Based on the scoring results from both the project group activity and personal interview, the Selection and Interview Committee discussed and reviewed the group activity scores, peer evaluations, and personal interview scores. Applicants who excelled across the board and achieved high scores were recommended for admission. For those who performed well in one area but poorly in another, the committee analyzed each case individually and reached a collective decision through careful deliberation.

D. The First Cohort of RBCC

In July 2022, HKUST(GZ) held the first cohort of RBCC to promote innovative educational concepts and inspire students' enthusiasm for self-directed learning. RBCC serves as the special channel for the RBM Program's admission and a significant supplement to its application review mechanism. The camp aims to cultivate their systems thinking and teamwork skills by guiding students to address social issues and propose solutions. The 14-day observation and training, both online and offline, provided a comprehensive and in-depth evaluation of participants to identify potential candidates suitable for the RBM Program. Beyond university and GPA rankings, the camp's selection process focused more on assessing students' practical and holistic abilities, offering a differentiated approach from the application review system. This complementary mechanism allows the program to fully attract talent with strong development potential.

Figure 2-3 Opening of the first RBCC in 2022

a. Challenge camp theme

The first RBCC adopted an open-ended, socially relevant theme, “If We Could Go Back to 2019”, which encouraged students to address social issues related to the COVID-19 pandemic. The theme invited participants to reflect on how to tackle the major challenges facing humanity and stimulated their innovative thinking and creativity.

b. Activities

First was the online training. Applicants must submit their applications online, and after a preliminary screening, they participated in a 7-day online camp. During this period, applicants were required to observe and reflect on social conditions during the COVID-19 pandemic, identify real-world social issues, and propose specific solutions. They then optimized these solutions through project-based teamwork. The final assignment involved recording a 5-minute short video detailing the project design process and proposed solutions, which served as the design report for the online camp.

Next came the offline practice. Applicants who passed the online camp review proceeded to a 7-day offline camp, where they formed teams with participants from diverse educational and cultural backgrounds. After dividing tasks based on the theme of the online camp and each team's defined project goals, participants utilized available resources and their own initiative to work closely in designing solutions. Each team strived to achieve their project goals through continuous experimentation and practice, and was assigned a professional supervisor, who provided guidance and oversaw the project's progress throughout the process.

Finally, there was the offline roadshow. On the last day of the offline camp, the RBM Program's Selection and Interview Committee (the fourth subcommittee) organized a project roadshow in adherence to the principles of fairness, transparency, and impartiality. They evaluated participants' overall performance during the camp based on the program's admission and interview standards. Outstanding participants were admitted to the RBM Program.

E.Recommendation Review Mechanism

The RBM Program's Recommendation Review Mechanism refers to applicants who have been selected and recommended by an academic institution recognized by our university (currently only Guangzhou University, which is jointly running with the Hong Kong University of Science and Technology) after being nominated (limited quota per year). These applicants will be able to enter the interview stage of the RBM project alongside applicants applying through the Application Review Mechanism, and those who successfully pass the interview will be admitted to the RBM Program.

This mechanism is an important admission strategy jointly promoted by our university and the collaborating academic institution, aimed at supporting the development strategies of local governments and providing direct participation opportunities in the RBM Program interview for outstanding applicants recommended by the collaborating academic institution, thereby contributing to the region's collaborations in talent cultivation and knowledge innovation.

③ Issues and areas for optimization in Class 2 admission practices

First, the appeal mechanism for the RBM Program admission process was not well-established. The types of appeals were complex, with some involving fairness and impartiality issues in the admission process, which made it inappropriate for the Selection and Interview Committee—who made the original admission decisions—to review these cases again. Therefore, it is recommended to establish an independent appeal review committee, especially for cases concerning the fairness and impartiality of the admission process, which should be addressed promptly. Additionally, detailed appeal procedures and regulations should be established, clearly outlining the conditions, process, and feedback methods for appeals, to enhance the transparency and credibility of the appeal mechanism.

Second, the workload for reviewing application materials was considerable. The rolling selection process has contributed to this increased workload, resulting in a relatively long waiting list period. It is thus recommended to further optimize the rolling selection mechanism by either reducing the number of effective cycles or limiting the total number of cycles for the waiting list. The pre-selection mechanism and its standards should also be improved, and a review process for recommendations made by Thrust professors may be introduced to ensure their quality and fairness. Additionally, technologies such as AI may assist in the allocation and screening of application materials to improve efficiency and reduce subjectivity.

Third, the difficulty of project group activity is not high. It is recommended to further optimize and diversify the activities and their requirements to effectively assess the applicants' overall abilities and potential. Additionally, peer evaluations within groups may be optimized to improve their reliability. Furthermore, strengthening internal training for reviewers will enhance their understanding of the RBM Program's innovative teaching concepts and talent evaluation and admission criteria. This, in turn, can help reduce discrepancies in interview scoring and align the evaluation criteria.

Fourth, the selection mechanism and activities of RBCC need optimization to accurately evaluate participants' overall abilities. It is also important to clarify the selection criteria and standard procedures. Moreover, the organization of the activities should align more closely with the talent selection mechanism so that reviewers can engage more actively in the actual selection process and assess each participant's overall abilities more accurately.

Fifth, the global promotional efforts were inadequate, resulting in a limited pool of international students. It is recommended to enhance outreach by conducting both online and offline promotional activities targeting international audiences. Promotional channels can be expanded through partnerships with foreign universities and participation in international education exhibitions. Additionally, leveraging online platforms, including the Internet and social media, will help attract more exceptional international students.

(3) RBM Program Class 3 (2024-2025 fall) admission practices

① Overall data

The 3rd cohort of RBM Program aims to recruit 400 students. After 10 rounds of selection and interviews, including the Red Bird Challenge Camp, 383 new students were finally enrolled, basically reaching the annual enrollment target. Out of 4,187 applicants, about 32% passed the selection of materials, and the percentage of applicants who were finally accepted through the interview and review was about 13%. The majority of the new students (about 99.5%) came from the Chinese mainland, while only two students were from other countries. In terms of gender distribution, about 69% of the students were male and 31% were female. The ratio of male to female is about 2:1. Regarding educational backgrounds, about 7% of students held graduate degrees, while 93% students held undergraduate degrees. Regrading the undergraduate background, about 82% students came from Project 985 universities, Project 211 universities, and Double First-Class universities. Additionally, about 8% students graduated from overseas universities and Chinese-foreign cooperative universities. The remaining 10% students came from other universities. In terms of undergraduate majors, the proportion of students in science & engineering, business, medical science, art & design, management and liberal arts is 67%, 11%, 7%, 7%, 3% and 2%, respectively, and about 3% in other majors.

② Iteration of the admission system for Class 3

A. Establish Appeal Committee

Building on the admission committee mechanisms for the RBM Program Classes 1 and 2, an Appeal Committee has been introduced to further optimize the appeal process and ensure fairness and impartiality in admissions. The Appeal Committee is tasked with handling complaints regarding the fairness of the application and interview processes. Complainants must submit formal appeal materials to the official email address, along with specific evidence supporting their claims regarding any perceived fairness. The Appeal Committee will convene meetings to discuss and review the appeals, and its decisions will take effect after a 48-hour public notice period.

B. Updates and iterations for offline interview

To ensure consistency in admission criteria, all applicants must qualify for recommendation admission through an offline interview. Given the visa and travel costs of overseas applicants from countries and regions outside of Hong Kong, Macau, and Taiwan, an online pre-interview has been introduced. The results of this assessment have been provided to help applicants decide whether to participate in the offline interview.

Additionally, the admission committee has redesigned the project group activity to enhance participation enthusiasm and improve the efficiency of reviewer observations. The new activity features a domino challenge (see Figure 2-4), where each group of 4 to 6 members must create a domino setup within a specified timeframe, ensuring that their designs connect with other groups in a way that triggers a mechanical switch. Reviewers observe and evaluate the participants based on leadership, teamwork, communication skills, planning, execution, creativity, self-management, and project completion (see Table 2-6).


Figure 2-4 Offline interview activity for the RBM Program in 2024

The new group activity offers three advantages. First, the increased task difficulty and heightened environmental pressure enable interviewees to showcase their comprehensive abilities and competences in a fuller, more natural and authentic manner, providing reviewers with more to evaluate. The limited timeframe has increased the complexity of group activity tasks so much that all participants must invest more energy and attention in close collaboration, thus reducing the likelihood of rehearsed or contrived performances. Additionally, the successful completion of the final task relies on cooperation and negotiation between adjacent groups, adding an element of uncertainty to the situation. Second, the activity facilitates an assessment of applicants' teamwork, communication, and project management skills. It includes an evaluation of project completion and strengthens the connections between intra- and inter-group collaboration, which significantly enhances communication among participants. This requires not only close collaboration within each group but also multiple discussions with the adjacent two groups to co-formulate the triggering plans. Third, the activity fosters participants' innovative thinking and creativity, which helps uncover talent with unique ways of thinking and innovation abilities. Within the constraints of available materials and tools, participants can explore various creative solutions, thereby expanding the scope for imagination and creativity.

C. The 2nd cohort of RBCC

The theme of the second RBCC was “The Endless Frontier: Embracing Emerging Technologies for a Better World”. This multidisciplinary camp aimed to discover and nurture talent with development potential for the RBM Program through a 14-day online and offline experience. Following a selection process and online camp auditions, 301 students participated in the offline camp, where they formed teams and engaged in projects under the guidance of Academic and Industry Supervisors. The design, collaboration, and implementation of the camp projects have empowered to students unleash their potential while cultivating their systems and integrative thinking.

> “The Endless Frontier: Embracing Emerging Technologies for a Better World”


Figure 2-5: Opening Ceremony of RBCC in 2023

D. AI-assisted admission system

The RBM Program has started to incorporate AI technology into the admission process to enhance efficiency, fairness, and scientific rigor. By leveraging big data analytics and expert guidance, the AI system can minimize human influence and facilitate a more standardized evaluation:

First, the AI system can mitigate subjectivity and inconsistency by developing detailed evaluation criteria aligned with the talent cultivation philosophy, educational methods, and admission requirements of the RBM Program. This approach minimizes the influence of human factors during the assessment process to ensure that each applicant receives a fair and impartial evaluation.

Second, the AI system can efficiently and quickly screen and conduct preliminary assessments of application materials to identify outstanding candidates. After extensive data training, it can understand and learn the professional evaluation criteria across disciplines, rapidly screen and assess a large volume of application materials in a short period, and identify potential outstanding candidates who align with the RBM Program's training goals. This has improved screening efficiency and reduced the workload for admission staff.

Third, the AI system can conduct a detailed analysis of interview performances by closely observing and recording interview videos. It combines multimodal analysis techniques (such as video, audio, and text information) to fully evaluate candidates' performances by capturing subtle non-verbal signals and key points in their verbal expressions. This results in detailed evaluation reports that provide the Selection and Interview Committee with science-based references for decision-making.

Last, the AI system can facilitate a data-driven comprehensive evaluation by integrating all information about the applicants, including their application materials, interview performances, and recommendation letters. It leverages big data analytics to uncover each candidate's potential and suitability and provide the admission committee with a more holistic understanding of their overall qualities.

③ Issues and areas for optimization in Class 3 admission practices

First, the group activity for the offline interview featured a domino challenge, which emphasized problem-solving over problem-finding. To better evaluate candidates' comprehensive qualities, the offline interview could incorporate the five stages of design thinking: empathy, definition, ideation, prototyping, and testing. For example, open-ended questions can be used to encourage candidates to identify and analyze real-world issues while showcasing their thought processes and solutions. This approach will provide a more comprehensive assessment of candidates' innovative thinking and problem-solving abilities.

Second, even with specific evaluation rules in place, reviewers may still tend to rely on traditional selection criteria, thus introducing some subjectivity into the assessment process. To address this, it is necessary to further refine and optimize the evaluation criteria by making them more specific, actionable, and efficient. The criteria should incorporate clear evaluation dimensions and detailed scoring guidelines to ensure consistency in the reviewers' judgements. Additionally, regular training and mock evaluations should be conducted to continuously improve the consistency and accuracy of reviewers during actual assessments.

Third, although a dedicated grading system had been developed for the admission process, the Selection and Interview Committee still needed to invest significant manpower. Future efforts will focus on enhancing the development and application of multimodal large AI models, particularly in material selection and interview evaluation. The performance of the AI system can be improved through big data training and continuous optimization. By using the AI system for preliminary screening and auxiliary evaluations, the committee can significantly increase efficiency, reduce manpower needs, and ensure fair and consistent evaluations.

Fourth, the AI system required massive data input and its performance was limited by insufficient data. To address this, it is essential to strengthen data collection and utilization by expanding both the scope and depth of data gathered to ensure richness and diversity. This includes collecting more data from previous admission rounds as well as various types of candidate performance data during the application process, such as material selection score sheets, group activity observation forms from offline interviews, and personal interview score sheets. Big data analytics can then uncover more valuable insights for AI system training and optimization.

III. CHALLENGES AND REFLECTIONS ON ADMISSION MECHANISM INNOVATIONS

1. CONFUSION AMONG REVIEWERS REGARDING THE CRITERIA FOR SELECTING TRANSDISCIPLINARY TALENT

The classification of disciplines has long provided a systematic, specialized, organized, and streamlined framework for knowledge management and talent cultivation. This framework allows the academic community to define stable organizational boundaries around disciplines and create an academic paradigm characterized by "a definite system of knowledge, methodologies and academic evaluation, and an exemplary model of training and work practices". As a result, disciplines carry a connotation of "discipline", imbuing knowledge with normative power that subtly compels individuals within a particular knowledge domain to act as enforcers, guardians, and creators of disciplinary norms. Through discipline classification, a tacit consensus has emerged regarding talent cultivation objectives across different fields under this disciplinary framework to shape a relatively precise professional "profile" for selecting future talent in each discipline. Admission exam topics for various fields can be aligned with the converging criteria of disciplinary paradigms, while scholars, as "gatekeepers" of these norms, wield the authority granted by their respective disciplines to make admission decisions.

However, the shift towards a transdisciplinary paradigm aims to break free from the constraints of traditional disciplinary norms and emphasizes cultivating transdisciplinary innovative talent. Although HKUST(GZ) has preliminarily outlined the knowledge, abilities, and competences for nurturing transdisciplinary innovators, the disruptive and rapidly evolving nature of transdisciplinary innovation makes it difficult to define an accurate profile for future innovation leaders facing an uncertain future. Furthermore, it is challenging to quickly establish a consensus on talent admission under the transdisciplinary paradigm reform, let alone set up an entirely objective and reliable admission criteria system. As a result, many core aspects of the admission process still heavily rely on the subjective, experience-based judgment of the review team. Given that the both individual and collective experience of reviewers is profoundly shaped by institutional frameworks, disciplinary culture, and personal preferences, scholars bound by disciplinary norms are often prone to conventional thinking and defaulting to the "master-apprentice" model of talent selection. At the same time, faculty members who prioritize scientific research and academic achievements may struggle to accurately assess students' potential in areas such as engineering innovation and entrepreneurship. As a result, scholars, who have grown and thrived within a single-discipline paradigm, must consciously break free from such confines and actively explore new standards for selecting transdisciplinary talent. As reforms progress, the culture of transdisciplinary innovation is expected to be increasingly internalized among both faculty and students. Moreover, as talent cultivated through the RBM Program gains recognition from the nation, society, and the job market, the profile of innovation leaders and the consensus around their selection will become clearer over time.

2. THE DILEMMA OF BALANCING ACHIEVEMENTS AND POTENTIAL WHEN SELECTING TRANSDISCIPLINARY STUDENTS

Graduate admissions aim to assess applicants' current achievements through various indicators such as academic performance, research publications, awards, honors, and certifications, while also predicting their future potential within the program such as their ability to develop diverse skills and overall competences. The core challenge in admissions lies in the uncertainty of predicting an individual's future development based on their current achievements. Traditionally, GPA has been a key indicator of a student's achievements during the admission process. However, an overemphasis on exam results tends to prioritize precision in learning. This focus on mastering a single-discipline paradigm is insufficient for fostering breakthrough innovation and even less effective for evaluating a student's innovation abilities. In practice, while hard indicators such as grades, publication count, and honors are clear and straightforward, the evaluation of students' abilities and competences—often classified as "soft indicators"—lacks the same clarity. This ambiguity can hinder reviewers from assessing a student's future potential. Consequently, many reviewers at HKUST(GZ) find themselves grappling with the dilemma of balancing achievements and potential in transdisciplinary graduate admissions. First, during the team project observation stage, reviewers tend to minimize the scoring differences among students to avoid inadvertently overlooking talent due to misjudgment. Second, in the personal interview stage, a preference for assessing existing achievements leads reviewers to focus on validating hard indicators such as grades, research achievements, and project honors, often at the expense of evaluating potential growth in abilities and competences. Last, during the admission decision stage, the question of whether to prioritize team project assessment results or personal interview performance has become a recurring point of discussion within the admission committee.

Guided by a holistic review-based and competence-oriented approach, HKUST(GZ) is continuously iterating and refining its interview assessment procedures. Throughout the admission process, there is an increasing emphasis on applicants' growth potential as the primary criterion. Candidates who emerge from personal interviews must undergo a filtering process based on team project observation results to eliminate those unsuited for the collaborative model of the RBM program. Additionally, HKUST(GZ) is identifying quality indicators that shape transdisciplinary graduate training by incorporating perspectives from various stakeholders, including the RBM program's policymakers, executors, reviewers, students, and employers. Leveraging generative AI, the university is developing a matching model to predict the alignment between applicants' achievements as reflected in their application materials and the developmental potential required for the RBM program. Data model results serve as a useful reference for reviewers to better implement the "holistic review-based and competence-oriented" principle during team project evaluations and personal interviews. The adoption of more intelligent and systematic methods for assessing innovative talent will also enhance the efficiency and consistency of graduate admission decisions.

3. RESPONSES TO MARKET INTERVENTION ISSUES AND SOCIAL EQUITY CONSIDERATIONS

Balancing effective talent selection with fairness poses a critical theoretical and practical challenge for adaptive talent recruitment. From an external perspective, graduate admissions must ensure both opportunity and procedural fairness. It is essential to consider whether students from different universities, majors, and family backgrounds have equal access to graduate programs. Additionally, transparency in evaluation standards and procedures is crucial, as is the need to identify any inappropriate regulations, information asymmetry, or rent-seeking opportunities. From an internal perspective, the most pressing concern in admissions is substantive fairness, which assesses whether the criteria accurately reflect the compatibility between applicants and the university's talent cultivation programs. In practice, conflicts often arise between the internal and external notions of fairness, requiring compromises and trade-offs at various stages. For instance, HKUST(GZ) discloses all interview questions and evaluation criteria to applicants to ensure procedural fairness and reduce the risks of information asymmetry and market intervention. However, this practice raises concerns about substantive fairness, as students may tailor their behaviors based on the pre-disclosed questions and scoring guidelines, leading to inauthentic performances that compromise the validity of Situational Judgment Tests.

In response to these practical challenges, HKUST(GZ) continues to improve the effectiveness of team project observations in its latest admission cycle. First, the university has enhanced the diversity and open-endedness of the questions, placing greater emphasis on cooperation, negotiation, and adaptability both within and between teams. This approach enables a more comprehensive display of students' abilities and competences. Second, a moderate increase in the emphasis on project completion was introduced to create a pressure environment, thereby enhancing the naturalness of behavioral observations. Additionally, HKUST(GZ) plans to gradually expand its efforts to address social equity. The promotion of RBCC will target a wider audience, including students from central and western regions of China, ensuring equitable opportunities for participation. The cultivation of transdisciplinary innovation leaders is a long-term systemic project that requires gradual advancements in concept, organization, and institutional innovation. Over time, this initiative is expected to generate spillover effects that enhance the internal and external compatibility of reform and innovation while also driving systematic changes in China's higher education talent cultivation.

DESIGN PRINCIPLES AND IMPLEMENTATION MECHANISM OF PROJECT-BASED LEARNING

03

III. DESIGN PRINCIPLES AND IMPLEMENTATION MECHANISM OF PROJECT-BASED LEARNING

I. PROBLEM: THE DISCONNECT BETWEEN KNOWLEDGE TRANSFER AND ABILITY ENHANCEMENT

How does the RBM program address the disconnect between knowledge transfer and skill enhancement? This question serves as the logical starting point for related discussions. This chapter focuses on two main questions to explore the design principles and execution mechanisms of PBL. The first question centers on the essence of PBL. What exactly does PBL in the RBM program entail? How does it differ from traditional training models such as experimental teaching, research groups, corporate-commissioned research projects or non-government funded initiatives? Clearly defining the key elements of PBL helps unify understanding and avoid misinterpretations among different stakeholders—students, faculty, companies, government, and university administrators.

The second question addresses the main processes of PBL. How is PBL implemented in the RBM program to ensure alignment with its original design? What are the criteria for selecting projects? How do core courses enhance transferable skills? How do regular meetings, bi-weekly reports, and other routine tasks contribute to immersive training? How are individual and group projects synchronized? How should the program view and address failures during key stages such as project evaluation? The discussion of these questions is grounded in a thorough review of practices from the first two RBM classes. By mapping out the entire process of PBL, we can optimize the system and reduce the misallocation of strategic resources such as time, space, budget, and personnel. The main components mentioned earlier (e.g., curriculum development focused on transferable skills such as design thinking, digital management tools like bi-weekly reports, and quality assurance mechanisms like Proposal Qualification Assessment) will be elaborated on in subsequent chapters with detailed and practical insights.

II. DESIGN PRINCIPLES

According to the original definition from the website PBLWorks, PBL is “a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge”. A similar definition is offered by the Columbia Center for Teaching and Learning, which describes PBL as “a dynamic approach to teaching in which instructors play an important role in structuring the learning experience, guiding students as they work to find solutions to complex problems in collaboration with diverse peers, and developing skills and acquiring knowledge throughout the process”.

In line with the transdisciplinary talent cultivation focus of the RBM program, particularly its innovative practices in MPhil program training since 2022, this section outlines the underlying logic of PBL and distills the following seven key elements as its design principles:

- Real-world problem-driven transdisciplinary project design
- A teaching philosophy focused on “individualized education that centers on each student's growth”
- Simultaneous knowledge transfer and ability enhancement
- Immersive training through daily interactions
- Continuous iterative improvement based on design thinking
- A distinct educational approach from traditional experimental teaching
- Academically challenging corporate-commissioned projects

1. REAL-WORLD PROBLEM-DRIVEN TRANSDISCIPLINARY PROJECT DESIGN

PBL encourages students to take charge of selecting and designing their projects. They can choose topics and plan their projects according to their interests and career aspirations. This approach not only enhances their sense of engagement and responsibility but also aligns learning with their personal development needs. During project execution, students are responsible for gathering information, analyzing and defining problems, and developing solutions, while teachers serve as guides and advisors rather than the sole sources of information. Through team-based projects, students learn from one another while sharing responsibilities, fostering the complementarity of knowledge and skills. Moreover, the diverse academic backgrounds of students contribute to a rich variety of perspectives and foster interdisciplinary communication and collaboration.

2. A TEACHING PHILOSOPHY FOCUSED ON “INDIVIDUALIZED EDUCATION THAT CENTERS ON EACH STUDENT'S GROWTH”

Team projects often stem from real-life issues, such as social problems, environmental challenges, or technical hurdles. Solving these issues requires the integration of multidisciplinary knowledge. Here are three primary sources of projects:

- Industry needs: Projects tailored to business or industry needs may focus on areas such as product development, process improvement, and technological innovation. By leveraging interdisciplinary knowledge and skills, students work under the guidance of both industry and academic supervisors to refine and define fundamental scientific problems. This approach allows them to create team projects that are relevant to industry needs without the pressure of urgent delivery timelines.

- University research: University research projects are often interdisciplinary and can serve as a source of team projects. Students get the opportunity to engage in real research and tackle problems they encounter along the way.

- Social service and community engagement: Community service or public welfare projects—such as those centered on environmental protection, social welfare, and educational support—enable students to grasp social responsibility while applying their interdisciplinary knowledge.

3. SIMULTANEOUS KNOWLEDGE TRANSFER AND ABILITY ENHANCEMENT

Traditional master's education focuses on classroom teaching and literature reviews but falls short in fostering hands-on experience and practical skills. PBL addresses this gap by emphasizing practice and application. This effective approach continuously enhances students' knowledge and abilities through real-world projects. For example, in the field of AI, students must participate in actual machine learning projects through teamwork. They are required to apply their professional knowledge while also analyzing problems, brainstorming solutions, and potentially proposing innovative algorithms or technologies.

First, PBL can significantly improve students' problem-solving skills. In real projects, students must analyze, ponder and resolve various complex problems they encounter. This hands-on process helps them gain a deeper understanding of theoretical concepts and apply them in real-world scenarios. By participating in practical projects, students develop their problem-solving and hands-on skills, laying a solid foundation for their future career development.

Second, PBL enhances students' teamwork skills. In real-world projects, students must collaborate with their peers to complete tasks, which teaches them how to effectively communicate, coordinate, and cooperate with others. Close teamwork is essential for future careers, and honing these skills equips students with a fundamental competence that is indispensable for any professional path they may choose.

Third, PBL fosters students' innovation abilities. They must continuously think and explore to find optimal solutions during projects. This hands-on process stimulates their creativity and inspires them to view problems from different perspectives and propose novel solutions. Innovation skills will set students apart in their future careers.

4. IMMERSIVE TRAINING THROUGH DAILY INTERACTIONS

PBL promotes immersive teaching through regular group meetings, bi-weekly reports, and other scheduled student-teacher interactions. In this subtle, gradual learning process, students benefit from timely guidance and feedback. Regular meetings and bi-weekly reports create opportunities for students to communicate project progress, challenges, and difficulties to their instructors, who in turn offer timely guidance and feedback to help students address specific issues and improve learning outcomes.

Such student-teacher interactions also help ignite students' enthusiasm for learning and enhance their ability to learn independently. During scheduled interactions such as regular group meetings and bi-weekly reports, students must come prepared and actively participate in discussions and progress reports. This process fuels their passion for learning and encourages them to engage more proactively in project activities. It also fosters their self-directed learning skills, enabling them to reflect on their learning process and strategies while solving problems without overly relying on their teacher's guidance.

Moreover, students can discuss and collaborate with team members during these interactions, which strengthens their teamwork abilities. Additionally, presenting project progress and solutions fosters their communication and problem-solving skills.

5. CONTINUOUS ITERATIVE IMPROVEMENT BASED ON DESIGN THINKING

RBM PBL can be regarded as a quintessential case of design thinking: it begins with empathy to identify students' pain points, followed by the collection of information through research, then employs divergent thinking to uncover influencing factors, and ultimately culminates in the creation of a minimal viable product (MVP) to establish a minimal prototype, which will be rigorously tested and swiftly iterated upon.

First, in PBL, teachers must cultivate a profound understanding of students' needs and challenges by adopting their perspectives to identify the obstacles and difficulties encountered in their learning. By understanding and focusing on students, teachers can more effectively design project tasks and course content, enabling students to gain genuine assistance and growth throughout the project.

Subsequently, teachers are required to conduct thorough research on the teaching content, student needs, and industry trends to better guide students' learning. Within the PBL framework, teachers must take into account the real needs of students and evolving industry trends while inspiring students to design project tasks that ignite their interests and enhance practical skills, thereby promoting the development of students' transferable skills.

Next, teachers should employ divergent thinking to examine issues from multiple perspectives and identify the critical factors that influence students' learning and project execution. By carefully taking into account various factors, teachers can more effectively design project tasks and practice sessions to guide students. For instance, they can align group projects with individual student projects, which helps to enhance students' problem-solving and teamwork skills.

Thereafter, teachers can guide students to create an MVP, allowing them to validate their ideas and solutions with minimal trial-and-error costs in the shortest time possible. This process aids students in transforming theoretical knowledge into viable products or solutions, while simultaneously cultivating their hands-on skills and enhancing their innovation and problem-solving capabilities.

Finally, teachers must rigorously test their hypotheses and solutions, for instance, by conducting surveys to gather insights into students' aspirations for further education, employment, or entrepreneurship, and then swiftly iterate based on the feedback received. This iterative practice ensures the continuous improvement of PBL.

PBL, grounded in the principles of design thinking, emphasizes rapid iteration, which inherently encourages students to confront failure with courage. In the pursuit of cutting-edge exploration within emerging fields, setbacks are often unavoidable; however, students can derive invaluable lessons from these failures, enabling them to identify issues and discover areas for improvement, thereby continually refining their projects. This spirit of willingness to experiment and embrace failure fosters resilience and cultivates innovative capabilities among students. Moreover, through ongoing project iteration, students enhance their problem-solving skills and adaptability, both of which are essential competencies for future career development.

It is important to note that PBL is not merely an incubator for entrepreneurship, nor is its success measured by the quantity of projects completed by students. The essence of this approach lies in the growth and development of students throughout the two-year PBL journey. It encompasses not only the accumulation of knowledge and skills but also embodies a proactive attitude toward facing challenges, continuous learning, and personal growth. Even if group projects or individual student projects fail, PBL can still meet the teaching objective of serving as a vehicle for simultaneous knowledge transfer and ability enhancement.

6. A DISTINCT EDUCATIONAL APPROACH FROM TRADITIONAL EXPERIMENTAL TEACHING

Whether in foundational disciplines such as mathematics, physics, and chemistry or in emergent fields like robotics and intelligent manufacturing within the realm of "new engineering", experimental teaching remains an indispensable component of talent cultivation. So, what distinguishes the PBL of the RBM Program from traditional experimental teaching?

First, in terms of intended learning outcomes (ILOs), a key ILO for PBL of the RBM Program is the ability to define and solve problems across diverse situations. This competency represents one of the transferable skills essential for leading talent in technological innovation. Regardless of whether students pursue further education, employment, or entrepreneurship, they will inevitably confront a real challenge, a complex issue, or what may appear to be an insurmountable wicked problem someday. How should they respond in such situations? PBL offers a comprehensive framework—a universal "scaffolding"—comprising a suite of lines of thinking, methodologies, and tools for identifying, defining, and addressing such issues. In contrast, traditional experimental teaching is often predicated on pre-set objectives and fragmented tasks devised by the teacher, frequently providing explicit procedural steps while overlooking the vital preliminary phase of encouraging students to recognize and discover problems independently. This approach diverges from the fundamental intent of experimental teaching, which aims to inspire students to actively explore unknown phenomena.

Secondly, regarding the organization of teaching, PBL takes place under a structure that highlights multidisciplinary integration and the participation of multiple stakeholders. Solving complex problems in the real world, whether in academia or industry, necessitates collaborative efforts among project members from diverse disciplinary backgrounds, rather than a singularly focused effort within isolated disciplines. However, traditional laboratories are generally overseen by a principal investigator (PI), who decides on the research topics and areas of focus. For a student, becoming a member of a specific laboratory entails joining the research team of an expert and taking on the role of a research assistant with designated responsibilities. In contrast, PBL emphasizes the development of students' skills to independently recognize and tackle challenges, moving away from the traditional approach where teachers set predetermined goals and tasks. This method not only encourages students to think independently and be more innovative but also improves their ability to apply and integrate knowledge across different fields through multidisciplinary collaboration, preparing them to better face the complexities of the future.

7. ACADEMICALLY CHALLENGING CORPORATE-COMMISSIONED PROJECTS

In practice, the selection of project topics for the RBM PBL approach primarily derives from three pivotal sources: issues discerned by students, projects commissioned by corporate entities, and questions raised by teachers (Project Supervisors or Academic Supervisors). Corporate-commissioned projects not only stem from genuine needs in production practices but also provide a conducive testing environment for project implementation, potentially facilitating robust collaborations with universities through non-government funded initiatives and joint training initiatives. Yet, it is important to acknowledge that not all projects commissioned by corporates qualify as suitable for PBL. These corporate projects must, first and foremost, be academically challenging enough to qualify for selection.

RBM students undertake a two-year PBL experience that leads to the attainment of an MPhil degree from HKSUT. This indicates that both the team project and the individual student project must comply with the research requirements and academic standards for coursework, proposal development, thesis writing, and defense as set forth by the university. This

principle constitutes the first fundamental tenet that PBL must uphold and serves as a benchmark for determining the eligibility of corporate-commissioned projects for inclusion in the RBM Program.

To illustrate how corporate-commissioned projects can satisfy the requirements of being academically challenging, consider the example of PBL in the field of robotics—a hallmark of "new engineering". If a corporate-commissioned project pertains to humanoid robots addressing a specific challenge in a particular domain by fulfilling a particular function (for instance, mitigating the shortage of caregivers in an aging society), it exemplifies a project that meets the selection criteria of the RBM Program. Firstly, from the perspective of problem formulation, this represents a forward-looking, genuine challenge, for which there is currently no definitive standard answer or established solution. The developmental, complex, and uncertain nature of such a project underscores the necessity of PBL.

Secondly, from the perspective of the learning process, the absence of definitive or readily available solutions compels students to explore companies or other practical environments for in-depth research. By engaging with empathy, they are able to pinpoint the difficulties faced by target users, gather and analyze relevant data, and ultimately identify, define, and tackle a scientific, engineering, or social issue. In conclusion, PBL sets a rigorous standard for academically challenging projects, effectively filtering out the majority of "fire-fighting" projects commissioned by corporates, and also differentiating them from simpler skill training activities, such as operating machinery or calibrating equipment.

The chosen projects must not only follow essential disciplinary principles and knowledge frameworks but also address the real social demands in the future. Furthermore, these projects should demonstrate clear logic and complementary value among the various individual projects undertaken by each student. This approach to PBL not only improves students' academic proficiency but also helps them remain competitive in their future careers.

III. IMPLEMENTATION MECHANISM

The RBM Program creates a non-specialized educational environment enriched by diversified teaching activities, allowing students to develop a deep understanding of the multifaceted context of problems. Through interdisciplinary teamwork, students, guided by their supervisors, formulate project proposals that specify learning objectives and intended outcomes. And following a Proposal Quality Assessment (PQA), they advance toward the next milestones of their projects. The program emphasizes the collaborative guidance of Academic Supervisors and Project Supervisors, while also reinforcing the acquisition of specialized knowledge alongside transferable skills. Students are encouraged to take on project management responsibilities, fostering collaboration and knowledge integration within teams. The supervisor team regularly reviews progress, provides feedback, and assists students in overcoming challenges, ensuring timely project completion. Throughout this process, project management, academic development, and skill enhancement proceed in parallel, aligning students' academic and professional competencies with their personal development goals. Ultimately, students culminate their learning journey by publicly presenting their project outcomes (roadshows) and submitting their theses. The "Project-driven Design Thinking" course is woven throughout the project, helping students cultivate transferable skills that align with project milestones and requirements. This mechanism aims to nurture students' interdisciplinary knowledge, teamwork skills, and innovative thinking through the implementation of real projects, while simultaneously enhancing the practical impact and quality of educational activities.

The implementation tasks for each phase are as follows:

1. Planning and preparation

During the first six months of the RBM Program, students participate in a general curriculum that includes design thinking courses, academic lectures, workshops, and field research activities. They use methods such as observations, interviews, and surveys to understand the needs and experiences of the target users or stakeholders. Students independently explore, discover, and comprehend the issues at hand, considering the relevant social, economic, technological, and environmental factors. They then integrate and analyze the collected data and information to identify the core needs and critical pain points of their target users or stakeholders.

Taking the "Reshape" project undertaken by the first cohort of RBM students as an example, they discovered during their on-site visits and research that companies extensively utilized cardboard boxes for the logistics and transportation of production materials and finished products. Within the entire logistics cycle system, significant challenges emerge such as management difficulties, the risk of material loss, a short lifecycle for cardboard boxes, a complex recycling process, substantial environmental impact, and the difficulty of achieving digital management throughout the logistics transportation process. Consequently, this group of students resolved to develop a digital logistics management system, utilizing innovative plastic packaging boxes as a vehicle to address the practical logistics management issues faced by companies.

"Students independently explore, discover, and comprehend the issues at hand, considering the relevant social, economic, technological, and environmental factors. They then integrate and analyze the collected data and information to identify the core needs and critical pain points of their target users or stakeholders."

Figure 3-1 Members of the "Reshape" project team conducting on-site research in a company

2. Project design

Based on the issues identified during the research and exploration phase, RBM students, with the guidance of their supervisors, will propose an interdisciplinary team-based project. They will establish detailed learning objectives, outlining the knowledge and skills to be acquired, the intended outcomes of the project, and the interdisciplinary knowledge and skills involved. Additionally, they will plan how knowledge and skills from various fields will complement and intersect with one another. Students will also identify the required resources for project implementation, including materials, tools, technologies, and venues, and ensure their availability. The proposal will then be reviewed by the "Educational Project Committee" (EPC), composed of experts from diverse fields, to ensure its alignment with the requirements of interdisciplinary project-based guided learning. Once the proposal is approved, the student team, with the support of the supervisor team, will develop a project framework that includes timelines, milestones, and deliverables, as well as individual research and project timelines and milestones. They will also assess the required budget and resources while identifying potential project risks. Finally, each student will compile their personal PQA report and prepare for the PQA defense.

In the "Reshape" project, the students suggested incorporating low-cost RFID tags into the new plastic packaging boxes. This would enable real-time data collection during material transportation. The collected data would be sent to a local server or the company's cloud, where it would be encrypted and managed using blockchain technology. In addition, algorithms would be used to monitor the transportation information of the boxes and share this information with users' (corporate logistics management personnel) terminal devices. By utilizing big data technology, the project aims to improve logistics scheduling and the recycling and use of packaging boxes. It also aims to provide analysis and recommendations on the production and operational activities of companies.

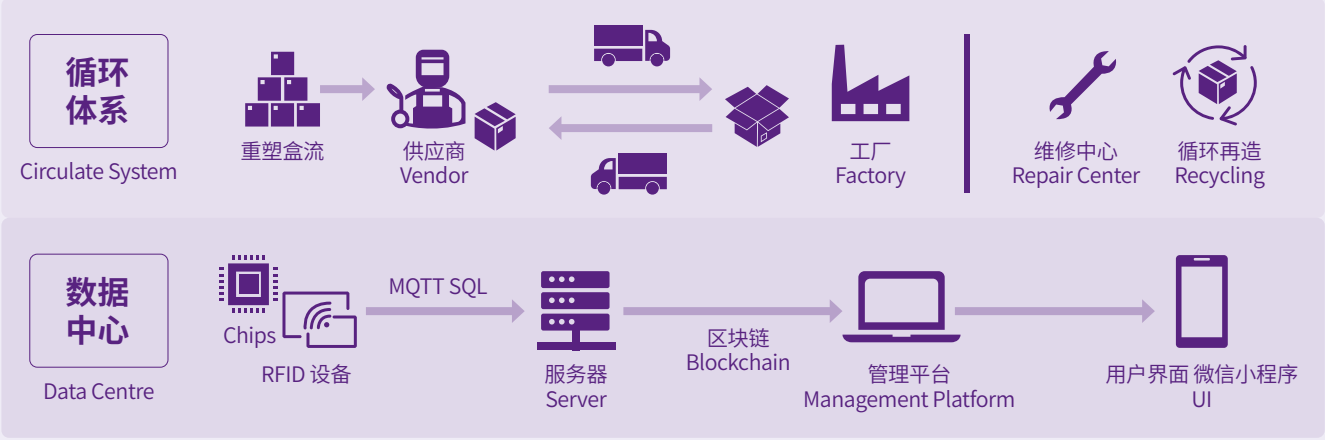


Figure 3-2 "Reshape" project proposal

3. Project implementation

Throughout the project implementation phase, students are strongly encouraged to assume the role of Project Manager. As Project Managers, students should work closely with team members to develop a well-defined project plan and timeline, ensuring that everyone comprehensively understands the project objectives. It's important for students in the Project Manager role to cultivate a positive team environment that fosters open communication and collaboration. They should promote sharing of ideas and feedback, and appropriately assign tasks and resources based on each member's skills and interests, allowing everyone to leverage their strengths for the benefit of the team's overall efficiency. As project managers, students should consistently monitor progress, identify and manage risks, and make necessary adjustments to project direction and resource allocation to ensure the project stays on course. When facing challenges, Project Managers should

actively seek guidance and support from supervisors and industry experts, maintaining close communication to provide updates on project developments and issues. It's also crucial for them to reflect on both the successes and failures of the project to constantly enhance their project management skills.

Embracing the role of a Project Manager offers a powerful opportunity for students to develop essential leadership skills. From team management and decision-making to resource integration, students gain a comprehensive skill set crucial for their holistic development. As Project Managers, students need to collaborate with peers from different disciplines, therefore honing their teamwork and communication prowess. This role empowers students to refine their management and execution abilities through real-world projects, elevating their practical and problem-solving skills to prepare them for future career success.

Team members are expected to actively participate in all stages of the project, including research, design, implementation, and evaluation. It's essential for them to proactively seek out interdisciplinary knowledge and skills, take ownership of their learning progress and project tasks, ensure the timely completion of each phase of work, and foster effective communication and collaboration with fellow team members to collectively accomplish project objectives. Furthermore, they are encouraged to respect and harness the diversity and interdisciplinary dynamics within the team.

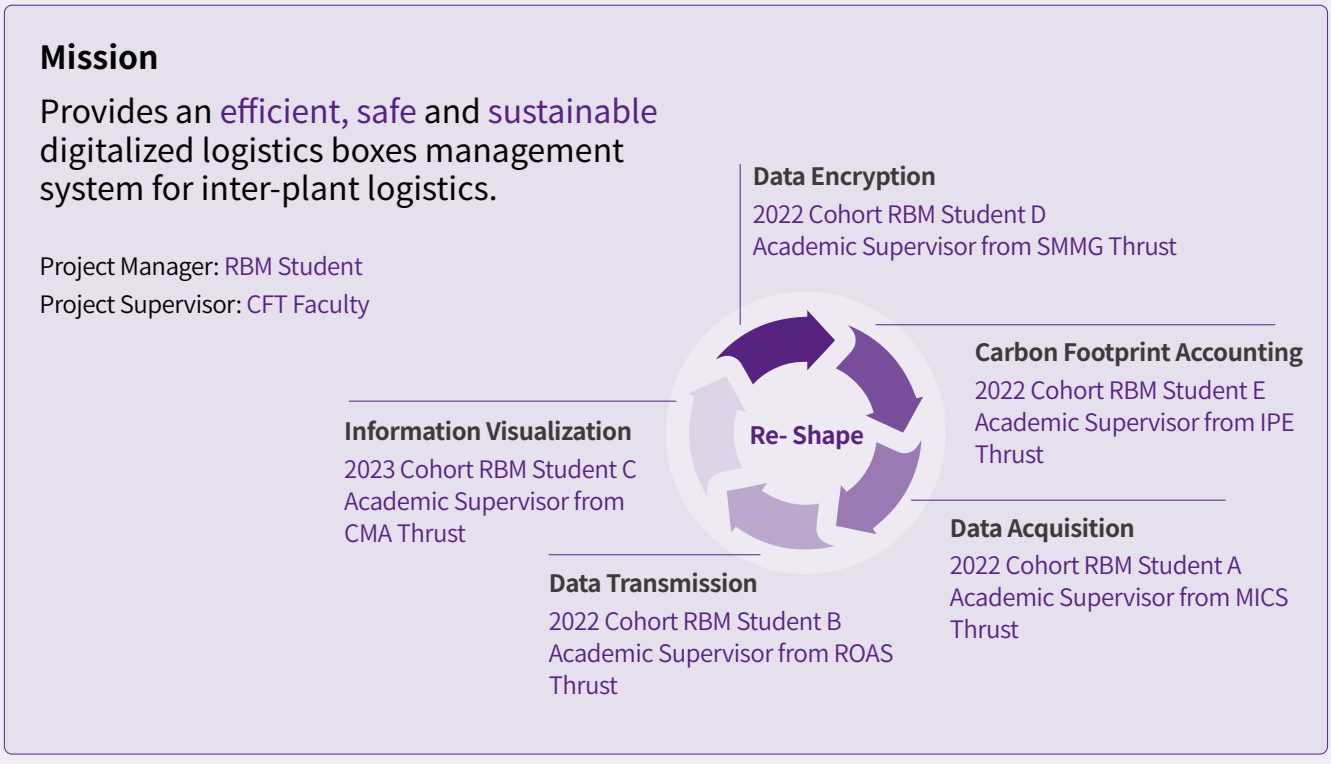


Figure 3-3 Roles and responsibilities of "Reshape" project team members

4. Supervision and support

Prior to starting the project, the Project Supervisor and Academic Supervisor work together to help students understand the learning objectives and assessment criteria. They ensure that the project follows the established direction and create a timeline with key milestones and deadlines to help students manage their time effectively and complete the project on time. The Project Supervisor and Academic Supervisor regularly meet with the students to review project progress, provide timely

feedback, and help students identify and resolve any issues promptly to keep the project on track.

Throughout the project implementation, the Project Supervisor also focuses on training students in transferable skills, helping them to receive feedback, enhance their teamwork and communication abilities, and develop creative, critical thinking, and problem-solving skills. The Academic Supervisor offers guidance and feedback on specialized knowledge, aiding students in accumulating knowledge and improving their academic research capabilities.

After finishing the phase-specific tasks of the project, students will participate in roadshows or group reports to reflect on and summarize their experiences. This will allow them to share what they have learned, evaluate the project outcomes, and think about how they can apply the knowledge and skills they have acquired in their future studies or careers.

Figure 3-4 “Re-shape” project team roadshow

5. Evaluation and feedback

Projects serve as the primary vehicle for teaching, yet the outcomes of which are not the only criteria for evaluation. The process evaluation primarily encompasses a comprehensive assessment of students across multiple dimensions during the project, including their learning objectives in specialized knowledge, teamwork, innovative thinking, problem-solving capabilities, self-management, and learning attitudes. This approach provides a well-rounded understanding of students' learning progress.

The Proposal Quality Assessment (PQA) is the final examination for the first semester. An assessment committee made up of supervisors from various professional backgrounds conducts the assessment. During the PQA process, students are evaluated and scored based on their transferable skills. This includes their ability to empathize when defining problems, the results of on-site research, their skills in systems thinking, their knowledge of project management within group projects, and their communication skills as demonstrated in the PQA report and presentation (see the sixth chapter for more details).

During the implementation of the project, students are required to submit an academic progress report and an individual project progress report to their Academic Supervisor and Project Supervisor every two weeks. Through this bi-weekly report system, students reflect on and summarize their learning outcomes at each stage. The supervisors provide specific, clear, and constructive feedback based on the learning objectives, highlighting strengths as well as areas for improvement, and offering concrete suggestions for enhancement. This process also guides students in self-evaluation and reflection, fostering their abilities in self-monitoring and self-regulation.

Upon reaching each key Project Milestone, students are expected to deliver a Project Milestone report to both the Project Manager and the Project Supervisor. This report should detail the progress made on the project work concerning the milestone. In the event that a student encounters delays or struggles to meet the established project objectives, it is the

responsibility of the Project Manager and the Academic Supervisor to coordinate and provide guidance to the student. Together, they should help analyze the primary obstacles faced and encourage the exploration of potential solutions. The goal is to help students understand the challenges inherent in scientific research and to learn the importance of making timely adjustments to their solutions. Effectively addressing problems and embracing challenges is a significant driving force in enhancing academic capabilities.

By harnessing the power of online platforms and digital tools, such as bi-weekly reports and Project Milestone reports, we can ensure the timely recording and analysis of student activities and progress. This approach enables us to provide swift feedback on any challenges students face throughout their learning journey, ultimately leading to more efficient and accurate evaluations (see the seventh chapter for more details).

6. Promotion and outreach

To significantly promote and broaden student activities in interdisciplinary PBL, as well as to enhance the overall teaching experience, it is essential to harness the power of social media platforms to showcase student projects and capture attention from both internal and external audiences. This can be achieved by leveraging the university's official accounts or creating dedicated project accounts on platforms like Weibo, WeChat, and Xiaohongshu to share project updates, outcomes, and highlights.

The university regularly hosts project exhibitions and achievement showcases, inviting faculty, students, corporate partners, and industry experts from within and outside the school to attend. This provides an opportunity for attendees to gain insights into student project outcomes and facilitates an exchange between academia and industry. News releases and case study reports are created and shared through the university's website, industry magazines, and academic conferences to highlight the innovative achievements and lessons learned by the students.

Establishing partnerships with other universities, research institutions, or businesses to collaborate on projects or exchange experiences will increase the project's visibility and provide students with more resources and practical opportunities. Encouraging students to participate in relevant academic competitions or innovation challenges at both national and international levels will elevate the project's exposure and help students gain recognition and accolades. Furthermore, creating an online platform or resource repository to gather and organize project documentation, videos, photos, and related materials will facilitate access for both internal and external stakeholders, allowing them to better understand the progress of the projects.

Through these initiatives, we can effectively promote and broaden student project activities within interdisciplinary PBL, enrich students' learning experiences, and amplify the impact and value of educational activities.

IV. PBL INTRODUCES INDUSTRY ADVISORS TO ENHANCE THE RBM SUPERVISOR TEAM

Promising results have been seen in PBL from the two classes of the RBM Program. Adjustments have been made in the third class to explore broader prospects for the development of the project. Building on the original Project Supervisors and Academic Supervisors, PBL has introduced Industry Advisors. This measure further helps students gain industry-wise experience through hands-on practice to lay a solid foundation for their career development. For enhanced university-

industry collaboration, the RBM Program offers four types of Industry Advisors and four cooperation models to enhance students' practical abilities and increase value for enterprises.

1. Cooperation model I: establish the Red Bird Talent Training Base

Supervisor role: Advisor at the Red Bird Talent Training Base

As a collaborative effort between the College of Future Technology and renowned enterprises and industry leaders from home and abroad, the Red Bird Talent Training Base has been established and experts for business departments employed as Industry Advisors at the base. Students are encouraged to engage in daily operation at the base by identifying themes for the excellently integrated projects in cooperation with every enterprise. Modes and steps include:

The university signs a strategic framework agreement with a partner enterprise to set up a Red Bird Talent Training Base in the enterprise;

- The college closely coordinates with the enterprise's HR department to arrange rotation internships at the base for students, who are expected to participate in the teaching plan for ten weeks (one day a week).

- The enterprise recommends experts from business departments as Industry Advisors, who are responsible for course teaching, internship guidance and engage in activities for sharing at university. Industry Advisors participate in the design of university-enterprise joint course, such as career planning guidance and courses on technology sharing. In-depth guidance will be provided one day a week during the first ten weeks. Flexible modes for cooperation in projects and person-to-person consulting services will be adopted in the future.

- The enterprise provides support in material resources for cooperation projects including equipment and experiment materials.

With the goal of "complementary advantages for mutual benefit" between the university and enterprise, the base is an excellent platform to build the corporate brand and improve hiring efficiency and quality by preemptively enrolling high-quality graduates. It also opens a channel for research with the academic circle to enhance corporate R&D capabilities and industrial influence. On the other hand, through hands-on training and expert guidance, students gain first-hand experience and apply what they have learned at university in actual work. They get a chance to improve their learning ability and innovative thinking, learn about the corporate culture, operation mode, and industry's status quo, needs and ecosystem, cultivate a right attitude in employment choice and career planning for improved competence and better employment opportunities in the future.

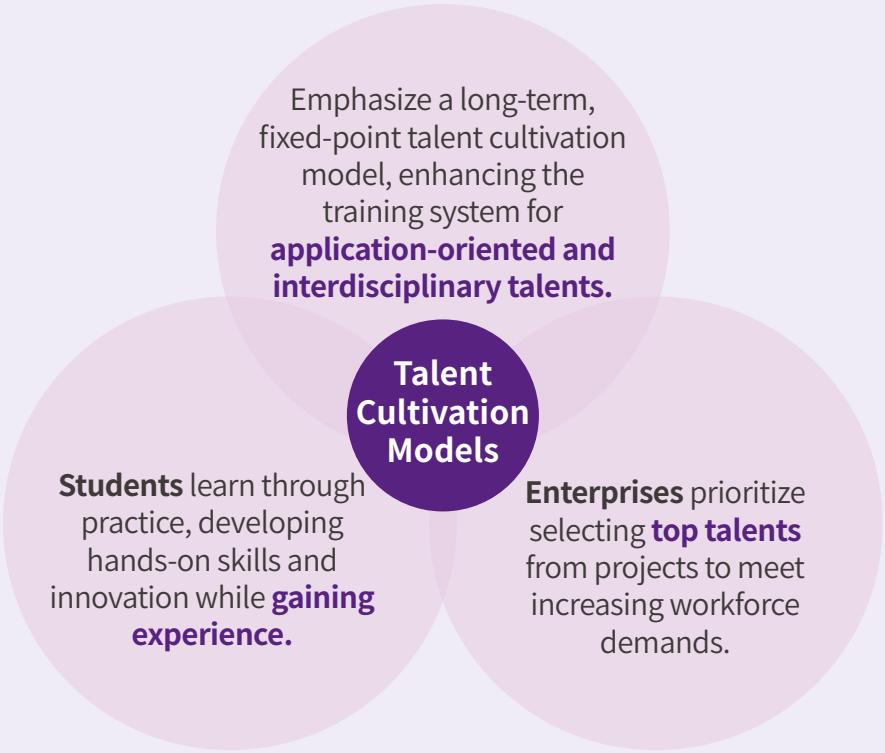


Figure 3-5 Talent Cultivation Models at the Red Bird Talent Training Base

2. Cooperation model II: cooperation with the RBM Program

Supervisor role: Industry Advisor in the RBM Program

With knowledge and resources in specific areas of expertise, Industry Advisors in the RBM Program are an asset for addressing inadequacies in talents for certain areas in our university, such as medicine, arts and design. Such Industry Advisors will be "brought in" in the form of projects at the proposal stage of the Program.

One Industry Advisor is responsible for one project. With the joint guidance of Industry Advisors, Academic Supervisors and Project Supervisors, students receive a two-year project training with continuous access to **Industry Advisors,** ensuring the smooth progression of the project.

During the proposal stage, Industry Advisors put forward opinions and suggestions regarding how the proposal aligns with actual needs in the industry. During the implementation stage, Industry Advisors offer students guidance on projects on a regular basis and assist them in the R&D and commercialization of scientific and technological achievements to help them master the knowledge and skills required for the profession. By integrating theory with practice, students hone their skills in solving programs and broaden their horizons on the industry. In the same time, Industry Advisors get a chance to cooperate with teachers in AI, smart manufacturing and sustainable technology, gain first-hand information on projects and grasp opportunities for commercialization of industry-academia-research findings. They also claim authorship to papers and patents according to academic conventions and actual contributions, and resolve difficulties in R&D in a joint effort to make achievements in scientific research for win-win results.

3. Cooperation model III: sharing cooperation

Supervisor role: guest for industry information sharing & one-on-one consulting expert

The third type of Industry Advisors are guests for industry information sharing. Focusing on regular discussion and sharing, corporate representatives share the latest industry developments and offer career advice once or twice a year or according to students' actual needs. Enterprises can enhance their promotion, employment and cooperation opportunities, help students develop a perception of the industry and offer guidance on career planning by making smart career moves based on personal interests and abilities, as well as clarifying required skills and occupational qualifications.

The fourth type of Industry Advisors are one-on-one consulting experts. Industry Advisors are included in the expert consulting pool from which students find their Industry Advisors from their preferred industry or enterprise through expert profiles before booking a one-on-one consultation. Based on their own needs, students discuss with Industry Advisors to confirm the frequency of their communication. This flexible approach to cooperation not only helps enterprises give back to society through consulting services and thus enhance their brand building and expand their industrial network, but also provides students with individual career advice regarding their career paths, and enhances their self-awareness to identify career goals and facilitate career planning.

By integrating resources to build an efficient interactive platform, this model combines the strength of enriched knowledge with improved ability, laying a solid foundation for their entrance into the job market. With identified career paths and expedited personal growth and social experience, students will significantly improve their competitiveness and adaptability to the job market for a promising future.

4. Cooperation model IV: multi-level cooperation

Supervisor role: comprehensive Industry Advisors

The fourth cooperation model has integrated the above three by providing knowledge and resources in their areas of expertise while arranging for the investigation in the industry and other activities. With an edge in professional research as well as corporate experience, such Industry Advisors engage in long-term collaboration in pillar projects with the college. They will be “brought in” on a regular basis to share experience with students and encourage students to “go out” for learning in Base of Red Bird MPhil established in their enterprises.

The first model focuses on offering students access to knowledge about enterprises, the second on research, and the third on helping students understand the industry and receive career guidance. The fourth model, however, makes up for the shortcomings of the aforementioned three models. By engaging in the pillar projects, in-depth industry-academia-research cooperation will be conducted to expedite the transfer of basic scientific and research findings into industrial technologies, R&D of key and generic technologies, as well as the sharing and application of technical achievements, based on the needs of both the enterprise and the university. In addition, the pillar projects of Project Supervisors are at the core of the long-term development of their scientific research and teaching. Demonstrating the connection between the program with enterprises, they are the most desirable type of Industry Advisors for the development of the college in the future. This model not only cultivates their ability of learning theory with practice but also helps develop an innovative mindset and improve their problem-solving skills. Such Industry Advisors will become the starting point and major battlefield for future industry-academia-research cooperation, further promoting the continuous development of the RBM Program.

	01 Advisor at theRed Bird Talent Training Base	02 Industry Advisor in the RBM Program	03 Guest for industry information sharing	04 One-on-one consulting expert
Collaboration Methods	• Sign a strategic framework with the enterprise • Coordinate with the enterprise's HR department • Enterprise-recommended experts serve as Industry Advisors	• Target specific RBM project teams • Industry Advisors form RBM's Project Groups based on real industry needs to initiate projects	• Regularly share industry updates and career development advice	• Invite experts to join the 'Expert Consultation Database • Students can seek one-on-one consulting guidance from industry advisors based on expert profiles
Frequency of Interaction	• Ten-week program, one day per week, focused support and student interaction • Transition to other types of Industry Advisors	• Maintain close communication with students throughout the two-year RBM Program to monitor project progress	• Once per academic year or semester or organize sharing sessions as needed by students	• Based on students' specific needs, communication with industry advisors will be detemmined by the students
Industry Benefits	• University provides endorsement • Batch transfer of top students • Establish official collaboration opportunities • Issue appointment letters to Industry Advisors	• Acquire project information for future industry-academia • Collaboration and secure authorship rights for papers and patents based on contributions	• Promote the company to connect with students • Engage with university for recruitment and collaboration opportunities	• Give back to society and the industry • Build personal brand
Student Benefits	• Gain deep exposure to the real industry environment and understand its ecosystem and needs • Clarify future career development	• Combine theoretical leaming with practical application to enhance problem-solving skills • Broaden industry perspective	• Build industry awareness • Make suitable career choices based on interests and abilities • Understand key skills and qualifications needed for future job searches	• Receive personalized career guidance to improve self-awareness and accurate self-assessment • Clarify career goals and choose the right career path

Figure 3-6 Four types of Industry Advisors

PROPOSAL QUALIFICATION ASSESSMENT (PQA)

04

IV. PROPOSAL QUALIFICATION ASSESSMENT (PQA)

How does PBL ensure the academic value and applicability of students' research project proposals? By using the mechanism of PQA. This chapter presents PQA's design principle and its application in the RBM Program, and analyzes how PQA benefits students in academic growth and improved capabilities, as well as challenges they come across in practice and measures to tackle them.

I. DESIGN PRINCIPLES AND SIGNIFICANCE OF PQA IN THE RBM PROGRAM

1. QUESTIONS RAISED: PAIN POINTS OF PBL TEAM COOPERATION

PQA evaluates whether students in the RBM Program master the required skills required six months after registration. This is also a very important review of PBL for students in the first semester. Adopting the project-based and group-based teaching, the program is intended to ensure the realization of teaching goals, including solving students' pain points in internalizing transferable skills, as well as helping them apply their knowledge in practical settings. However, any innovation comes with challenges. For the RBM Program Class 1, a series of issues emerge when students adapt to transition including teamwork going through formalities, an unclear master-apprentice model and the disconnection between knowledge and ability, all undermining the project progress and restricting students' personal growth. Therefore, the PQA mechanism is introduced into the RBM program and successfully implemented in the second class to address challenges during the transitional period and thus ensure the quality and performance of PBL.

2. PROBLEMS SOLVING: PQA'S VALUE DURING THE TRANSITION (MINDSET READINESS)

The first semester during the two-year program is a key transitional period for students to develop a unique RBM teaching language system. As they shift from a traditional model to an innovative PBL approach, students need more specific and practical guidance during their free exploration at the first stage of the learning curve to prepare them for raising valuable questions and planning milestones for study and research at the second stage. That's why PQA also stands as the starting point for the synchronous development of transferable skills and expertise of RBM students.

(1) The first time that students adopt the RBM mindset in practice as their comprehensive way of learning

The two years of the RBM Program are an invaluable experience for students to upgrade their way of thinking in learning. The

following mindsets are indispensable to becoming a top strategic engineer, strategic scientist, research scientist, or leading talent in innovation and entrepreneurship. The essence of the RBM Program lies in education. It focuses on helping students jump out of their original mindsets rather than the final outcome of the group project. PQA is the key driver for transforming students' way of thinking. It's the starting point for them to abandon divergent thinking, local thinking and static thinking while embracing structural perspectives and systematically transdisciplinary methods for identifying and defining problems with a long-term vision in seeking optimal solutions. RBM students' way of thinking integrates the mutually-reinforcing critical thinking, transdisciplinary thinking, design thinking, innovation and entrepreneurship mindset as well as strategic thinking, contributing to their unique mindset framework. How they master the transferable skills showcases the application of such a mindset. By combining the mindset training with the thesis proposal, PQA effectively guides and evaluates the readiness of RBM mindset and transferable skills.

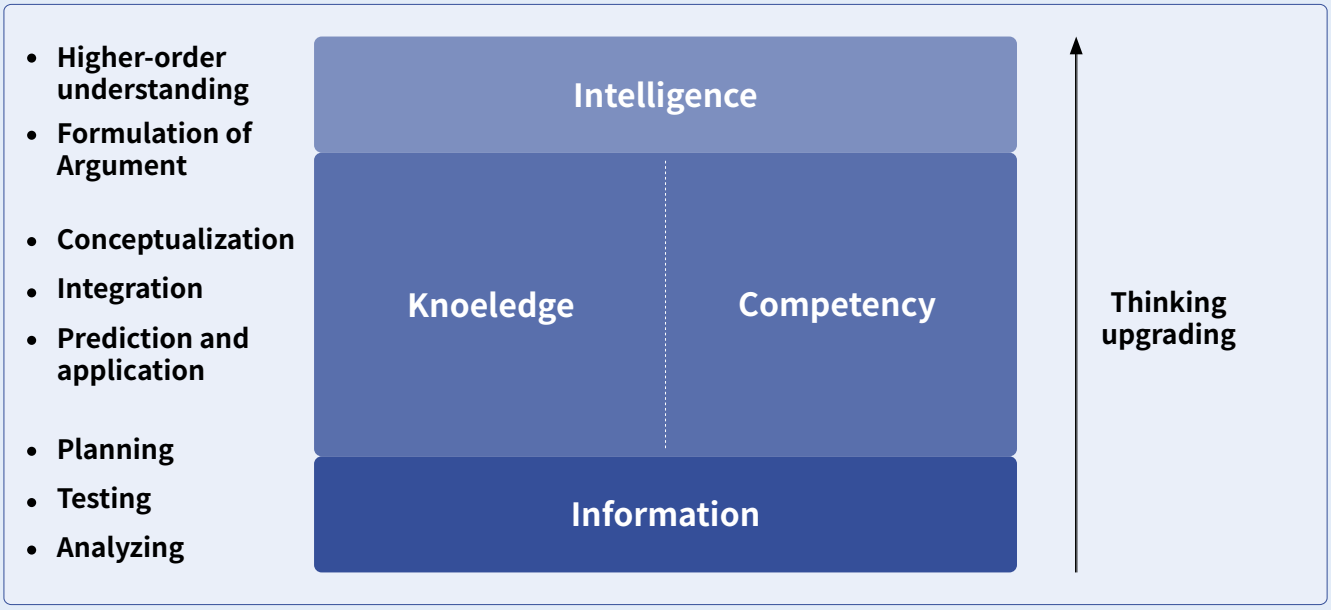
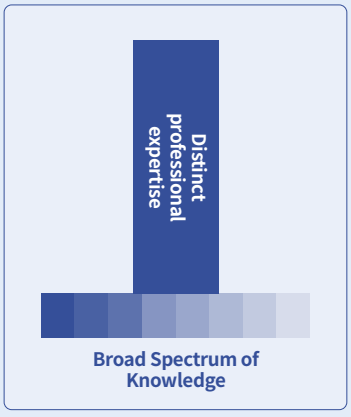


Figure 4-1 Level of comprehensive learning mindset by RBM students

① **Critical thinking:** It's an integral psychological feature of innovative talent, requiring students to make judgments and choices in a clear and reasonable way through critical thinking. RBM students are required to obtain and construct knowledge in the AI era, whether through reading, experiments, or interdisciplinary group discussion. The information and data thus received should be examined after thorough and clear thinking to determine their value, authenticity and efficacy.

② **Transdisciplinary thinking:** It's an essential way of thinking required of RBM students to avoid cognitive bias and conventional thinking caused by the single-disciplinary perspective, thus cultivating the T-type talent. It helps students gain a cognitive edge and solve difficult problems for innovation. The essence of transdisciplinary thinking lies in connecting the knowledge learnt to develop a complex framework constructed by functions, elements, relations and environment for a better definition, analysis and resolution of complicated issues.



* T-shaped talent refers to individuals who possess broad knowledge and deep professional skills.Its visual representation is characterized by the letter "T". The horizontal bar ("—") represents broad interdisciplinary knowledge. While the vertical bar ("|") represents deep expertise in a specific field. The knowledge structure of T-shaped talent is shown in the diagram.

③ **Design thinking:** It's a methodology that solves problems creatively, whose scientific design rules and procedures occupy an important position in the design of the RBM Program. With a focus on people, design thinking encourages students to dig deep into the uses' needs and solve problems creatively. In this program, design thinking is regarded as not only a tool or an ability but also a whole new learning method and thinking framework. The RBM Program offers two core courses: Interdisciplinary Design Thinking and Transdisciplinary Research Methods. Students are required to choose one of these courses to enhance their creativity and improve their problem-solving skills while also learning to be optimistic, confident and ready to take challenges.

④ **Innovation and entrepreneurship mindset:** The innovation mindset, which is fundamental to research and entrepreneurship, refers to the ability to think outside the box and apply knowledge flexibly to solve problems creatively. The training process of transforming sentimental aspirations for innovation into a sensible exploration of the innovation mindset is crucial for RBM students. The transition from "I want" to "I can" marks the integration of mindset with competence, which serves as the basis for the wisdom, courage and confidence required of entrepreneurship.

⑤ **Strategic thinking:** It's a high-level ability of thinking to comprehensively predict and make decisions concerning fundamental issues with a long-term and overall influence. It's also a core trait the RBM Program focuses on cultivating. With the design thinking integrating needs to seek for solutions, strategic thinking takes both future development trends and potential risks into account. Students are guided in the program to integrate resources, make plans and arrange for execution, honing their competence in overall control, decision-making and leadership. Students train for this mindset to not only improve their individual capability but also prepare themselves to become strategic engineers, strategic scientists and innovation and entrepreneurial leaders in the future.

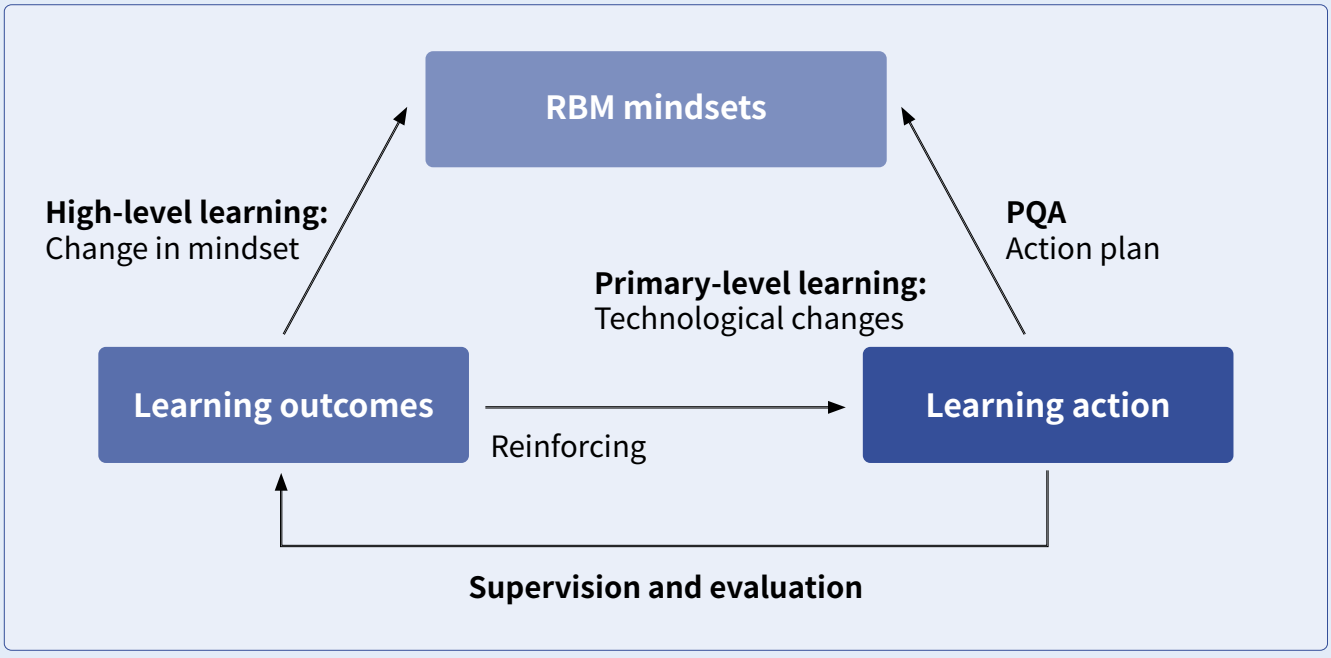


Figure 4-2 Increase in the level of thinking for learning in the RBM Program

The above five ways of thinking integrate and complement each other to build **an important foundation for the internalization of transferrable skills** for RBM students. It takes time and great efforts for these mindsets to be developed and applied to cultivate and improve skills. The comprehensive learning, with PQA as staged evaluation, boasts the circular trait of action learning (figure 4-2) to guide **an improvement in mindset (high-level learning)** for RBM students after several times of learning outcomes and learning actions. Through the guidance of PQA, students formally apply these mindsets systematically into thesis proposals for the first time. This process deepens their understanding of the RBM mindsets and helps them know their value and meaning in practical operation for later development of transferable skills. It's worth noting that scoring indicators for the Q&A session of PQA need not correspond fully to all the above mindsets, but rather, focus on their mindset readiness during the transition. A journey of a thousand miles begins with a single step. The PQA process has a long-term positive influence on students' mindsets, learning, research, employment and entrepreneurship.

(2) PQA plays an essential role in promoting understanding of group projects and enhances cohesion among teachers and students in the RBM Program

PQA not only improves students' mindset, but also facilitates a positive shift in their mentality and role to become active learners, team players and effective communicators typical of RBM students.

① **Active learner:** Basic knowledge in a field of study is essential, while interdisciplinary knowledge knows no bounds. In project-based and group-based learning environments, every RBM student is an active learner. They should leverage their expertise when applying theory to practice, and keep acquiring useful interdisciplinary knowledge (from Project Supervisors or other team members) to expand their knowledge base.

② **Team player:** The RBM team consists of students from different disciplines. Therefore, it's an essential competence for RBM students to work with team members who have different personalities and academic backgrounds. Throughout the group project, they should learn to manage their emotions and maintain an open attitude towards constructive criticism. Also, they should empathize with others, demonstrate high EQ, and be ready to resolve conflicts with effective strategies.

③ **Effective communicator:** An effective communicator should improve logical thinking, break down knowledge barriers, and enhance communication skills. As students of the MPhil Program, they need to strive to become an academic writer with strong written communication skills, effectively presenting the research questions, methodologies and conclusions. The RBM students should also be competent in language understanding and presentation, conveying accurate information and engaging in debates to gain recognition from audiences of different cultures and backgrounds.

With the introduction of PQA, teachers and students in the RBM program have reached a new high level in understanding group projects. They need to thoroughly analyze and examine the projects by probing into their goal, task and value, as well as conducting an overall evaluation of potential challenges. New ideas and methods are put forward in later group discussion and feedback sessions to further improve group proposals and iterate and deepen understanding in the process.

In the meanwhile, PQA promotes thorough interdisciplinary communication and cooperation between teachers and students. In preparing for PQA, team members need to listen to each other, understand and respect views held by members with different academic backgrounds and strike a balance between self-awareness and team spirit. Each RBM student will build close-knit connections and trust both in their areas of expertise and through emotional bonds with their Project Supervisors, Academic Supervisor and other team members, thus effectively enhancing team cohesion.

RBM students regard group projects as a team contest for research training where everyone goes all out for a common goal. They have a better chance of learning the importance of team spirit and becoming team players during this process. From a managerial perspective, PQA is beneficial in aligning project goals between supervisors and students, thus ensuring smooth implementation in line with the established goal and direction. In the next section, the model of PQA's design principles is put forward from three dimensions: quality assurance, learning evaluation and project management.

3. MODEL OF PQA'S DESIGN PRINCIPLES

An effective measure for quality assurance of the RBM Program, PQA is also a useful tool for evaluating students' learning processes and the catalyst for building the transdisciplinary education community. In terms of quality assurance, a standardized procedure and system of PQA is applied at the early stage of the project to ensure the program's expected academic standards and practice requirements. In terms of learning evaluation, PQA is used for assessing students' overall readiness for PBL during the transition, including academic basis, expertise, transferable skills and mindset shift. In terms of project management, PQA conducts progress control, risk management and resource allocation required for final delivery for each independent group project. It is a tool to detect the feasibility of the project in the early conception and milestone planning stages. See the figures below:

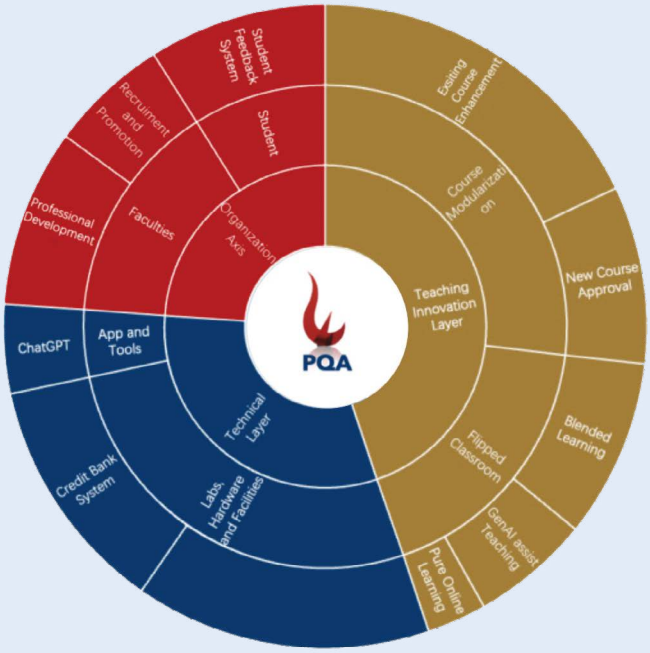


Figure 4-3 Design model of PQA in the RBM Program

(1) Quality assurance

Through standardized procedures and mechanisms, PQA strictly controls the project in its early stage to ensure its academic standards and practical requirements are aligned with the established goal, laying a solid foundation for smooth progress throughout the project.

① Standardized procedures

A. Project proposal report: PQA needs to establish a uniform written format and content standard that cover requirements in writing key parts including research background, purpose, methodology, and expected outcome. With templates and samples, PQA helps students understand these standards and comply with them to make the research plan more professional and useful.

B. Group roadshow and individual oral defense: establish the standard procedure for group and individual presentation, identify each key link and develop clear scoring criteria and review guidelines to ensure the fairness and uniformity of the evaluation process.

② Mechanisms

A. Guidance and feedback mechanism: design regular supervisor guidance meetings, and guide teachers in offering professional guidance for students directed by PQA to help them keep making progress. Peer reviewers can also consider including a feedback mechanism to encourage team members to review each other's work, thus improving their critical thinking and team spirit.

B. Evidence-based evaluation mechanism: evaluate projects' research quality, milestone arrangement and teamwork in a comprehensive and objective manner, and provide thorough evaluation results and suggestions for improvement.

(2) Learning evaluation

PQA examines students' overall readiness for PBL during the transition, including mastery of academic and professional knowledge, as well as cultivation of transferable skills and evaluation of mindset shift. The complete evaluation system accurately records students' progress and growth and offers guidance on their individual development.

① Knowledge

A. Academic expertise: PQA is primarily used for evaluating students' competency in mastering and applying professional knowledge. More importantly, through specialized courses and PQA, students can choose their Academic Supervisors and vice versa, and they develop an academic master-apprentice relationship.

B. Interdisciplinary knowledge: In their inquiry-based learning during group projects, students expand their knowledge beyond their specific fields as needed and engage in interdisciplinary knowledge and course studies. This aspect can also be examined through PQA, such as a student's understanding of the overall group project.

② Abilities

A. Individual transferable skills: focus on students' competency in applying the five core mindsets in “defining the problem” and finding solutions in real scenarios.

B. Individual academic competence: including research skills, competence in data analytics, academic writing and oral presentation. The presentation and test of research reports and individual thesis proposals are used for evaluating, training and enhancing their basic academic competency.

C. Teamwork and communication: PQA should evaluate students' communication efficiency and team spirit in their group project, for example, a test through team roadshows.

(3) Project management

PQA plays an equally important role in project management. Evaluation in progress control and risk management for each group project, as well as optimization of resource allocation are conducted to ensure the efficient and orderly operation of projects. It is a preliminary assessment tool for analyzing a project's feasibility in conception and milestone planning to ensure successful implementation.

① Tools

A. Overall design of the RBM Program: PQA, as an important tool that adjusts and optimizes the overall design of the RBM Program, contributes to reasonable and useful project design.

B. Interdisciplinary scientific research community: PQA promotes research communication and cooperation between Academic Supervisors and students across Hubs and Thrusts while enhancing community activities and resource sharing through the communication mechanisms of PQA and the RBM Program.

C. Risk management: PQA plays an important role in risk management by teaching students to identify and analyze project risk and providing everyone with opportunities for trial and error to prevent issues from arising in later stages.

② Resources

From project design and delivery: PQA evaluates resource allocation based on the project's actual needs and progress and provides the necessary support and flexibility for group projects to ensure they can achieve their predetermined goals.

To sum it up, PQA is a comprehensive and systematic process designed to ensure and enhance the cooperation efficiency and quality of PBL groups through a series of well-defined and carefully planned steps and activities. At its core, the model involves an in-depth analysis and understanding of a project's essence to define the problem accurately. Team members should communicate and discuss effectively to develop comprehensive solutions and reasonable subdivisions of tasks. In this way, the PQA model is beneficial in pooling collective wisdom to ensure the smooth progression towards established milestones, while also enhancing team cohesion and collaboration. In addition, through the clear three-way contract among Academic Supervisors, Project Supervisors and students, the PQA model ensures the project is progressing in the direction aligned with their established goal. This not only offers a clear learning and development path for students but also evaluates their transferable skills at the early stage. Lastly, it's worth mentioning the model itself is a dynamically evolving system that needs constant iteration and upgrading to adapt to changing teaching practices and student's needs. Through close integration with the RBM Program, the PQA model will keep optimizing to offer more diversified and effective guidance for learning, thus playing an essential role in cultivating high-caliber talent to tackle future challenges.

II. PQA PRACTICES IN THE RBM PROGRAM

1. PQA PRACTICES AND STAGES

As a key component of the PBL system, PQA evaluates students' transferable skills and showcases preliminary PBL outcomes. During the first six months of exploration, the RBM Program provides students with ample academic freedom and encourages them to discover their academic passions and choose their development paths based on their interests, educational backgrounds, and future career plans. Students actively connect with their preferred projects among many outstanding educational project proposals and form interdisciplinary project teams. After six months, students, guided by their Project Supervisors and Project Managers, make a preliminary decision about their Academic Supervisor through a mutual selection process based on the needs of team cooperation and their understanding of project research goals. They must successfully pass the PQA in order to register as graduate students within the Hub and Thrust of their chosen Academic Supervisor. Therefore, the PQA experience is crucial for students in not only cultivating their research abilities but also training them to apply the knowledge learned to solve real-world problems. PQA represents a learning outcome during their explorative learning journey and serves as a key milestone for their overall skill development.

The whole PQA process includes thesis proposal, group roadshow and individual oral defense. The Base of Red Bird MPhil will set up a Thesis Proposal Quality Evaluation Committee (hereinafter referred to as the Committee) in advance for each student, which generally consists of Academic Supervisors from the same group. Strictly complying with the principles of fairness and justice as well as the requirements for evaluation, the Committee evaluates the thesis proposals, group roadshow and individual oral defense of every student before putting forward a unanimous opinion after group discussion. Students are given one of the following four PQA results: pass, pass with minor revision, pass with major revision, and failure. Students who fail the PQA shall resume the above process for a second PQA as per the Committee's opinion. Only students passing the evaluation of the above three stages can enter the Thrust and continue project research. Those who fail the PQA are deemed academically unsatisfactory.

(1) Design and practice of thesis proposal

Students become active learners, team players and effective communicators as they grasp the group project's goal, task and value and get more involved. In the meantime, they turn personal research interests into specific research direction that aligns with their group's project based on the group's research content. They apply critical thinking and creative thinking into exploring issues, defining the problem and planning strategies for problem solving, thus establishing their own project's research goal and research plan. Then they need to present the research plan of both the group's and their own in writing as their thesis proposals, which include the following:

① **Group project inter-dependency:** An individual project doesn't exist alone. It has to be closely related to the group project to achieve project goals. In the thesis proposal, students have to clearly describe how their individual project contributes to the realization of the group project's goal and explain how they cooperate with other team members.

② **Research methods:** Choosing proper research methods is crucial for achieving project goals. Students must select the most appropriate qualitative, quantitative methods or a mix of the two according to the project's nature and requirements. They should elaborate on the theoretical basis of the selected research methods in the thesis proposal, and argue how these methods help them gather necessary data based on which reliable conclusions are drawn.

③ **Implementation plan and intended outcome:** A well-organized implementation plan and clear outcome goals are essential to project success. Students are required to list specific steps by stage for completing their individual projects, the intended outcome at every stage and how to evaluate and validate these outcomes. An elaborate timetable is necessary for indicating the starting and finishing date of every important task as well as how to allocate resources to ensure their completion.

④ **Milestones:** Milestones are key indicators of project progress to help the team monitor project progress and adjust the timetable in a timely manner. A series of feasible milestones should be included in the thesis proposal with exact deadlines. These milestones include preliminary research, prototype development and final delivery.

⑤ **Budget:** The project's budget plan shall set out all the necessary expenses, including costs for materials, equipment rentals, and software licenses. Potential extra expenses should also be considered and included in the budget. In the thesis proposal, students should show how they will effectively manage funds to make the project financially feasible.

⑥ **Risk evaluation and solutions:** The ability to identify potential risks and develop countermeasures is an important aspect of project management. Students should list the risks that may impact project progress or results in their thesis proposal, and offer mitigation and elimination solutions.

In writing the thesis proposal, students need to show their ability to identify issues, define the problem and write plans after learning for six months. They should sum up how they think, do and learn during this period, honing their competences in design thinking, critical thinking, systems thinking, summarizing and writing as well as communication and presentation. The thesis proposal also aims at cultivating their transferable skills in addition to research abilities. Students need to submit their thesis proposal and repetition check report before the group roadshow and individual oral defense, which will only begin after the thesis proposal is approved by Academic Supervisors and Project Supervisors.

(2) Design and practices of group roadshow and individual oral defense

At this stage, students are required to learn how to turn their complicated thesis proposals into clear and accurate presentations in both written and oral forms to professional and non-professional audiences. It's therefore necessary to master effective skills in academic writing and oral presentation. Assigned in the same time period, the team's group roadshow is followed by the individual oral defense of every team member. Afterwards, the PQA committee evaluates the thesis proposal, group roadshow and individual oral defenses before giving a unanimous opinion after discussion.

① **Group roadshow:** Students need to work with other team members in coordinating their content and presenting the team's overall outcomes. This part generally consists of a ten-minute group presentation and a five-minute group Q&A session.

During the group roadshow, every team member should think about how their individual research will impact the group outcomes, which means they need to know their roles and responsibilities within the team and ponder how their research is connected with and supports that of the whole team. They are required to clearly articulate their contributions to the team, including their independent thinking and problem solving during the research process, as well as their understanding of team goals and how they drive the whole project forward.

Through the group roadshow, students develop effective communication and coordination skills in a collaborative environment, recognize the significance of teamwork, and experience the sense of accomplishment that comes from achieving goals together. Such experience is beneficial for students in playing to their strengths and better integrating into teamwork in their future careers while also appreciating what others have contributed and showing respect.

② **Individual oral defense:** It consists of an eight-minute presentation and a five-minute Q&A session. During the individual oral defense, every student needs to give a one-minute brief introduction about the group project and describe how their individual project is related to the group project, their role, intended outcomes and contributions to the team. In terms of individual projects, students need to review current literature by analyzing the research results of previous researchers, explaining the theoretical basis of their selected research methods, as well as set out the research plan and intended outcomes at each stage, potential risks impacting project progress or results, and countermeasures. They are obligated to articulate their views and conclusions in a clear and logical manner and answer questions from all audiences. Their skills in oral expression and logical thinking get fully honed during this process.

(3) PQA practice data for students in the RBM Program Classes 1 and 2

The PQA mechanism was first ADOPTED in the first class of RBM students in January 2023. From January to April of 2023, 263 students from 53 project teams passed the PQA and registered as graduate students in the Hub and Thrust of their Academic Supervisors. Under the guidance of Academic Supervisors in their Thrust, Project Supervisors of the RBM Program and Industry Supervisors, they continue research on their individual project and the interdisciplinary team project.

After over one year of development, the RBM Program iterated in how the project team was set up initially, PQA thesis proposal, scoring mechanism and guidance feedback system based on the PQA practice of the first class of students. From January to March 2024, the second class of 344 students passed PQA. A total of 344 thesis proposals were collected, with 69 project teams completing group roadshows and 344 students engaging in individual oral defenses. 341 students passed PQA on their first attempt, with a success rate of 99.1%. 180 students received a direct pass, accounting for 52.3% of the total. 143 passed with minor revision for thesis proposals, accounting for 41.6% of the total. 18 of them passed with major revision for thesis proposals, accounting for 5.2% of the total. The remaining 3 students (0.9 %) failed on their first attempt but passed after revisions. Following this stage, students have seen significant improvements in their transferable skills including critical thinking, transdisciplinary thinking, design thinking, innovation and entrepreneurship mindset, strategic thinking and teamwork skills.

2. PQA'S GUIDANCE AND EVALUATION MECHANISMS

(1) Establishing a guidance and feedback mechanism

① **Establishing an all-round guidance system:** developing a guidance system consisting of Project Managers, Academic Supervisors and Project Supervisors in terms of design thinking, project management and areas of expertise, focusing on individualized education that centers on each student's growth, in an effort to maximize the teaching result. Project Supervisors and Project Managers guide students in project implementation and transferable skills to help them understand the feasibility and risks of project implementation, problems and challenges they may come across in the actual project, as well as control the integration of individual projects with group projects. In the meanwhile, Academic Supervisors guide students in their thesis proposal from an academic view, helping them identify research goals, select proper research methods and establish an academic framework. Multi-level guidance offers full support for students in developing transferable skills and academic capabilities.

② **Offering diverse training in writing:** The College of Future Technology has carefully designed a series of writing training sessions and lectures tailored to students' practical needs. These trainings include providing writing guidelines to help them know about the basic requirements and structures of academic writing, hosting writing workshops for hands-on opportunities and exchanges where they get to improve their writing skills for thesis proposals, organizing essay writing competitions to inspire their enthusiasm, as well as on-one-on tutoring by teachers from the language center that provides targeted guidance to address specific issues. Through these diverse training opportunities, students can gain a better understanding of the requirements and standards for research proposals, while enhancing their writing and research planning abilities.

(2) Establishing a comprehensive evaluation system

In order to comprehensively evaluate students' ability in selecting topics, innovation, team communication and project management, the College of Future Technology has established a comprehensive evaluation system for PQA. In terms of group project inter-dependency, problem definition or critical thinking, project planning skills, and communication skills, the system designs binary-choice questions (with a yes or no for answer) on fact-based judgments to assist teachers in fair and impartial evaluation. The opinions of Project Supervisors and Academic Supervisors from different academic backgrounds are also taken into consideration to ensure that the evaluation of their starting point, growth process and results is comprehensive, impartial and professional. By integrating all the elements based on the evaluation subject and content, the comprehensive and multifaceted evaluation is conducted from both a horizontal and vertical perspective, focusing on students' continuous improvement and research depth during its process, whose outcome demonstrates a consensus reached by scholars from various areas of expertise.

① Principles

First, impartiality and fairness: The evaluation process focuses on impartiality and fairness by avoiding bias and impartial behaviors. Second, transparency and openness: The evaluation standards and procedures are transparent and open to the evaluated parties, with timely feedback on evaluation outcomes. Third, diverse perspectives: The diversity of reviewers and audiences is ensured to provide students with broader perspectives and feedback.

② Reviewers

The PQA committee consists of a group of supervising professors offering guidance, including Project Manager, Project Supervisor and Academic Supervisors of every member of the group, with the Project Manager acting as the coordinator.

③ Evaluation dimensions

First, group project inter-dependency related questions: These questions focus on the connections and interactions between individual projects and group projects. Reviewers may ask how the individual work supports or enhances the group project, as well as the individual's role and contributions to the team. The evaluation focuses on understanding whether students are able to identify and implement strategies for collaboration and interdependence in team projects.

Second, problem definition or critical thinking related questions: This section of the questions focuses on how students define the problem in their project and their ability to use critical thinking to analyze the problem and propose solutions. Reviewers may explore how students clearly define the project's problem, and whether they are able to examine the problem from multiple perspectives and come up with innovative solutions.

Third, project planning skills related questions: The evaluation related to project planning skills focuses on students' organizational skills, time management and resource allocation. Reviewers examine how students plan the various phases of a project, including how they set goals, assign tasks, control timelines and budgets, and respond to changes and challenges that may arise.

Fourth, communication skills related questions: Questions evaluating students' communication skills will involve how effectively they convey ideas, information and research results. This includes written and oral communication skills and how they communicate effectively with teammates, instructors, reviewers, and potential audiences. Reviewers may evaluate students' presentation skills, interaction with the audience, and the way they respond to questions.

④ Scoring method

As mentioned before, the scoring is based on binary questions, answering with yes/no as options to ensure objective evaluation, and each committee member gives recommended PQA results.

⑤ Determination of evaluation results

The final results are determined by consensus from half or more of the committee members to ensure objectivity and accuracy. The evaluation results and comments will be given to the students in a timely manner for improvement accordingly.

3. PQA'S CHALLENGES AND MEASURES FOR IMPROVEMENT

As a milestone in the two-year study of RBM students, PQA is a systematic and complex task that examines not only students' ability in applying theory in practice and research abilities, but also skills such as project management and teamwork. It is inevitable to encounter some challenges and difficulties in the process of implementing PQA.

(1) Understanding and acceptance of the evaluation system: In the actual implementation, a few teachers lack a clear understanding of the principles and criteria for scoring or fail to reach a consensus, and some teachers raise questions about the scoring criteria and principles. At the same time, although the scoring criteria and score sheets are sent to students, some of them fail to understand fully the scoring process or introduce and demonstrate the four dimensions of the scoring criteria accordingly during the group roadshow and individual oral defense stages.

(2) Time limit: This is a problem many students came across. Due to the complexity of the project, students need to discover their personal interest in research and identify the direction that's aligned with the group project. However, due to the time limit for setting up a group, as well as insufficient communication between students and several supervisors and lack of understanding about the group project, some students find during the PQA stage that the topics for their individual project have no significant value or no sufficient relevance with the group project, thus requiring a change of topics or project groups.

(3) Resource limitation: Resource limitation is also a major challenge, in particular for students in their first year of study whose research involves certain experimental equipment or data gathering. Some of them cannot obtain relevant data needed for their proposal reports timely due to the required purchase of new experimental equipment or other resource limitations.

Therefore, based on the implementation experience of PQA from the first two classes of RBM students, the program will take the following measures to continuously improve and optimize PQA mechanisms and practices:

(1) Adding courses and thematic training on time management and project management: Through the training of the upcoming UCMP 6050 Project-driven Collaborative Design Thinking course (see Chapter 5), students can internalize design thinking into their personal thinking, and also learn rational methods for project management to plan and allocate time for themselves and the group more effectively, thus promoting the overall progress of individual and group projects. In addition, thematic training on time management and project management will be conducted by academic and industry experts and scholars to share their relevant experience and strategies.

(2) Optimizing the communication mechanism and channels between supervisors and students: The existing biweekly teaching system and platform for booking supervisors should be further optimized by simplifying the management process, developing more multi-directional interactive functions, and encouraging students and supervisors to use the digital teaching platform, so as to ensure more efficient and smooth communication.

(3) Increasing resources for experiments and consumables: It is necessary to investigate the actual needs of students for experimental equipment and consumables before increasing investment in lab equipment by working with relevant departments of the university, thus ensuring smooth research progress for all students.

(4) Strengthening the PQA guidance and support system: It is essential to strengthen the communication between Project Supervisors and Academic Supervisors through close project cooperation and process formulation to ensure a clear understanding of the quality standards of PQA for all participants. Guided by educational needs, the guiding principles and evaluation standards of PQA should be regularly reviewed and continuously iterated to keep PQA effective and adaptable.

Through these improvement measures and development plans, the RBM Program intends for PQA to become a platform not only for students to improve their academic and transferable skills, but also for supervisors and project managers to achieve professional growth. PQA's successful implementation will have a profound impact on students' future careers and the overall educational quality of the RBM Program at HKUST(GZ).

CURRICULUM DESIGN AND INNOVATION

05

V. CURRICULUM DESIGN AND INNOVATION

The traditional higher education model places excessive emphasis on imparting theoretical knowledge, often at the expense of developing students' transferable skills. This focus can hinder students' ability to effectively apply their knowledge to real-world problem-solving. In a rapidly evolving job market, relying solely on theoretical knowledge is insufficient and leaves students struggling to adapt to the workplace or to leverage their learning to innovate beyond existing theoretical boundaries. Consequently, it is essential for students to acquire transferable skills such as communication, critical thinking, innovation, teamwork, and leadership to successfully navigate and influence the dynamic work environment and societal needs.

Recognizing the challenges students face in adapting to societal demands, educators must integrate theory with practice in their teaching strategies and course designs. By engaging students in real-world or simulated environments, they can transform theoretical knowledge into practical skills through hands-on activities and project implementation.

How can the curriculum design of the RBM Program inspire students to enhance their innovation and practical skills while maintaining academic excellence? Grounded in the cross-disciplinary Project-Based Learning (PBL) model, the RBM Program prioritizes design thinking, the enhancement of students' professional knowledge, and the development of key transferable skills. This approach aims to integrate theoretical learning with practical application, facilitating the simultaneous growth of knowledge and skills. This chapter will explore the concept of project-based curriculum design and innovative teaching methods, detailing several core courses and highlighting the initiatives and support measures in curriculum design and teaching innovation at HKUST(GZ).

I. PROJECT-BASED COURSE AND TEACHING INNOVATION MODEL

Mainly guided by PBL, the course design for the RBM Program aims at enabling students to acquire professional knowledge and improve their ability to discover, raise and solve problems for the concurrent development of knowledge and abilities. Figure 5-1 shows the specific plan of the teaching innovation model, under which the project-based group learning runs through the entire postgraduate study of RBM students. During this period, the Project Supervisor provides students with customized training based on the progress of the student project. From the perspective of project development and implementation, the Project Supervisor guides students in developing and promoting projects with design thinking, and cultivating their transferable skills such as system thinking, project management, entrepreneurship and innovation. At the same time, the Project Supervisor encourages and guides students to serve as project managers for the entire project, learn and experience the entire process of project development and management, including proposing projects, recruiting project members, planning project development milestones, project budgets, space and asset management, daily project management, and project completion.

Figure 5-1 Pathway of the teaching innovation model for RBM Program

As mentioned above, the first 6 months after registration is the first stage of the teaching innovation model for students to explore freely. The RBM Program encourages students to explore different disciplinary directions and propose research projects of their interest. In the process of exploring and discovering research projects, students should apply the methodology learned in the cross-disciplinary design thinking course to actual research by taking the initiative to identify problems and exploring the interdisciplinary knowledge needed to solve the problems, thereby training themselves in active learning and teamwork. Students learn the importance and urgency of interdisciplinary research in actual project research while experiencing the difficulties and challenges of teamwork. Thus, they are better equipped to plan the second stage of learning and research, laying a solid foundation for future research and work.

During the last 18 months of postgraduate study, as the second stage of the teaching innovation model, students formally carry out interdisciplinary project research. They should gradually promote project research based on the individual and team project milestones established in the first stage. And to solve problems and needs encountered in the actual implementation of the project, they actively explore and acquire new knowledge as well as apply the professional knowledge and methodology they've learned in the project practice, thus steadily improving their ability and knowledge base. After 18 months of practical training, they need to summarize the experience of project research, and present it in the final roadshow before distilling the project outcomes and materials to form their final graduation thesis.

Under the innovative teaching model of the RBM Program, students have the opportunity to take innovative methodology courses, in addition to interdisciplinary domain knowledge. These methodology courses in cross-disciplinary research methods, cross-disciplinary design thinking and transferable skills are designed to inspire students, cultivate students' problem-solving skills, and help them develop human-centered innovative mindset. The above courses are tailored to the actual needs of students for interdisciplinary group projects, and provide students with all-round guidance for the entire learning stage. Guided by this methodology, students can truly internalize knowledge into capabilities in interdisciplinary group projects. In addition, the RBM Program also organizes Project Supervisors to design a series of courses in transferable skills specifically for students, helping them develop general skills and techniques that can be applied to a variety of scenarios and improve their soft power.

However, ability development does not happen overnight. A structured course arrangement is needed to help students jump out of their original comfort zone of thinking for a gradual transformation. To this end, the RBM Program introduces a biweekly teaching report system, which breaks down the overall learning goals into each stage of project development, and promptly reminds students to plan, adjust and monitor their learning goals for each stage. After students fill out the biweekly project progress report, the Project Supervisor provides feedback and suggestions based on their reports to promptly “correct any deviations” and bring them back to the human-centered innovative mindset. This system provides personalized guidance more in line with students' development path, contributing to achieving the goal of cultivating interdisciplinary leading talent in innovation and entrepreneurship.

II. COURSES OFFERED IN THE RBM PROGRAM AT HKUST(GZ)

The pursuit of knowledge is endless. How can universities inspire students' enthusiasm for learning and develop their lifelong learning habits and mindsets during their time at school? This has become an important proposition for the curriculum setting of the RBM Program. To this end, guided by RBM's collaborative learning pathway, the College of Future Technology has offered various courses around the concept of design thinking in line with a new course-based transdisciplinary education model and cultivates students' various transferable skills in many aspects. Design thinking is a people-oriented innovation model that draws on designers' tools and methods to meet people's needs and the requirements of business success. Focusing on the cultivation of transferable skills, the courses are designed to foster students' way of thinking and abilities such as critical thinking, analyzing problems and exploring solutions to complex problems apart from mastery of professional knowledge. Learning group helps students improve their skills in communication, expression and consensus reaching. A series of courses provides students with a concurrency development of knowledge and abilities, laying a solid foundation for their future entry into society.

The RBM Program encourages supervisors to impart knowledge through a variety of approaches. Classroom knowledge is not Merely about reciting from the book. Rather, it involves guiding students to take an active role in their learning through various teaching methods, allowing them to engage with and acquire professional knowledge. The supervisor's step-by-step guidance helps students explore the pathway of thought involved in the process of knowledge acquisition. In addition to focusing on students' mastery of professional knowledge, the supervisor also observes whether they can internalize and transfer knowledge, assessing their thinking mindset and problem-solving abilities. The supervisor can also adjust the guidance strategy in a timely manner according to their learning progress and feedback, thereby promotinga synchronous enhancement of students' learning and supervisors' teaching. Moreover, the course encourages students to listen, ask questions, speak, and write more. While these may seem like simple actions, they are designed to help students step out of their comfort zones and engage in ample cognitive practice within a limited timeframe. This approach not only familiarizes them with professional knowledge but also reinforces the application of design thinking concepts across various scenarios, fostering a kind of "muscle memory". Therefore, they not only become familiar with professional knowledge but also develop “muscle memory” for design thinking concepts that can be applied to various scenarios.

Figure 5-1 Courses offered by the College of Future Technology

Code and title of cross-disciplinary core courses	Course introduction
UCMP 6010 Cross-disciplinary Research Methods I	This course focuses on using various approaches to perform quantitative analysis through real-world examples. Students will learn how to use different tools in an interdisciplinary project and how to acquire new skills on their own. The course offers different modules that are multidisciplinary/multifunctional and generally applicable to a wide class of problems.
UCMP 6030 Cross-disciplinary Design Thinking I	This course focuses on user-collaborative design methods for generating inclusive product solutions that integrate stakeholder and product functionality perspectives. Students will create specified product/process/policy/protocol/plan (5P) concept models through the use of recursive user feedback engagement methods, experimental prototyping, and divergent and convergent ideation strategies. Featured topics include design thinking; stakeholder research; concept development, screening, and selection; and interaction design.
UCMP 6050 Project-driven Collaborative Design Thinking	This course aims to familiarize students with the principles of design thinking and promote the adoption of a human-centered approach to problem-solving. Students will gain the ability to identify users' pain points, define problems, and develop creative and innovative solutions. By engaging in interdisciplinary collaboration, students will have the opportunity to apply their problem-solving skills to real-world projects. This course is divided into three modules, with each module being taken during one regular term. The course content is designed to closely follow the key milestones of students' thesis projects.

1. UCMP 6010 CROSS-DISCIPLINARY RESEARCH METHODS I

UCMP 6010 Cross-disciplinary Research Methods I is the first modularized postgraduate course at HKUST(GZ). Course modularization means that the smallest unit of course management is no longer defined by a standard duration per semester, but is determined by the actual needs of the knowledge covered in the course within the knowledge map or knowledge flow. The university organizes teaching groups consisting of faculty from different research fields to collaboratively design the modules based on the progressive logic of disciplinary knowledge and the structural characteristics of various courses. Its interdisciplinary and cross-major parallel modular design has made positive explorations and attempts for course innovation.

Design principles. Based on the characteristics of disciplines and knowledge , the course adopts a parallel model in course modularization for equipping students with the thinking, abilities and insights needed for successful interdisciplinary research. In traditional study models, students often only learn the research methods of their own discipline in a systematic way, lacking channels to systematically study and understand the research methods of other disciplines, which limits the development of interdisciplinary research. Thus HKUST(GZ) has carefully designed this course to offer a systematic approach for students to identify and solve research problems that span multiple disciplines, conduct elaborate literature reviews related to these topics and tackle different problems by effectively adopting appropriate methodologies.

As the first attempt at modular course innovation, UCMP 6010 was first launched in 2022/23 Spring Term and has been offered for three consecutive semesters. The course is divided into 9 modules, of which module A is compulsory and the other 8 modules elective. Students are required to choose at least 3 of the 8 modules to study and pass the assessment. The 9 course modules are taught by 9 instructors from different research areas. To ensure that students from different research areas can master research methods from areas other than their own, students can only choose modules (except for module A) offered by instructors from other Thrusts, thus guiding students to learn research methods from those areas.

> “Based on the characteristics of disciplines and knowledge , the course adopts a parallel model in course modularization for equipping students with the thinking, abilities and insights needed for successful interdisciplinary research.”

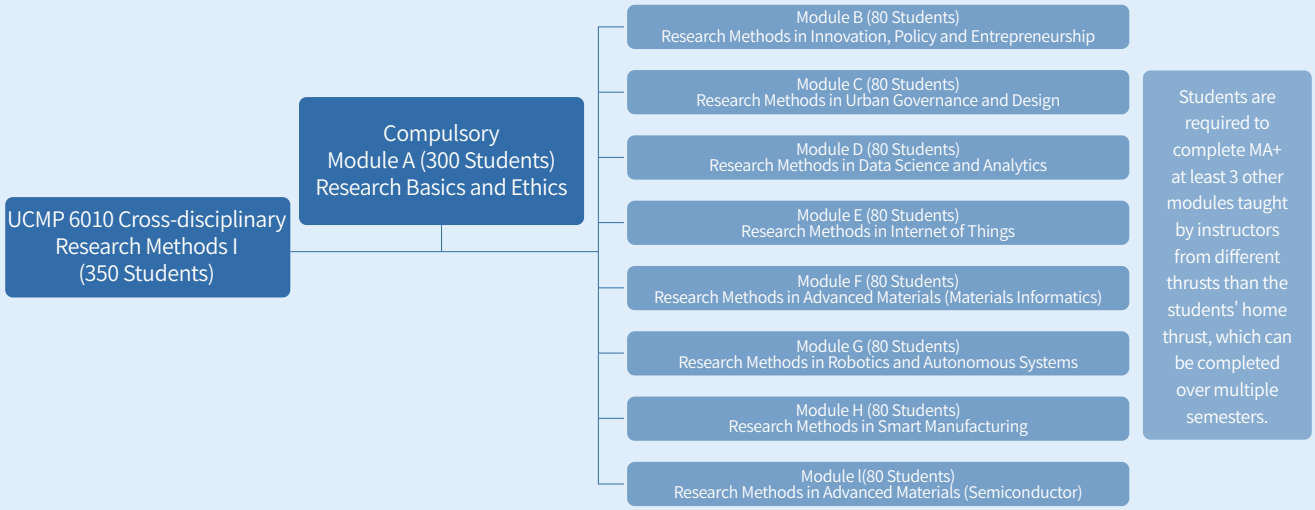


Figure 5-2 Module structure diagram for UCMP 6010 Cross-disciplinary Research Methods I

Study mode. To enable students to understand and learn research methods in other areas, the course places no limit on the number of elective modules students can choose. Students are allowed to select more than 3 elective modules from fields other than their own that interest them. After completing the modules according to the requirements, students will receive the corresponding grades for each module at the end of the semester. Students need to select satisfactory module grades to combine their final course grade on the Knowledge Module Selection System, while the grades of the extra course modules can be excluded from the final course grade. In terms of study time, students can study course modules across multiple semesters. If they could not complete the required modules in one semester or are not satisfied with the grades of certain modules, they can choose not to combine the final course grade in that semester. In this way, students' grade for that semester will be marked as "PP", and they will continue to study the course in the next semester until finally completing the required modules and getting satisfactory grades. Students' final grade for the course will be represented as a letter grade, which is calculated based on the average of the grade for module A and the grades of the other 3 elective modules.

Figure 5-3 Class of Module A


Figure 5-4 In-class Discussion of Module C

Course content. Module A mainly introduces the research basics and ethics, helping students understand the overall principles of research and the basic principles of research methods, and master general research skills. The other eight modules introduce research methods in Innovation, Policy and Entrepreneurship, Urban Governance and Design, Data Science and Analytics, Internet of Things, Advanced Materials (Materials Informatics), Robots and Autonomous Systems, Smart Manufacturing, Advanced Materials (Semiconductor) and other areas. Instructors in the above areas explain in simple terms the underlying logic and first principles of research in this area. The core lies in enabling students to master the way of thinking for research and learning in this area, rather than simply mastering the research methods at the technical level. After finishing the above content, students can understand the research foundation and research methods in different areas, and enhance their understanding of the research methods in this area through case studies. Mastering research tools in different areas, they will be able to expand and enhance their knowledge in different areas through independent learning, laying the foundation for interdisciplinary research.

2. UCMP 6030 CROSS-DISCIPLINARY DESIGN THINKING I

(1) Course introduction

With the arrival of the first cohort of RBM students on campus in September 2022, the UCMP 6030 Cross-disciplinary Design Thinking course was officially offered, aiming at cultivating students' innovative problem-solving methods and fostering human-centered thinking. This course is taught by three Project Supervisors from the College of Future Technology for 263 students. At the same time, several instructors from the Pillar of Language Education of the College of Education Sciences joined to help students improve their competence in English expression in the actual project by offering English learning resources and incorporating English learning into the course. All MPhil and PhD students are required to complete either UCMP 6010 or UCMP 6030, which are both university-level core courses. To meet the learning needs of PhD students, this course was offered exclusively for them in the spring semester of 2023.

Since the fall semester of 2023, the course was offered to both RBM students and PhD students. MPhil and PhD students learnt user-centered collaborative methods together in the same classroom to develop innovative and effective solutions. The theme for this semester was "Smart Campus", which encouraged the practice of turning the campus into a "Living Lab"

for a better tomorrow. To ensure the quality of the course, 369 students were divided into 8 classes and more than 70 project groups to explore how to improve campus life in all aspects through the principles of design thinking. The teaching group invited colleagues from different departments of the university to provide students with advice and help to support them in completing the project. From December 20 to 27, 2023, the "Smart Campus" Design Thinking Final Project Exhibition was in full swing at the Student Activity Center. More than 70 designs engaged in group roadshow, of which 16 went onstage and presented their prototype of project design they had been working on for a semester to the whole university.

Figure 5-5 Final project roadshow in the fall semester of 2023

(2) Course extension

The teaching of design thinking extends from the teaching in the classroom to various activities both on and off campus. By collaborating with different organizations, diverse approaches are adopted to classroom knowledge into real-world contexts, enhancing students' understanding and internalization of design thinking concepts. This approach solidifies the students' acquired knowledge, bridging theoretical learning with practical application. It not only enhances students' hands-on experience but also fosters their innovative thinking to deal with complex and ever-changing challenges. Moreover, these activities encourage cross-disciplinary collaboration among teachers and students, starting from user needs and considering problems from multiple perspectives. Through communication and collaboration, they generate sparks of creativity, inspiring new ideas and seeking unique, practical, and forward-thinking solutions. This collaborative process helps cultivate students' teamwork abilities and interdisciplinary thinking, preparing them to better adapt to diverse future work environments.

① Metaverse Joint Cross-disciplinary Design Thinking Course

Officially launched in the fall semester of 2023, the Metaverse Joint cross-disciplinary Design Thinking Course has proved to be highly popular among students from the outset of its registration, enrolling a total of ten students from both HKUST(GZ) and HKUST for its first round. This course leverages digital twin technology to construct a metaverse virtual classroom, enabling faculty and students from both campuses to engage in the same activities such as lectures, tutorials and seminars, thereby enhancing students' problem-solving skills and teamwork abilities. This virtual spatial platform expands the traditional teaching medium, offering new possibilities for education in terms of innovative environments and interactive content. With the strong support of the leadership from both campuses, the professors leading this course collaborated with various departments to communicate extensively and consider all aspects of demand, ultimately determining the technical solutions for the course to ensure smooth progression.

Figure 5-6 Students in the Metaverse Cross-disciplinary Design Thinking Class

② 2023 Summer Camp of Sustainable Design Thinking Certificate Program

HKUST(GZ) and HKUST co-hosted a Sustainable Design Thinking summer camp from June 1 to 9, 2023. Thirty-one students from China, Malaysia, India, Canada, and the Philippines, participated in this camp. They were divided into 8 groups and, under the guidance of supervisors from both campuses, developed sustainable development proposals tailored for the two campuses. Their experience in the summer camp helped conduct preliminary research, identify key pain points, and put on the final presentation, for which they were awarded certificates of completion.

Figure 5-7 Group photos of students at the 2023 Summer Camp of Sustainable Design Thinking Certificate Program

③ Joint Design thinking course by HKUST(GZ) and China Academy of Art

The 2023 Joint Design Thinking course, Co-organized by the China Academy of Art (CAA) and HKUST(GZ), centers on the major theme of “AIGC+ART”, showcasing the imagination and creativity from the integration of art and technology in the era of AI through interdisciplinary practical collaboration. After a competitive application process based on merit and voluntary enrollment, the 40 students recruited from both universities in June and July 2023 participated in a joint course held at HKUST(GZ) campus and CAA Xiangshan campus. Following a successful month-long exhibition of the students' work at the course in Hangzhou, the exhibition moved to the HKUST(GZ) campus. The joint course lasted a total of 31 days, has brought together 10 cross-disciplinary supervisors and 40 interdisciplinary creators from the two universities to collaborate on innovative projects.

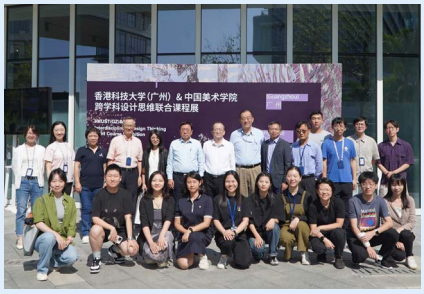


Figure 5-8 The joint course faculty and students posed for a group photo before the exhibition at HKUST(GZ) campus

3. UCMP 6050 PROJECT-DRIVEN COLLABORATIVE DESIGN THINKING

(1) Continuous innovation and self-iteration: evolution from UCMP 6030 to UCMP 6050

① Course background

UCMP 6030 Transdisciplinary Design Thinking, with people-oriented design thinking as an innovative problem-solving idea and methodology, advocates project-based learning based on teamwork. The course for the fall semester in 2023, themed “Smart Campus”, encouraged students to engage in a group-based exploration of diverse facets of campus life and learn to identify pain points experienced by both students and teachers in their daily campus life. Inspired by design thinking, they innovatively addressed challenges such as energy conservation, library resources, and waste recycling on campus by

conducting comprehensive research to understand and define problems, offering better solutions to improve campus life. The integration of PBL and design thinking empowers students to learn by doing in project teams with diverse backgrounds, fostering interdisciplinary collaboration and significantly enhancing their comprehensive abilities.

② Course design

The RBM Program actively iterates its course and teaching arrangement based on ongoing observations, aiming to be aligned with the evolving needs of students and the future workforce. Based on the feedback from the first class of RBM students on their course learning and project progress, the RBM Program has conducted timely reviews of its institutional mechanisms. This innovative PBL training model features group research projects that extend throughout the two-year postgraduate program, with key milestones ensuring continuous project development. Such project-driven training programs require consistent guidance of methodological and conceptual knowledge. Therefore, the methodology of thinking should be taught throughout key stages of students' group research to effectively promote their learning outcomes. In light of this, the RBM Program has designed and launched a new course, UCMP 6050: Project-driven Collaborative Design Thinking, specifically for RBM students, while the existing UCMP 6030 course will continue to be offered to all doctoral students.

③ Study model

UCMP 6050 is a two-credit course structured into three sequential modules, each spanning one semester and consisting of 30 hours that cover both classroom lectures and practical learning. A total of 90 learning hours is allocated to provide students with a comprehensive and in-depth learning experience. Each semester's modular course content is closely aligned with the key milestones of the RBM students' thesis projects (see Figure 5-9), providing real-time, dynamic support for their team research.

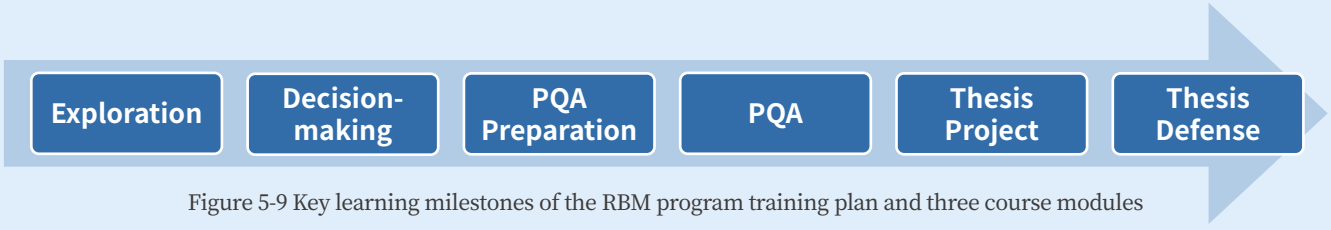


Figure 5-9 Key learning milestones of the RBM program training plan and three course modules

Module 1 for the first semester begins with key stages and a complete cycle of design thinking: empathy, definition (of questions), ideation, prototyping and testing, offering students an overall understanding of its necessary aspects as an innovative methodology for problem solving. Then it focuses on finding research opportunities and defining potential problems, corresponding to the key milestones of “exploration” and “decision making” in the training plan of the RBM Program. Module 2 in the second semester emphasizes solution ideation and prototyping, corresponding to the key milestones of “PQA preparation” and “PQA”. And Module 3 in the third semester is themed on project implementation, corresponding to the key milestone of “thesis project”.

④ Course significance

The setting of UCMP 6050 reflects the RBM program's pursuit of innovation in the philosophy of education and teaching as well as the training system. As a university core course in the postgraduate training program, it requires a higher level of attention from the university, teachers and students. This not only means paying attention to the simultaneous cultivation of knowledge and abilities required of the course, but also a promotion of innovation in philosophy of education and teaching as well as the training system. Through such institutional iterative innovation, the RBM program will more effectively foster students' knowledge and abilities simultaneously, laying a solid foundation for their future academic and professional careers.

(2) Synchronization of knowledge and abilities: innovation and challenges of UCMP 6050

UCMP 6050 adopts group project-based interactive teaching approach taught by Project Supervisors from the College of Future Technology. Each supervisor leads a class of 4-6 groups of students, each group consisting of several students, who work as a team in the project-driven collaborative course. With the concept of design thinking, the supervisor guides students to work together in a project-based learning environment to discover, define and solve project problems, thus achieving simultaneous improvement of knowledge and ability. In this process, teachers not only pass down knowledge, but also set an example in the practice of design thinking. They must be able to adjust and optimize teaching strategies in different teaching scenarios according to the specific needs of student groups and project progress, in order to continuously provide conditions and resources required for the development of student groups in a constantly changing teaching environment.

In terms of educational innovation, the UCMP 6050 course aims to integrate the design thinking knowledge with the improvement of students' ability to promote team projects for a unity of knowledge and action. The course creates a unique micro-teaching environment through research topics, collaborative processes and other related elements of each team's group project. To effectively teach design thinking in this environment, teachers need to implement customized teaching strategies for each team's specific project.

This customized teaching method poses high professional requirements on teachers, who need to apply their own diverse research and teaching experience to internalize the unified intended learning outcomes. Just as martial arts masters use any items at hand as weapons to achieve their goals, teachers with high teaching adaptability and innovation can customize and adjust teaching content and methods through various teaching resources and strategies according to students' research interests and learning needs. In a diverse learning environment, teachers can flexibly use a variety of teaching methods for different student groups to effectively achieve these intended learning outcomes.

In addition, like the two above compulsory courses, teachers in the UCMP 6050 course, which is still under design, are composed of experts and professors from different disciplines and professional backgrounds. Senior teachers work closely with young teachers as a highly responsive, supportive and united teaching group by giving full play to their respective disciplinary backgrounds and personal expertise, as well as sharing and supporting each other in curriculum design, teaching design and teaching experience.

FACULTY TEAM BUILDING

06

VI. FACULTY TEAM BUILDING

The teaching model of the RBM Program emphasizes project-based learning, guiding students to internalize their abilities through repeated training and immersion for quickly transferring to other abilities and new knowledge areas. Unfortunately, many "knowledge winners" are always hesitant about capacity building. In imparting knowledge and guiding academic development, traditional university teachers often ignore the process of ability training for students, which poses huge challenges for the RBM Program in achieving the simultaneous development of knowledge and ability. The key to the success of the program lies in building a faculty competent in interdisciplinary teaching and innovative spirit. This chapter will analyze the challenges faced by the program in faculty team building, and introduce measures such as talent recruitment, career development and faculty training to improve the comprehensive quality of the faculty and the ability to integrate disciplines.

I. CHALLENGES FACED BY FACULTY TEAM BUILDING

1. LIMITATIONS OF THE TRADITIONAL MASTER-APPRENTICE MODEL

In the current system of higher education, postgraduate education mostly adopts the master-apprentice model under which students are often restricted by the framework of exam-oriented education and lack in-depth exploration of their personal scientific research interests and expertise. Most students will choose to "obey" the arrangements of their supervisors in order to graduate with a degree. However, the RBM model proposes a new educational idea: encouraging students to explore and try and fail according to their true scientific research ideas based on their own wishes, abilities and interests, on the condition that sufficient academic guidance is given. This model greatly promotes the internalization of students' abilities, but it may also cause conflicts in cognition and interests between students and supervisors. Especially when students' academic research interests are inconsistent with the research direction of supervisors, the guidance of postgraduate students may be regarded as an extra burden by supervisors. This is the first important challenge faced by the RBM Program.

2. INADEQUATE METHODS OF FOSTERING STUDENTS' SOFT SKILLS BY ACADEMIC SUPERVISORS

Despite their profound knowledge base and rich academic guidance experience as "knowledge winners" in their disciplines, Academic Supervisors often lack effective training and methods for fostering students' soft skills or transferable skills. This makes it difficult for Academic Supervisors to consciously, strategically and systematically impart these abilities. This dilemma cannot be changed overnight through training for teachers, but rather reflects the significant gap in faculty in the transition from traditional higher education to transdisciplinary education. The RBM program cannot rely entirely on teachers in the thrust to guide students in their academic studies as well as their capacity building. This shortcoming is the second important challenge facing the RBM Program.

3. INTRODUCTION AND IMPLEMENTATION OF THE PROJECT SUPERVISOR SYSTEM

In response to the above challenges, the RBM Program introduces a Project Supervisor system through an innovative mechanism design, aiming to solve the incompatibility between the traditional graduate training model and the RBM education model, and at the same time make up for the shortcomings of academic supervisors in teaching soft skills and transferable skills. The core of the Project Supervisor system is to further establish a multi-dimensional, interdisciplinary educational community based on the Academic Supervisor system. Project Supervisors must have different professional backgrounds and skills, and the experience of being independently responsible for large-scale projects in addition to academic projects that can provide students with specialized guidance and support for transferable skills.

First, through clear roles and responsibilities, the Project Supervisor system ensures that students receive sufficient personal attention during scientific research and exploration, especially students' ability training and personal development. Second, the Project Supervisor system is conducive to promoting interdisciplinary cooperation. Through cross-disciplinary knowledge accumulation and diversified industry experience, project supervisors play the role of the bridge for interdisciplinary cooperation projects. Third, the Project Supervisor system is conducive to cultivating students' transferable skills and transdisciplinary thinking. By integrating transferable skills in different areas, the system provides students with a broader academic vision and opportunities for practice. Students are offered access to diverse ways of thinking and problem-solving methods, which helps them develop innovative thinking and transdisciplinary thinking, and foster the capability of solving complex real-world problems. Therefore, it is necessary for the RBM Program to resolve the current dilemma and promote the development of transdisciplinary education in a more personalized, diversified and practical direction through a new Project Supervisor system.

II. SPECIFIC MEASURES

1. TALENT RECRUITMENT

CFT is dedicated to developing a diverse faculty team with comprehensive qualities to support the RBM Program's shift towards a transdisciplinary talent cultivation paradigm. The RBM Program seeks faculty members with a solid academic foundation, extensive experience, and diverse backgrounds. This combination strengthens faculty support for this innovative master's program, ensures students develop knowledge and skills in parallel, and helps cultivate transdisciplinary leading talent in innovation and entrepreneurship. Key considerations in building the faculty team include:

(1) Passion for education and shared values

A passion for education and a shared educational philosophy are the primary criteria for selecting a Project Supervisor for the RBM Program. Only teachers with a deep enthusiasm for education can translate their ideals into consistent, innovative daily practices. The program continually seeks teachers with a strong sense of mission, dedication to educational reform, and perseverance, who are willing to invest significant time and effort in understanding students' needs, designing tailored courses, and exploring new teaching methods to enhance learning outcomes. Their passion should go beyond mere

transmission of knowledge to inspiring students to explore their potential and academic interests. To ensure this, the RBM Program employs a carefully crafted evaluation mechanism to comprehensively and deeply assess candidates' teaching abilities, potential, and experiences. Given the program's unique educational ecosystem, this evaluation process values not only academic diversity but also industry experience and cross-disciplinary capabilities.

① **Structured interview questions:** The interview process follows a well-structured question framework designed to thoroughly explore candidates' educational philosophies and practices. For example, regarding educational vision and motivation, candidates might be asked, "Why do you choose to engage with the RBM Program? How do you interpret the program's innovative education model?" These questions aim to assess whether candidates have a deep understanding of and passion for the program's educational vision.

② **In-depth analysis of teaching cases:** Candidates are required to present innovative practices from their previous teaching experience or related fields and submit supporting materials. For instance, they may be asked, "Can you share an instance where you successfully guided students to surpass their own limits? How did this foster their active learning and innovation abilities?" This part assesses candidates' ability to apply innovative teaching methods in real-world situations and to motivate and support student growth.

③ **Transfer of cross-domain experience:** To develop a diverse faculty, the RBM Program gives particular attention to candidates transitioning from sectors such as government, business, and entrepreneurial ventures. During the interview, the panel will explore how these prior experiences can translate into unique strengths in education. For example, candidates might be asked, "How do you plan to integrate your experience in business/government/startups into your courses to enhance students' practical skills and innovative thinking?" Such discussions evaluate candidates' commitment, adaptability, and creativity in transitioning to the role of a Project Supervisor.

④ **Leadership and project management skills:** Given the importance of teamwork and PBL in education, the panel will closely evaluate candidates' leadership and project management abilities. Candidates may be asked, "Can you describe a time when you successfully led a team to complete an educational project or research? How did you support team members' growth during the process?". These questions are designed to assess how candidates empower their teams and how their leadership experiences positively contribute to student development.

This comprehensive evaluation strategy ensures that each teacher joining the RBM Program not only brings a diverse background and rich experience but also demonstrates the ability to integrate these insights into their teaching, inspiring students and fostering their growth on multiple levels while contributing to educational innovation.

(2) Academic background and practical experience

Project Supervisors in the RBM Program are expected to have extensive academic research and project experience and to be able to guide and support students in team-based research projects by drawing on their academic knowledge and hands-on expertise. They must have undergone sufficient academic training, with key evaluation criteria including degree certification, academic achievements, quantitative assessment of corporate and project experience, evaluation of research methods and academic literacy, continuous learning and academic contributions, peer reviews, and student feedback. This ensures they can provide students with strong academic guidance and research experience in their respective fields. With a solid foundation in knowledge, research methods, critical thinking, and academic research, they are well-equipped to effectively guide students in transdisciplinary learning and hands-on projects. In addition, Project Supervisors are expected to have industry experience or strong collaborative ties with the business sector, alongside rich team project experiences across diverse settings such as businesses, research institutes, and universities. This enables them to effectively guide students in team-building, identify research directions in a transdisciplinary context, manage and execute projects, and offer comprehensive resource support.

Furthermore, Project Supervisors should have experience in fostering transferable skills in others and the ability to use creative teaching strategies to help students grasp the learning content while cultivating their independent thinking and teamwork abilities. A faculty team with these qualities will significantly enrich the educational resources of the RBM Program, enhance the teaching quality, strengthen the program's competitiveness in nurturing future-oriented talent, and support students' all-round development.

(3) Diverse backgrounds

The RBM Program places a strong emphasis on faculty diversity and adopts a range of forward-looking and inclusive recruitment strategies and team-building approaches to create a diverse team that prepares students for the complexities of future society and helps them grow into problem solvers for future challenges. First, the program values diversity in academic backgrounds, bringing together faculty from various fields, including natural sciences, engineering, humanities, and social sciences. This academic diversity offers students a wide range of perspectives and expands their knowledge horizon while supporting transdisciplinary team projects and fostering cross-disciplinary collaboration and innovation. Second, the program emphasizes cultural diversity by actively recruiting faculty from different countries and cultural backgrounds. This enriches the curriculum with varied cultural perspectives, exposing students to diverse ways of thinking and problem-solving. As a result, students develop a global vision and cross-cultural communication skills, which better prepare them to navigate the diversity and complexity of a globalized world. Moreover, this cross-cultural exchange and collaboration offer students a more comprehensive learning experience. Third, the program prioritizes diversity in industry backgrounds by strengthening partnerships with various sectors. It seeks candidates with innovative teaching methods and relevant industry experience, aiming to equip students with design thinking, critical thinking, and skills to address real-life challenges in diverse situations. To build a diverse faculty, the RBM Program employs a combination of innovative recruitment strategies and team-building initiatives:

① **Global recruitment platforms and partnerships:** The program actively expands its channels for recruiting overseas talent by participating in global education forums and recruitment fairs, hosting specialized recruitment events in top-performing countries and regions in education, and maintaining long-term partnerships with leading international universities and research institutions.

② **Cross-cultural adaptability assessment:** The program integrates assessments of cross-cultural communication and collaboration skills into the recruitment process through scenario-based simulations and case studies. This approach ensures that new faculty members not only possess valuable expertise but are also well-prepared to teach effectively in a multicultural environment.

③ **Industry Supervisor scheme:** The program maintains partnerships with renowned enterprises, government agencies, and non-profit organizations and invites industry experts to serve as part-time or visiting professors. This collaboration brings the latest industry practices and cutting-edge developments directly into the classroom.

Looking ahead, the RBM Program is dedicated to creating a boundaryless learning community, where distinctions between teachers and students, scholars and practitioners increasingly fade as they collaborate in global knowledge creation and problem-solving. By continuously optimizing its faculty structure and strengthening international cooperation and exchange, the program aims to push the boundaries of educational innovation and cultivate transdisciplinary talent capable of leading the future and addressing global challenges.

2. CAREER DEVELOPMENT AND TEACHER TRAINING

The RBM Program's objective of concurrently developing students' knowledge and skills imposes greater demands and expectations on educators. In response, HKUST(GZ) offers continuous support through a series of meticulously designed capacity-building activities and teaching resources, which not only enhance educators' capabilities but also foster innovation in teaching. These initiatives establish a robust foundation for improving overall teaching quality. With this comprehensive and ongoing support, HKUST(GZ) is actively cultivating a dynamic, innovative, and sustainable teaching ecosystem.

(1) Comprehensive teacher training measures

HKUST(GZ) proactively encourages and supports the continuous enhancement of teaching skills through various initiatives. These include adaptation and training programs for new faculty members, customized visits to prestigious overseas universities for all faculty, and specialized training programs for Project Supervisors in the RBM Program.

① New Faculty Teaching Program (NFTP)

To facilitate faculty development and promote an open, innovative educational environment, HKUST(GZ) has introduced the Teaching Universe Framework. This comprehensive training system is designed to encourage faculty growth, the adoption of cutting-edge teaching methods, and their integration into the curriculum. The framework also emphasizes leadership development, management skills, and Scholarships of teaching and learning (SoTL). Central to this framework is the New Faculty Teaching Program (NFTP), specifically designed for newly appointed faculty at HKUST(GZ), who are required to complete a specified number of training hours within their first year. During the 2024 Spring Term, NFTP offered 11 training sessions on various topics, including HKUST(GZ)'s teaching philosophy, policies, ethics, innovative teaching methods guided by active learning principles, educational technology, and evaluation strategies—addressing the unique needs of new faculty. NFTP also enables new project supervisors of the RBM Program to quickly acclimate to HKUST(GZ)'s teaching culture and expectations.

Figure 6-1 President Lionel M. Ni introducing HKUST(GZ)'s teaching philosophy to new faculty members

② Overseas study trip

From August 2 to 3, 2023, a delegation of faculty from the RBM Program and various Hubs of HKUST(GZ) visited the Singapore University of Technology and Design (SUTD) for a two-day exchange. During the visit, faculty members gained deep insights into how SUTD employs its innovative design thinking-led educational philosophy to organize teaching practices and drive institutional innovation, as well as how it systematically uses innovative teaching methods, such as flipped classrooms, to enhance educational quality. The delegation also explored a wealth of teaching cases and practical experiences, which provided HKUST(GZ) faculty, including Project Supervisors in the RBM Program, with detailed references to inform their teaching practices and course design.

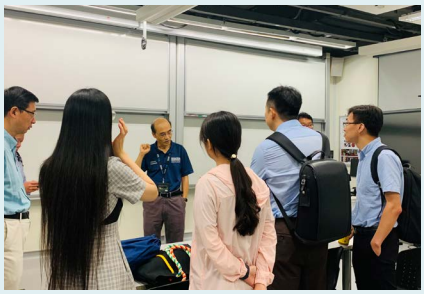


Figure 6-2 Visit at SUTD

③ Specialized training for Project Supervisors in the RBM Program

The RBM Program's talent cultivation goals and curriculum design differ from conventional programs, requiring distinct teaching objectives, methods, and evaluation strategies. To address these needs, HKUST(GZ) has developed a training program focused on transferable skills development, specifically for Project Supervisors in the RBM Program. In the 2024 Spring Term, six bi-weekly lectures and workshops were organized, covering essential topics such as teaching plan design, interdisciplinary thinking, critical thinking, communication, entrepreneurial spirit, and innovative thinking. These sessions equip Project Supervisors with the tools necessary to guide and support students in mastering crucial transferable skills. Leveraging their experience and expertise, trainers presented rich case studies, broadening the knowledge base of Project Supervisors and providing practical, actionable examples for designing courses and fostering transferable skills in students.

Figure 6-3 RBM Program's Project Supervisors receiving specialized training

Table 6-1 Specialized training sessions for Project Supervisors in the RBM Program

Training sessions	Essential transferable skills	Duration
1	Teaching plan	3.5 hours
2	Interdisciplinary mindset	3.5 hours
3	Critical thinking	3.5 hours
4	Communication	3.5 hours
5	Entrepreneurship spirit	3.5 hours
6	Innovative thinking	3.5 hours

(2) Systematic teaching evaluation mechanism

The RBM Program continuously enhances teaching quality by gathering feedback from various channels. One example is the regular teaching evaluation meetings, where Project Supervisors and students discuss teaching effectiveness and share suggestions for improvement. This feedback serves as the foundation for making necessary adjustments and improvements to the teaching approach.

① Bi-weekly teaching plan for Project Supervisors

Throughout the two-year RBM Program, Project Supervisors are responsible for using design thinking to guide students in identifying, defining, and solving real-world problems while forming project teams, ensuring the synchronized development of students' knowledge and skills. To achieve these objectives, Project Supervisors must clearly define intended learning outcomes (ILOs) for various stages of the program and choose appropriate teaching methods based on their experience to meet students' specific needs. They are also tasked with setting relevant learning content and assessing students' progress to complete the teaching cycle. To facilitate this process, the RBM Program has established a bi-weekly teaching plan for Project Supervisors (see Table 6-2), which Project Supervisors have to distribute to students before each teaching period to ensure that students are aware of the objectives and content.

> “The RBM Program has established a bi-weekly teaching plan for Project Supervisors (see Table 6-2), which Project Supervisors have to distribute to students before each teaching period to ensure that students are aware of the objectives and content.”

Table 6-2 Bi-weekly teaching plan for Project Supervisors

Project Supervisor Teaching Plan			
Form Content		Data and Logic	
		Required/ Optional	Form Type
Name		/	Auto Insert
Teaching Week		/	Auto Insert
Teaching Content		Yes	Multi-line Input
Intended Learning Outcomes(TLOs)	Content	Yes	Multi-line Input
	Add a Line		
Teaching Methods		Yes	Multi-line Input
Assessment Methods		Yes	Multi-line Input
Assessment Rubrics for Grading		Yes	Multi-line Input
Attachment	Click to Upload	No	File Upload

The content to be filled out in the teaching plan includes:

- **Intended learning outcomes (ILOs):** Project Supervisors should explicitly list the ILOs, specifying them to a level that can be quantified to facilitate evaluation.
- **Teaching content:** Project Supervisors should clearly outline the content to be covered during the current period and ensure it aligns with the ILOs.
- **Teaching methods:** Project Supervisors should select teaching methods that effectively foster students' transferable skills, rather than relying solely on traditional classroom teaching, while ensuring alignment with the ILOs and teaching content.
- **Assessment methods:** Project Supervisors are responsible for designing and implementing assessment methods that correspond to the ILOs to ensure students meet the expected objectives.
- **Assessment rubrics for grading:** Project Supervisors should provide transparent grading rubrics and processes, ensuring that students understand the basis and standards for assessment, so as to guide them towards achieving the expected objectives.

② Student feedback

Under the Bi-weekly Teaching and Learning Report mechanism, students are required to report both their academic research progress and project progress to their Project Supervisor. In addition, they have to provide feedback on the teaching plan issued by their Project Supervisor and on the teaching activities over the past two weeks in their bi-weekly project log. This feedback, based on factual assessments of the Project Supervisor's teaching practices, is given anonymously through simple yes/no questions, allowing for an objective evaluation of the teaching plan's implementation and promoting continuous improvement in teaching. The content includes:

Table 6-3 Student feedback on the teaching plan

Student Feedback on Teaching Plan		
Category	Statement	Response
Intended Learning Outcomes	My PS explained the ILOs to me	Yes/No
Teaching Content	My PS covered the listed teaching content(Student provide feedback on each part of teaching content)	Yes/No
Teaching Methods	My PS used the listed teaching method(s) in the last two weeks' teaching (Student provide feedback on each part of teaching method)	Yes/No
	Students don't have to know the pedagogical jargons, no more teaching method selection	
Assessment Methods	My PS explained the requirements and expectations on the assessment(s)	Yes/No
Assessment Rubrics	My PS explained the criteria on assessment(s) to me	Yes/No
	My PS provided feedback based on my performance	Yes/No

(3) Closed-loop mechanism for capacity building

The RBM Program regularly organizes teaching seminars to provide Project Supervisors with a platform for exchanging ideas and learning from one another. During these seminars, Project Supervisors can discuss challenges they encounter in their teaching, share successful practices, and receive feedback from colleagues, For example, the RBM Program encourages Project Supervisors to employ diverse teaching methods, such as flipped classrooms, case-based teaching, and interactive discussions, to motivate students and foster critical thinking in them. Project Supervisors are also encouraged to document their teaching practices and share them at these seminars, allowing other faculty members to learn from and adopt effective approaches. The core objective of the RBM Program's quality assurance mechanism is to create a closed loop for capacity building, ensuring that teaching practices are closely linked to personal growth. This continuous cycle facilitates the ongoing refinement of teaching design and the steady enhancement of teacher capacity.

① Teaching plan design

Project Supervisors develop teaching plans that align with academic standards while unlocking student potential by thoroughly analyzing students' learning needs, cognitive characteristics, and industry trends. At this stage, Project Supervisors leverage their own experience to create plans aimed at cultivating transferable skills, such as critical thinking, innovation, and practical abilities.

② Teaching practice

During the teaching practice stage, Project Supervisors employ various teaching methods, including case studies, group discussions, and experiments, to engage students and guide them in active exploration and in-depth thinking.

③ Ongoing capacity building

Project Supervisors continuously enhance their teaching skills and professional competencies through self-reflection, participation in teaching seminars, classroom observations, peer reviews, and tailored training programs.

④ Continuous refinement of teaching design

Project Supervisors regularly refine their teaching designs based on feedback on their practices, ensuring that their instructional activities remain optimized and effective.

In this closed-loop process, Project Supervisors gradually develop a conscious awareness of teaching by following the essential steps of teaching design, practice, reflection, and improvement. They internalize teaching concepts and methods through this process, seamlessly integrating them into their instructional practices. This internalization is vital for fostering students' soft skills, including critical thinking, innovation, and teamwork. By employing this closed-loop mechanism, the RBM Program enhances Project Supervisors' teaching abilities and overall teaching quality, thereby establishing a solid foundation for students' holistic development, which not only supports their academic growth but also prepares them for future careers.

(4) Culture immersion: Mingzhi series events

The Mingzhi series events cultivate a vibrant atmosphere while promoting faculty development, including Project Supervisors in the RBM Program. This series includes the Mingzhi Education Forum, Mingzhi Teaching and Learning, and Mingzhi Distinguish Lecture—Liberal Arts Salon, offering Project Supervisors a platform for growth through knowledge expansion, innovation in teaching methods, and in-depth peer exchanges.

Mingzhi Education Forum invites researchers and practitioners in the education field to share insights, experiences, and challenges with faculty, students, and the public. Its goal is to inspire participants to reflect on educational innovation and explore solutions collaboratively. This initiative helps Project Supervisors from diverse professional backgrounds refresh their teaching concepts and methods, creating a more open and interactive learning environment.

Mingzhi Teaching and Learning is a platform focused on teaching practice. It invites teaching experts from various fields to share innovative methods and best practices with faculty and teaching assistants, aiming to enhance teaching skills and effectiveness. Through this exchange, Project Supervisors inspire one another, grow together, and contribute to the overall improvement of teaching quality.

Mingzhi Distinguish Lecture—Liberal Arts Salon emphasizes cross-disciplinary exchanges in the humanities and social sciences. It features renowned scholars, artists, and industry experts who share their personal experiences and research findings. The aim is to deepen understanding of holistic development and liberal arts education among faculty and students, strengthen multicultural exchange on campus, and broaden the academic perspectives of both teachers and students.

Figure 6-4 Project Supervisors in the RBM Program participating in the Mingzhi Teaching and Learning lecture

In summary, HKUST(GZ) is progressing toward an open, integrated, and sustainable teaching support mechanism through a range of innovative activities and training programs. It enhances educators' instructional skills and academic standards while fostering a teaching culture centered on the individualized development and holistic growth of each student. Consequently, it cultivates a vibrant and innovation-driven teaching community that continuously advances the quality of education at HKUST(GZ).

DIGITAL TECHNOLOGY IN PBL MANAGEMENT AND QUALITY ASSURANCE

07

VII. DIGITAL TECHNOLOGY IN PBL MANAGEMENT AND QUALITY ASSURANCE

Fragmented administrative and teaching processes in universities often lead to inefficiencies and hinder data-backed decision-making. As technology and industry evolve rapidly, educational systems must adapt more flexibly and swiftly, but traditional frameworks often fail to meet these demands. While the RBM Program adopts innovative transdisciplinary PBL, it faces several quality assurance challenges in its implementation. High-quality mentorship from Academic Supervisors is essential for advancing academic research, and effective management mechanisms are needed to improve students' project management skills. Moreover, cultivating transferable skills requires careful teaching design and continuous feedback from Project Supervisors. Practical obstacles, such as low student engagement, difficulty in tracking teachers' workloads, and challenges in monitoring teaching quality, can undermine the intended outcomes and effectiveness of PBL.

Fortunately, there are already industry cases where significant transformations have been achieved through the adoption of digital strategies. These companies leverage digital and data platforms to collect and analyze information, which not only drives business innovation but also improves operational efficiency. In this context, how can the RBM Program at HKUST(GZ) utilize digital technology to enhance teaching management efficiency and ensure quality? The program has introduced a Full-life Cycle Digital Teaching and Learning Management System, which ensures teaching quality through digital process management. This system enables data traceability, event retrospectives, and real-time, evidence-based suggestions and feedback for future teaching improvement. Not only does this approach align with industry standards, but it also sets a new benchmark for higher education practices. By creating more integrated, responsive, and effective educational processes, it offers innovative solutions to existing challenges. This chapter will explore how the RBM Program develops the Full-life Cycle Digital Teaching and Learning Management System and data platform to improve administrative efficiency, personalize teaching and ensure teaching quality, and showcase the application of digital technology in PBL through specific examples.

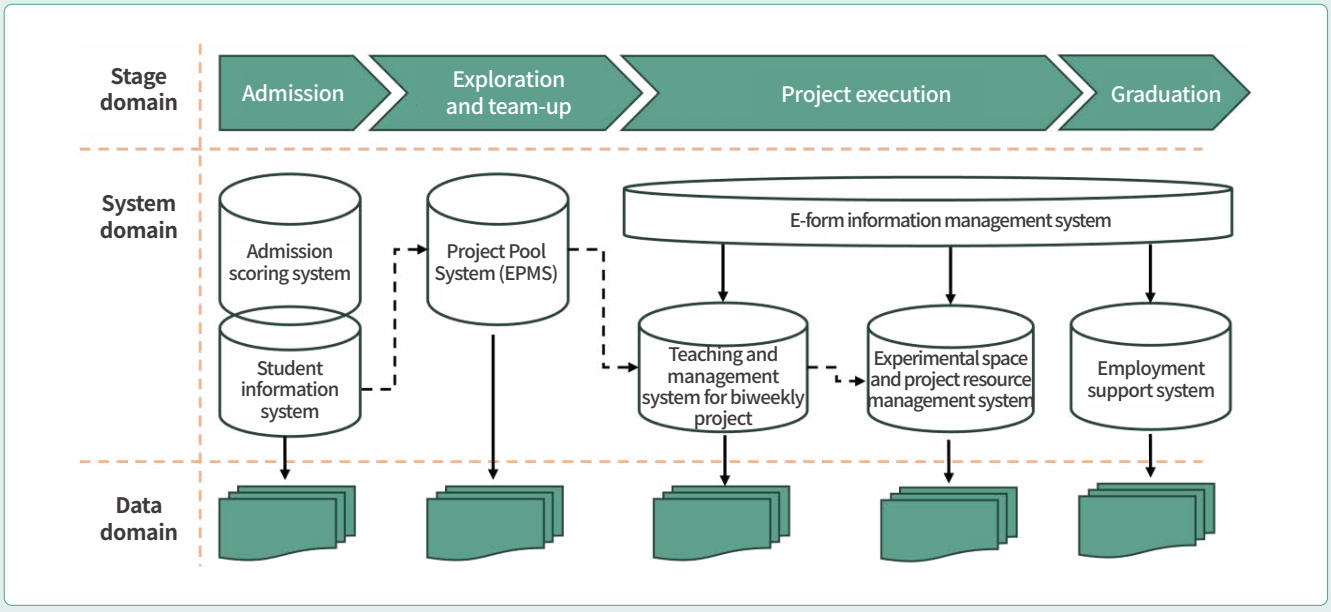


Figure 7-1 Roadmap of Full-life Cycle Digital Teaching and Learning Management for RBM students

I. NECESSITY OF BUILDING A FULL-LIFE CYCLE DIGITAL TEACHING AND LEARNING MANAGEMENT SYSTEM AND DATA PLATFORM

Building a Full-life Cycle Digital Teaching and Learning Management System and data platform holds significant value. First, it supports innovative and personalized student learning. By analyzing individual learning patterns and outcomes, the system provides each student with customized project paths and resources, encouraging innovative approaches and critical thinking in solving cross-disciplinary problems. Second, it enhances administrative efficiency. The Full-life Cycle Digital Teaching and Learning Management System significantly reduces administrative burdens by automating and integrating processes such as admissions, grading, and alumni tracking. This automation eliminates inefficient manual tasks, allowing faculty and staff to focus on activities that directly impact student success. Third, it improves teaching and learning outcomes through data-driven insights. Teachers can use these insights to adjust their teaching methods and content to better meet the diverse needs of students. This adaptive approach ensures that students benefit from individualized education, which is particularly critical in PBL, where real-time adjustments are key. Fourth, it ensures data integration and security. As concerns over data privacy and security grow, a robust system that seamlessly integrates with other platforms while ensuring data security is essential. This integration helps create a unified educational ecosystem and facilitates secure cross-disciplinary and industry collaboration.

II. ROLE AND VALUE OF TRANSDISCIPLINARY PBL MANAGEMENT

PBL is a key initiative of the RBM Program aimed at addressing pain points in higher education talent development and cultivating “transdisciplinary leading talent in innovation and entrepreneurship”. To support this, the program has introduced innovative designs in project planning, team composition, and project and teaching management. However, PBL presents several challenges: How can students' academic abilities be fully developed through project participation? How can their transferable skills extend beyond theoretical knowledge? And how can PBL be sustained over the two-year cycle with effective collaboration between students and faculty? These challenges place significant demands on both faculty and administrative staff involved in the RBM Program. To address these issues, the program continuously refines its teaching process through close collaboration among all stakeholders to ensure the effective implementation of its educational philosophy. Key factors in ensuring the quality of PBL include timely tracking of student project progress, effective documentation of teaching activities and student growth, and ongoing improvements in teaching quality and effectiveness.

III. CHALLENGES OF IMPLEMENTING INNOVATIVE TRANSDISCIPLINARY PBL AND ENSURING QUALITY

The innovative use of PBL in the RBM Program throughout the two-year study cycle aims to enhance students' academic research and transferable skills by engaging them in projects that identify, define, and solve real-world problems. However, these projects differ from typical industry projects; they are fundamentally educational endeavors designed to hone students' knowledge and skills and promote their long-term development. In these projects, the training and experiences students acquire during the process are often more valued than the final outcomes, whereas conventional industry projects focus primarily on achieving tangible results. This fundamental distinction in project objectives between PBL and industry projects creates considerable challenges in managing the teaching process and ensuring quality in PBL. It has become increasingly clear that PBL cannot simply replicate traditional project management methods. As an educational strategy that uses projects to develop students' academic research and transferable skills, it faces multiple quality assurance challenges during implementation:

1. ACADEMIC DEVELOPMENT CHALLENGES

(1) Students: A primary training goal of the RBM Program, as an MPhil Program, is to enable students to integrate theoretical knowledge with real-world issues through PBL and to conduct in-depth research so as to meet the academic standards required for earning a master's degree. As a result, students' research projects must exhibit a certain level of academic rigor to fulfill both academic and degree requirements. However, during the research process, students may encounter challenges such as a lack of clarity of research direction and difficulties in accessing resources, which may affect the depth and breadth of their research. Therefore, the involvement of Academic Supervisors in guiding students through these obstacles is essential.

(2) Academic Supervisors: Insufficient engagement from Academic Supervisors poses a significant challenge. While HKUST(GZ) policy mandates their participation in VPTLO-related teaching, accurately recording the workload of Academic Supervisors in the RBM Program has proven difficult. Consequently, there is a lack of ongoing monitoring and evaluation of teaching quality. This leads to a key question: how can we effectively track interactions between supervisors and students regarding their research projects to ensure high-quality teaching?

2. DIFFICULTIES IN TRANSFERABLE SKILLS DEVELOPMENT

(1) Students: PBL emphasizes cross-disciplinary collaboration and hands-on practice, requiring students to play active roles in teams to enhance transferable skills such as communication, coordination, and innovation. However, the diverse backgrounds and limited collaborative experience of team members can hinder this process. Without an effective skill development framework that enables timely and constructive feedback and allows teachers to adjust their strategies for students' growth, students may struggle to fully realize their potential in practice, leading to ineffective skill development.

(2) Project Supervisors: Developing transferable skills must extend beyond traditional classroom instruction and cannot rely solely on the transmission of knowledge and methodologies. Conventional curricula and teaching plans often overlook the interactions between Project Supervisors and students, making it difficult to quantify the contributions of Project Supervisors. As a result, their efforts may be underestimated as "light work".

This situation raises important questions: How can we effectively document the development of transferable skills as projects progress, particularly in non-traditional classroom settings? Given the difficulties in measuring transferable skills, how can we accurately evaluate the teaching efforts of Project Supervisors?

3. INEFFICIENCIES IN PROJECT MANAGEMENT

(1) Students: Project management is central to PBL, requiring students to effectively plan, execute, and monitor their projects. However, many students lack systematic training and practical experience in this area, which can lead to issues such as poor time management, unreasonable resource allocation, and insufficient risk control during execution, negatively impacting overall project efficiency and outcomes.

(2) Project Supervisors, Academic Supervisors, and Project Managers: They face the challenge of aligning team goals with individual objectives while advancing project progress. The success of a project often relies on collaboration among multiple supervisors, including Project Supervisors, Academic Supervisors, and Industry Supervisors. Yet, there may be a lack of effective communication and collaboration mechanisms between these supervisors, which hinders project synergy.

Then, how can we keep Project Supervisors, Academic Supervisors, and Project Managers updated on students' project and research progress in a more intuitive and transparent manner to help students navigate management challenges throughout the project process?

IV. EXAMPLES OF PBL MANAGEMENT AND QUALITY ASSURANCE

To tackle these challenges, implementing effective teaching process management and quality assurance mechanisms is essential. Digital tools and platforms facilitate real-time data tracking, resource management, and communication and collaboration, helping both teachers and students better navigate the challenges in PBL and enhance teaching efficiency and quality. Through digital management, every aspect of the teaching process can be effectively monitored and optimized, ensuring that students make substantial progress in academic research, skills development, and project management.

1. BI-WEEKLY TEACHING AND LEARNING REPORT

(1) Design principles

① **Structured and timely feedback from supervisors:** The supervisor team provides bi-weekly feedback to students, helping them understand their performance and identify areas for improvement. In turn, students offer feedback on teaching, allowing for timely adjustments to the instructional approach.

② **Enhanced quality assurance mechanisms:** A dedicated platform has been established for interaction among students, Project Supervisors, and Academic Supervisors, facilitating smoother communication among educators, learners, and administrators and allowing for more prompt feedback.

③ **Timely tracking of project progress and risk identification:** Regular progress reports enable the timely tracking of project advancements and identification of potential risks, ensuring that projects stay on track.

④ **Reduction of subjective evaluation:** The evaluation system focuses on specific teaching behaviors and learning objectives achieved and student feedback on teachers is given based on objective actions and clearly defined metrics, minimizing subjectivity and enhancing the fairness and accuracy of assessments.

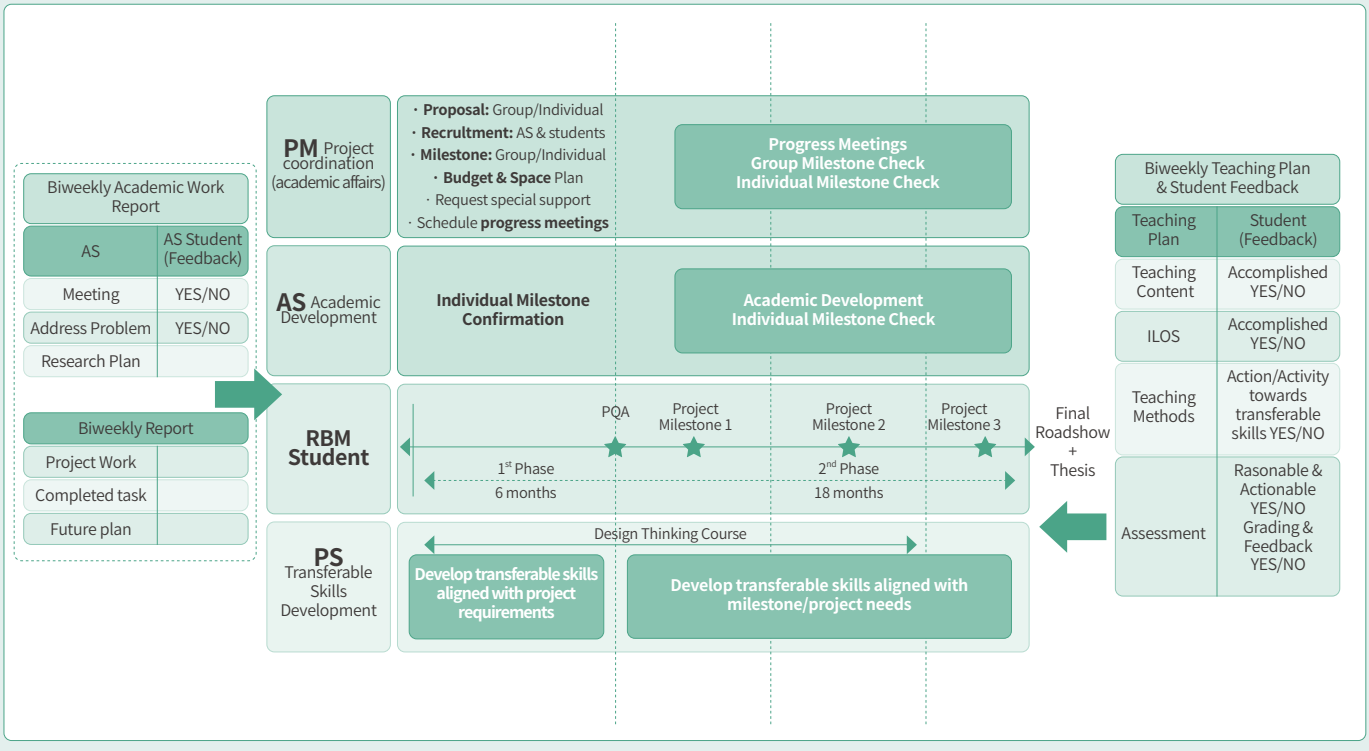


Figure 7-2 Quality assurance mechanism for PBL—Bi-weekly Teaching and Learning Report

(2) Components

① Bi-weekly teaching plan for Project Supervisors (see Chapter VI for details)

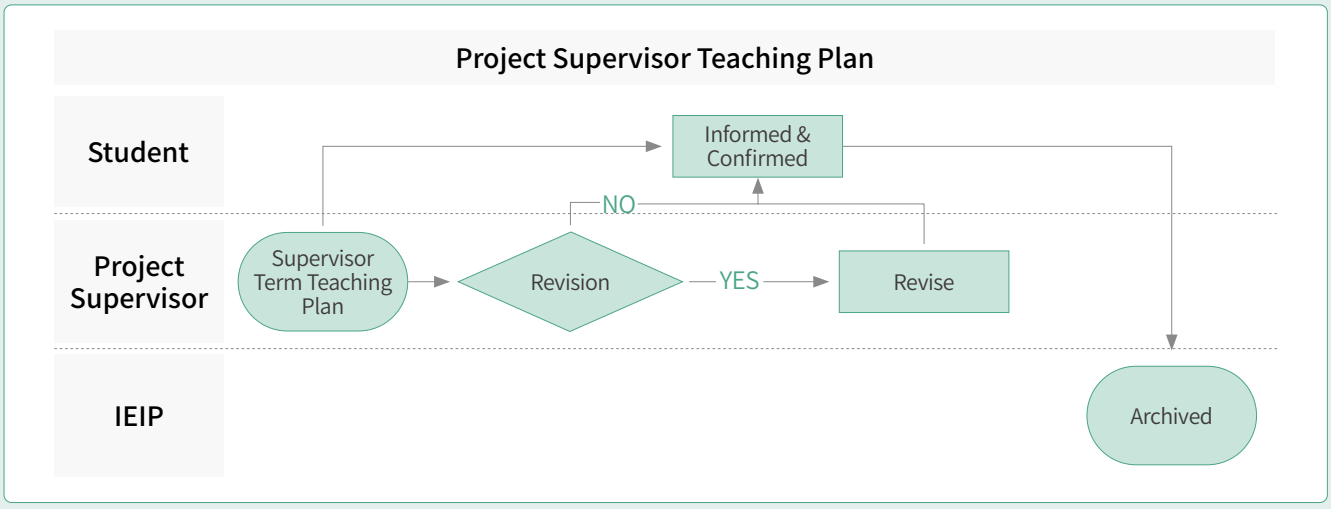


Figure 7-3 Project Supervisor teaching plan review process

② Bi-weekly academic research log for students: As MPhil students, RBM students are required to regularly report research progress to their Academic Supervisor and receive guidance after selecting an Academic Supervisor, passing the PQA, and entering the project research phase. In traditional master's programs, such communication often occurs through meetings or emails, and supervisors tend to devote more attention to doctoral students than to master's students. In contrast, the RBM Program has introduced a bi-weekly academic research log, which allows students to document their research progress while requiring Academic Supervisors to evaluate students' research performance. It serves as an effective tool for maintaining regular communication and feedback between students and their Academic Supervisors.

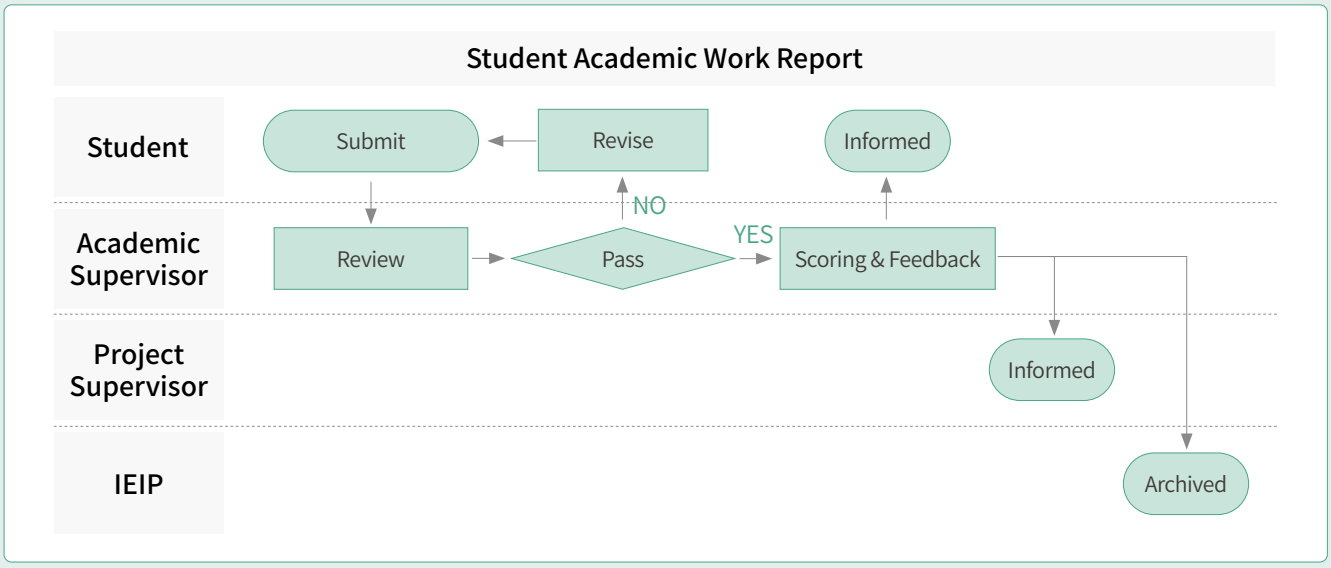


Figure 7-4 Bi-weekly academic research log submission and review process

A. Completed by: student

B. Approved by: Academic Supervisor

C. Specific content:

- Meetings with my Academic Supervisor: Students indicate whether they met with their Academic Supervisor in the past two weeks, including the duration of the meeting if applicable; if no meeting occurred, students need to specify the reason. This ensures that Academic Supervisors provide regular guidance to students.
- Did my Academic Supervisor assist me in resolving research issues: Students indicate whether their Academic Supervisor helped resolve any research issues. If no assistance was provided, students are required to explain the reason. To ensure effective communication between students and their Academic Supervisor, the RBM Program may intervene promptly if a student's research progress stalls due to Academic Supervisor-related reasons.
- Research plan for the next two weeks and expected outcomes: Students outline their research plan and anticipated progress. This aims to develop students' ability to plan their progress.

③ **Bi-weekly project log:** In addition to regularly reporting on their academic research progress, students are also required to update their project progress to their Project Supervisor through a bi-weekly project log, as the project serves as a vehicle for their research. In the log, students are also asked to evaluate the teaching performance of their Project Supervisor over the past two weeks. This allows Project Supervisors to stay informed about students' project advancements and provide timely feedback on their learning performance. Meanwhile, students anonymously and objectively assess whether the Project Supervisor's teaching plan has been effectively implemented by answering yes/no questions, offering constructive feedback to enhance teaching quality.

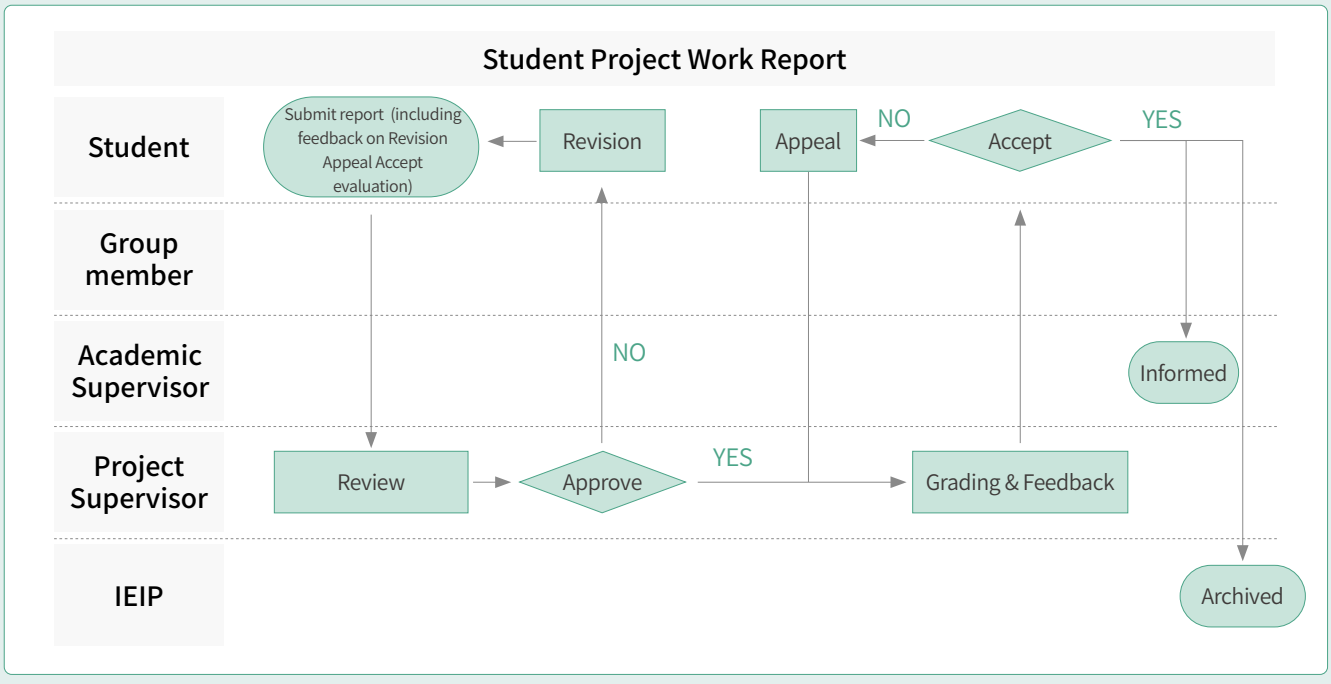


Figure 7-5 Bi-weekly project log submission and review process

A. Completed by: student

B. Approved by: Project Supervisor

C. Specific content:

a. Project work:

- Research activities completed in the past two weeks: Students list the research activities they have completed in the past two weeks to track project progress.
- Plans for the next two weeks: Students outline their plans for the next phase of the project. This aims to foster systems thinking in students.
- Meetings with my Project Supervisor: Students indicate whether they met with their Project Supervisor in the past two weeks, including the duration of the meeting if applicable; if no meeting occurred, students need to specify the reason. This ensures that Project Supervisors fulfill their teaching responsibilities.
- List at least one project research activity from a fellow team member: This ensures a minimum level of communication within the project team.

b. Teaching plan evaluation (yes/no questions):

- My Project Supervisor explained the ILOs to me: Students confirm whether the Project Supervisor clearly explained each ILO.
- My Project Supervisor covered the listed teaching content: Students confirm whether the Project Supervisor addressed the teaching content specified in the teaching plan.
- My Project Supervisor used the listed teaching method(s): Students confirm whether the Project Supervisor followed the teaching method(s) outlined in the teaching plan.
- My Project Supervisor explained the requirements and expectations on the assessment(s): Students confirm whether the Project Supervisor clearly communicated the assessment requirements.
- My Project Supervisor explained the criteria on assessment(s) to me: Students confirm whether the Project Supervisor clearly explained the grading rubrics.
- My Project Supervisor provided feedback based on my performance: Students confirm whether the Project Supervisor offered timely feedback during the teaching process.

(3) Implementation effects and advantages

The Bi-weekly Teaching and Learning Report system has greatly enhanced both teaching quality assurance and the tracking of students' learning progress. Structured and timely feedback from supervisors provides students with clearer insights into their progress and areas for improvement. The multi-directional communication platform established through the system facilitates interaction among educators, students, and administrators, leading to more efficient communication and prompt feedback, which in turn enhances teaching quality and supports the holistic development of students. Regular progress updates and project risk identification help ensure smooth project execution while minimizing subjectivity in evaluations, thereby promoting fairness and accuracy. Overall, the Bi-weekly Teaching and Learning Report system lays a solid foundation for efficient management and high-quality teaching of the RBM Program.

2. LEVERAGING AI TOOLS FOR STUDENTS FEEDBACK ANALYSIS AND TEACHING EVALUATION

To enhance the depth and effectiveness of teaching evaluations while maintaining objectivity in bi-weekly reports, we recognize the importance of student feedback on faculty performance. However, open-ended comments present significant challenges for thorough analysis, as traditional manual review methods are time-consuming and resource-intensive. Advances in AI, particularly large language models (LLMs), are transforming the landscape of educational feedback analysis. Our exploration into using AI for processing student feedback has resulted in significant gains in efficiency and accuracy.

(1) Original Process and Its Limitations

Through bi-weekly reports, students have provided open-ended feedback on various aspects of faculty teaching, including teaching methodologies and overall learning experiences. While some of these feedback entries have been manually selected for discussion during regular RBM faculty meetings, this selection process is laborious. Traditionally, two experienced human coders independently reviewed and labeled each piece of feedback, classifying them as either "Satisfactory" or "Needs Improvement." Feedback marked as "Needs Improvement" would be further examined and discussed in faculty meetings. The aim of applying AI tools was to automate this classification process, minimizing manual effort while preserving high accuracy.

(2) Application of AI tools

For this task, we chose Hugging Face's pre-trained DistilBERT model, a lightweight and efficient variant of BERT fine-tuned for binary sentiment classification. This model demonstrated strong performance in distinguishing between positive and negative sentiment, making it a suitable candidate for our feedback analysis.

We evaluated the AI's performance by comparing its classification results with those of human coders. The AI model achieved an impressive 96.16% accuracy against Coder 1 and 93.15% accuracy against Coder 2. When the human labels were consolidated into an averaged ground truth, the model maintained a high accuracy of 95.89%, with a recall rate of 97.88% and an F1 score of 97.73%. These metrics indicate that the AI model can replicate human judgment with exceptional precision, effectively automating the analysis process without sacrificing accuracy. The high F1 score highlights the model's balanced performance in precision and recall.

(3) Impact on Teaching Evaluation Process

The implementation of this AI tool has substantially enhanced both the efficiency and quality of student feedback analysis. By automating the classification of feedback, we have eliminated many of the time-consuming steps associated with manual labeling. This has allowed for quicker, more objective insights into teaching performance. The AI model's output facilitates detailed evaluations, enabling faculty to understand overall student satisfaction and pinpoint specific areas for improvement. With more timely feedback, instructors can make targeted adjustments to their teaching strategies, ultimately enriching the learning experience for current and future students.

(4) Future Directions and Broader Implications

Looking ahead, the success of this AI-driven system marks the start of a broader transformation in teaching evaluation methods. We plan to integrate more advanced models capable of handling nuanced feedback, offering personalized recommendations to faculty across various disciplines. Additionally, by tracking feedback trends over time and linking them with course performance metrics, we aim to reveal deeper insights into the evolution of teaching strategies, optimizing them for enhanced student success.

3. INTELLIGENT GRADING SYSTEM

The RBM Program's admission process has encountered several challenges due to a growing applicant pool and innovative interview procedures, which traditional admission and evaluation methods are ill-equipped to handle. These challenges include:

- High application volume: The large number of applicants creates a significant workload, requiring a digital system to streamline operations and enhance efficiency.
- Fairness in multidimensional evaluations: It is essential to ensure that the matching of applicants and interviewers is not only random but also aligned with their respective areas of expertise, enabling accurate assessments in specialized fields.
- Difficulty in review and decision-making: Objective data is essential for analyzing the entire admission process and driving continuous improvement.

To address these challenges, the RBM Program has developed an intelligent grading system that leverages advanced digital and intelligent technologies to provide comprehensive support for the admission grading process.

(1) System design and function

① Preliminary screening

A. Automated CV screening: The grading system screens CVs automatically against predefined admission criteria. The steps are as follows:

a. Upload all applicants' CVs to the system.

b. Define screening criteria, such as academic performance, research experience, and the quality of recommendation letters.

c. The system filters CVs that meet the criteria and generates a preliminary screening report.

B. Selection

a. Intelligent professor matching: The system matches applicants with professors who have similar professional backgrounds for CV evaluation. The steps are as follows:

b. Applicants enter detailed information about their professional background in the system.

c. The system matches applicants with the most suitable professors based on keywords.

d. Professors evaluate the CVs, assign scores, and give feedback through the system.

C. Offline interview

a. Group interview: The system randomly assigns interview panels by lottery to ensure fairness. The steps are as follows:

(a) On the interview day, the system generates random groupings for applicants and interviewers.

(b) Interviewers and applicants receive their group assignments via the system.

(c) The interview panel conducts collective interviews with the applicants and records scores and feedback in the system.

b. Individual interview: Individual interview sessions are also assigned randomly to ensure fairness. The steps are as follows:

(a) The system generates an individual interview schedule and notifies the applicants.

(b) Interviewers access each applicant's schedule and background information through the system.

(c) After the interview, interviewers enter scores and evaluations into the system, which then generates a comprehensive assessment report.

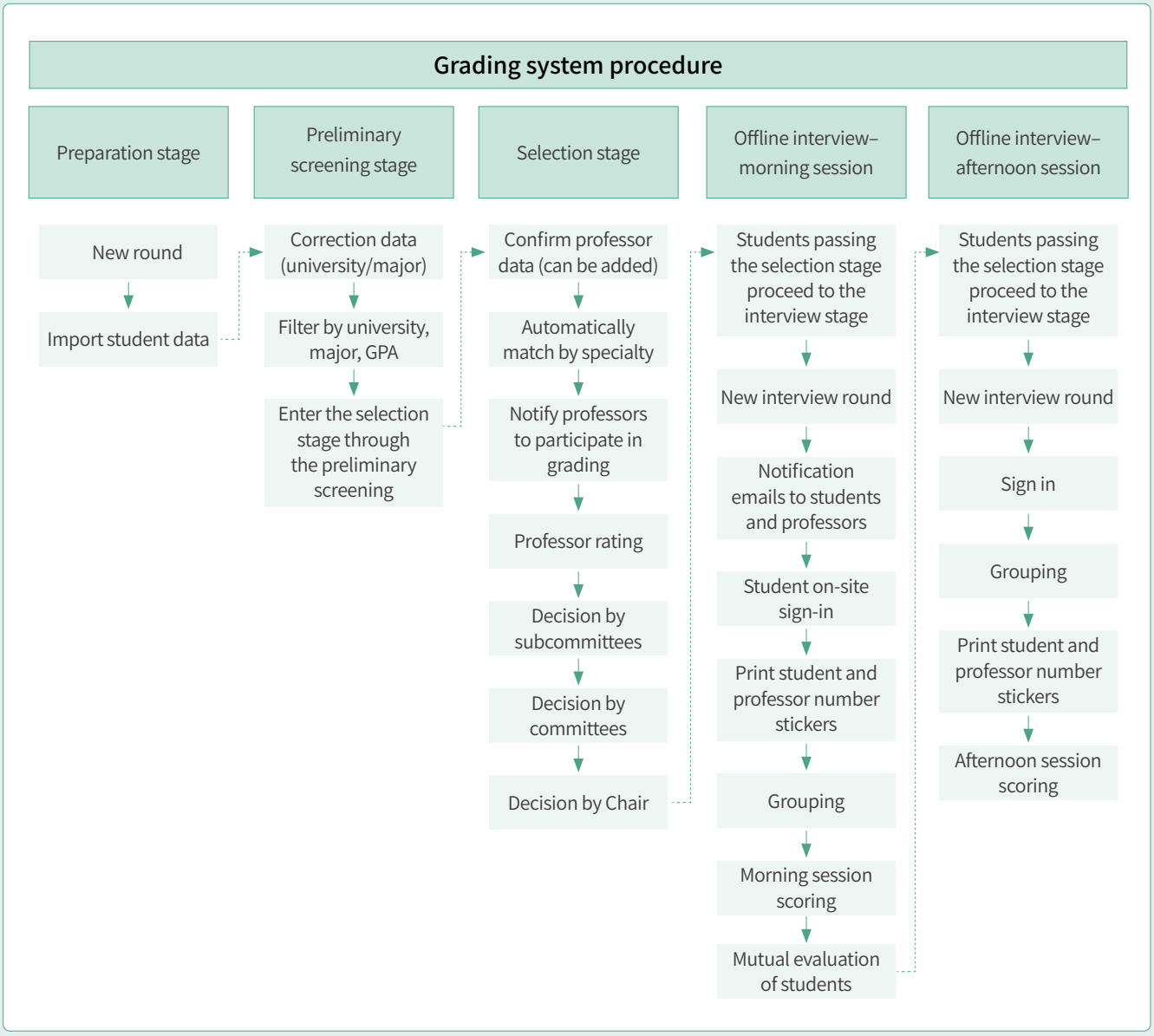


Figure 7-6 Process of the intelligent grading system

(2) Implementation effects and advantages

This intelligent grading system enables the RBM Program to efficiently analyze applicant information, significantly shortening the admission cycle. The precise matching of professors enhances the relevance and accuracy of evaluations, while the system documents every step of the admission process, ensuring transparency and traceability throughout. This guarantees fairness and credibility in evaluation. In addition, with data support, the evaluation strategy can be continuously reviewed and refined, ensuring its comprehensiveness and adaptability to current needs.

4. INTELLIGENT PROJECT POOL SYSTEM

In the RBM Program, PBL is a vital approach for cultivating students' practical abilities and innovative thinking. However, the current processes for collecting, reviewing, and matching project proposals face several challenges as follows.

- Inconsistent proposal formats: This leads to low management efficiency and makes quick and accurate information retrieval and processing difficult.
- Lack of a centralized sharing platform: This hinders effective communication and knowledge sharing among students, between students and mentors, and among mentors themselves.
- Complex review process: It is essential to ensure fairness in evaluations while efficiently coordinating the schedules of multiple expert reviewers.

To address these challenges, the RBM program has designed an Intelligent Project Pool System. This system employs advanced information, digital, and intelligent technologies to standardize proposal formats, simplify the submission process, and facilitate rapid information retrieval and processing. The specific operations are as follows.

(1) System design and function

① Standardization of project proposal document format

A. Standard proposal template: The system provides a unified project proposal template, including sections for project background, objectives, implementation plan, and expected outcomes.

B. Simplified submission process: The system automatically generates a standardized project proposal document once students fill in proposal information and upload relevant materials in the system.

② Establishment of an on-campus sharing platform

A. Information sharing and communication: An on-campus sharing platform is built that allows students, mentors, and judges to view and communicate about project progress at any time.

B. Integration of collaboration tools: The platform integrates instant messaging tools, file-sharing features, and project management tools to facilitate team collaboration.

③ Rolling online project review mechanism

A. Flexible submission and review: Students can submit project proposals at any time, and the system automatically assigns review times.

B. Expert review and feedback: The system matches review experts based on their professional background, and experts review proposals and provide feedback through the system.

④ Systematic review process and traceable records

A. Transparent review process: The system records each stage of the review, ensuring transparency throughout the process.

B. Data-driven optimization: The system analyzes review data to continuously optimize the review process and standards.

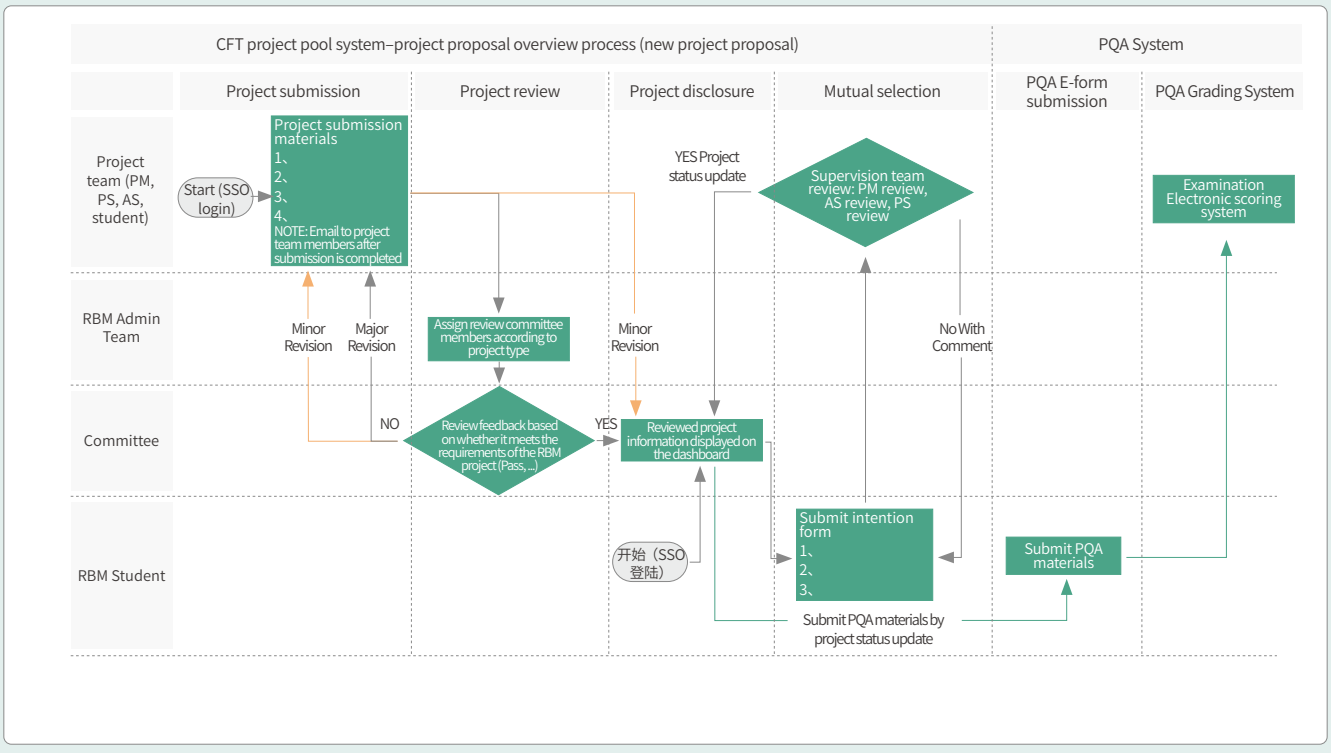


Figure 7-7 Process overview of the intelligent project pool system

(2) Implementation effects and advantages

The Intelligent Project Pool System has significantly improved the efficiency and transparency of project management, facilitating effective communication and knowledge sharing between students and mentors. The systematic review process and traceable records have enhanced the fairness and transparency of evaluations, reducing the impact of human factors. Through continuous data-driven optimization, the system ensures the comprehensiveness and relevance of the evaluation framework, driving educational innovation and fostering students' self-directed learning, teamwork, and cross-disciplinary research abilities.

5. PROJECT-BASED TEACHING WORKSHOP AND TEACHING SPACE MANAGEMENT SYSTEM

Within the project-based and design-oriented educational framework of the RBM Program, students should be able to frequently raise innovative ideas and iterate quickly, which is crucial for cultivating their innovative abilities. However, traditional teaching workshops and space management systems have shortcomings in resource allocation, flow efficiency, and procurement planning. To address these issues, the RBM Program has designed an intelligent management system.

(1) System design and function

① In-depth analysis based on historical data

A. Data collection and analysis: The system collects and analyzes historical data on space reservation patterns, equipment usage frequency, and consumable consumption to identify usage trends and forecast future demand.

B. Resource optimization: Based on the analysis results, the allocation of teaching spaces and equipment resources is optimized to improve resource flow efficiency and minimize underutilization.

② Real-time updates of equipment and venue usage

A. Dynamic resource management: The system updates the usage status of equipment and venues in real time, ensuring transparency of resource conditions.

B. Effective project risk management: Student teams can stay informed about resource availability through the system, enabling effective project risk management and financial planning.

③ Accurate procurement forecasting

A. Procurement planning: The system provides procurement forecasts for equipment and consumables based on historical data and usage trends, helping managers plan ahead to align resources with teaching needs.

B. Inventory management optimization: The system monitors the inventory of equipment and consumables in real-time, ensuring timely replenishment and optimized inventory management.

(2) Implementation effects and advantages

By applying this intelligent system, the RBM Program has achieved refined management of teaching resources, improved resource utilization, enhanced the accuracy of procurement plans, and reduced resource waste. The real-time updated resource information helps student teams manage projects more effectively, increasing project execution efficiency. This system is not only a key tool for driving innovation in project-based teaching workshops and educational space management but also creates an efficient, flexible, and data-driven learning environment for RBM students. It fosters innovative thinking, enhances project implementation efficiency, and provides strong support for educators.

The RBM Program has constructed a comprehensive PBL management and quality assurance system by adopting advanced digital technologies. Through various innovative methods, such as the bi-weekly report system, the intelligent grading system, the Intelligent Project Pool System, and teaching workshop and space management systems, it effectively addresses many challenges in the current project-based education model, significantly enhancing teaching efficiency and quality.

DESIGN OF TRANSDISCIPLINARY PROJECT-BASED EXPERIMENTAL TEACHING

08

VIII. DESIGN OF TRANSDISCIPLINARY PROJECT-BASED EXPERIMENTAL TEACHING

The transdisciplinary project-based experimental teaching system is an innovative educational model based on the RBM transdisciplinary PBL approach. The core of this system is to promote active learning, deepen the educational philosophy of "learning-by-doing", and cultivate students' original innovative thinking from "zero to one". Through a demand-driven experimental teaching framework, theoretical courses, and the construction of experimental resources, it supports experimental teaching for transdisciplinary PBL and explores its practices and applications. This chapter will introduce the design of laboratories and intelligent management systems in the RBM Program for project-based experimental teaching, emphasizing the principles of "individualized education that centers on each student's growth" and "learning-by-doing", with the aim of developing students' comprehensive abilities through hands-on experience.

I. FACILITY DESIGN FOR PROJECT-BASED EXPERIMENTAL TEACHING

1. CLASSROOM DESIGN

(1) Open study space

The large classroom has removed fixed partitions to create a flexible and open space (see Figure 8-1). This includes areas for free discussion, an open lecture zone, and private quiet rooms, providing conditions for a variety of activities. The classroom also features a stage-sharing area, which offers students an open and interactive environment for in-depth communication and discussion with experts from both inside and outside the university.

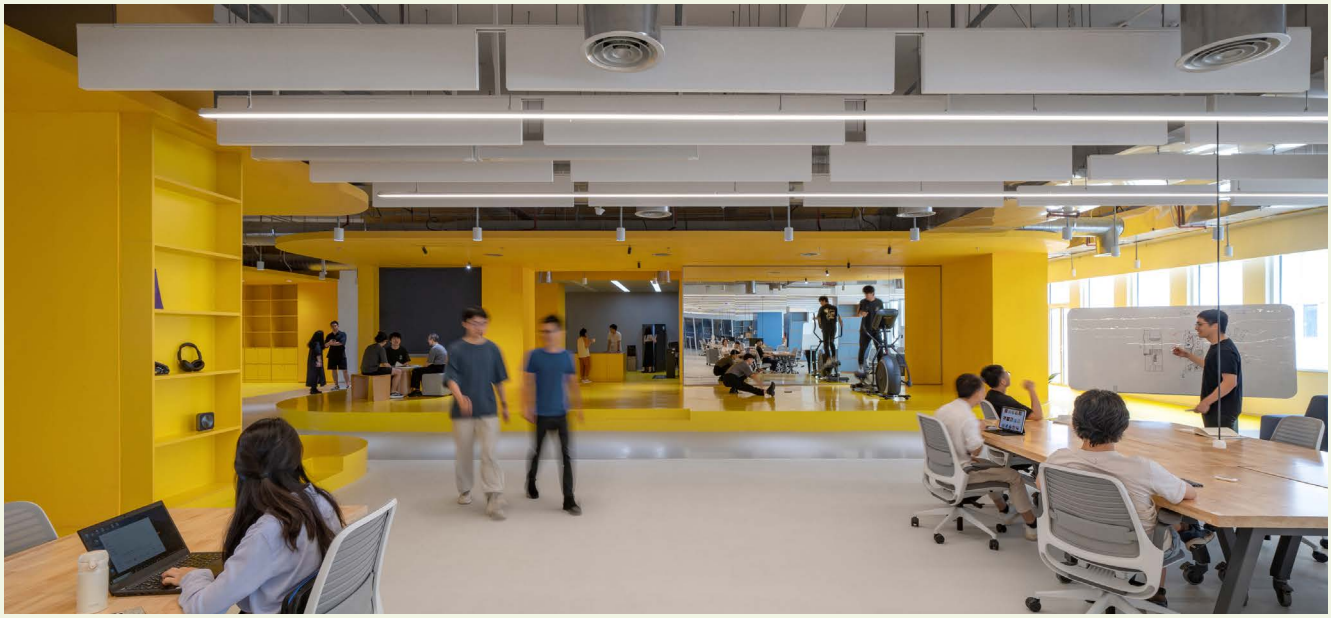


Figure 8-1 Open study space

(2) Promoting group PBL

The design of the Red Bird Maker Space Classroom is centered around project teams, encouraging students to collaborate on projects and fostering teamwork and problem-solving skills. The space offers ample workstations and independent discussion rooms to support focused collaboration within groups, as well as a resource room that allows students to fully utilize the space and resources for practical projects.

2. WORKSHOP DESIGN

(1) Positioning and structural design

The workshops follow the principles of "learning-by-doing" and "applying knowledge in practice", establishing a solutions center for engineering challenges that integrates learning, hands-on practice, and skill development. This includes woodworking and 3D printing workshops, a large-scale machining workshop, a materials preparation workshop, and a precision measurement and electrical and electronic workshop. Through hands-on activities such as design, processing, assembly, and testing, students gain a deep understanding of the entire product development process and continually advance the practical implementation of their projects.

(2) Innovative experimental teaching platform managed by professional teams

The workshops serve as a core platform that integrates transdisciplinary project-based teaching with resource sharing, providing students with a multifunctional space that combines theoretical learning, hands-on experimentation, discussion, and presentation of achievements. Managed by a team of engineers with professional backgrounds and extensive experience in engineering practice and project implementation, the workshops offer technical skills and valuable industry insights. And the engineers provide comprehensive support and guidance to students (see Figure 8-2).

“The workshops serve as a core platform that integrates transdisciplinary project-based teaching with resource sharing, providing students with a multifunctional space that combines theoretical learning, hands-on experimentation, discussion, and presentation of achievements.”

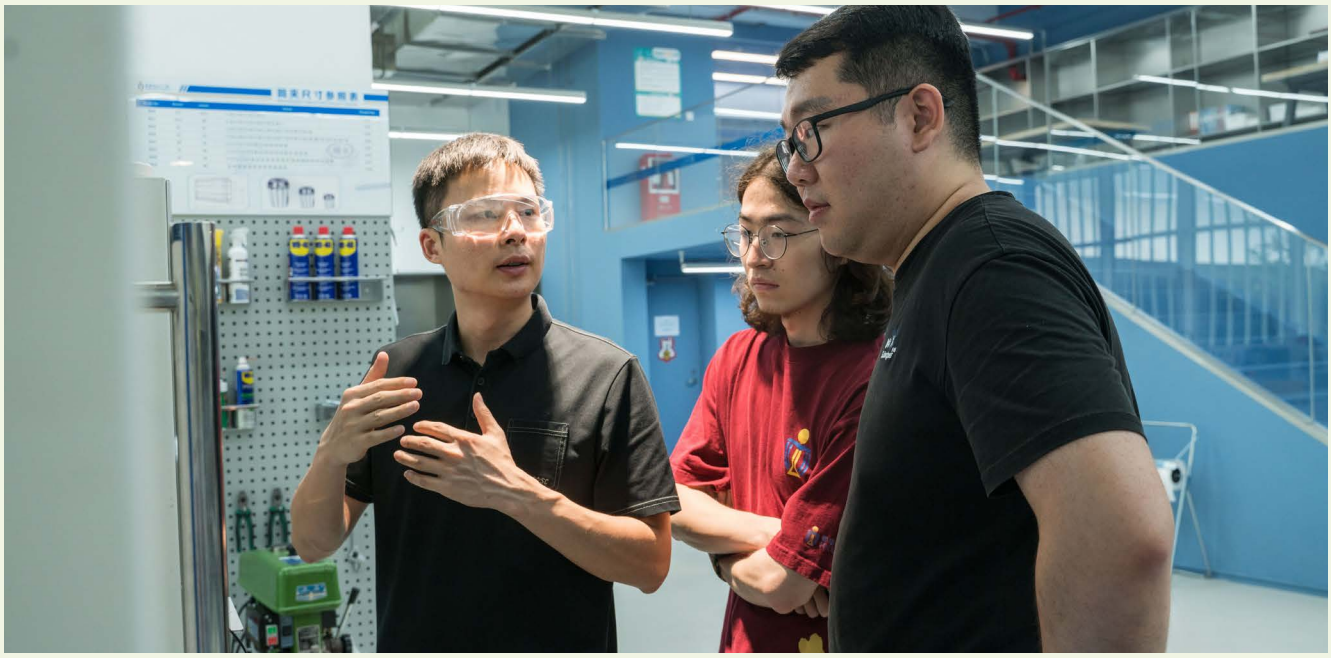


Figure 8-2 Students receiving training in the instrument area of a large-scale machining workshop

3. CENTRAL RESEARCH FACILITIES

HKUST(GZ) has established several central research facilities in cutting-edge fields (see Figure 8-3), providing advanced research equipment and technical support from professionals for faculty and students. These facilities play a crucial role in the development of transdisciplinary fields. They include Laboratory Animal Facility, Biosciences Central Research Facility, Materials Characterization and Preparation Facility, Data Center, Nanosystem Fabrication Facility, Novel IC Exploration Facility, Earth and Environmental Systems Research Facility, and Dynamic Reconstruction and Applied Meta Studio. These facilities not only create favorable conditions for the development of project-based experimental teaching but also contribute to strengthening industry-academia-research cooperation in the Greater Bay Area and globally.

Sharing of the research facilities across the university is one of the important features for promoting transdisciplinary research. This sharing model further enhances collaboration and innovation in cross-disciplinary research. Firstly, this sharing mechanism allows researchers from different disciplines to easily access advanced equipment and technologies from various fields, facilitating breakthroughs and innovations in knowledge and original research. Secondly, the shared central research facilities provide a platform for interdisciplinary exchange, where researchers and students can share ideas and spark inspiration, driving forward original research. Additionally, this resource-sharing model effectively improves the utilization efficiency of equipment and technical resources, avoids duplicate investments and resource waste, and saves substantial costs for the university and researchers.

Figure 8-3 Central research facilities

II. INTELLIGENT MANAGEMENT SYSTEM DESIGN

Through intelligent management measures, the RBMS not only provides an efficient and stable experimental teaching environment but also promotes the rational use of resources and optimized management, offering better research and teaching support for students and teachers.

First, a management system and maintenance support framework for the intelligent teaching laboratories has been established. By promoting an integrated intelligent management system, the project-centered digital operation of instrument usage, consumable tracking, and budget control will be achieved. This system can not only monitor the usage of laboratory equipment in real time but also enable remote diagnostics and maintenance, allowing for early warnings and handling of potential failures to ensure the efficient operation and longevity of experimental equipment. This approach effectively reduces the impact of equipment malfunctions on teaching activities, enhancing the efficiency and quality of experimental teaching. Additionally, the intelligent management system provides data analysis capabilities to help managers optimize resource allocation and laboratory usage strategies.

Second, a budget and management plan for the RBMS facilities is developed to ensure rational allocation and utilization of resources. Specifically, the intelligent management system can maintain detailed records of all facilities and equipment within RBMS, including usage frequency, consumable consumption, and maintenance records. Through data analysis, managers can identify which equipment and resources are used most frequently, allowing for the formulation of scientific and rational budgets and procurement plans, thus avoiding resource waste. Furthermore, the intelligent management system can automatically adjust resource allocation based on project needs, ensuring that each project receives the necessary support, thereby improving overall management efficiency and resource utilization.

In summary, the transdisciplinary project-based experimental teaching system at HKUST(GZ) embodies an advanced concept that transcends traditional disciplinary barriers, focusing on cultivating talent in an environment rich in teamwork and innovation. This system fosters a learning environment that promotes cross-disciplinary communication and collaboration, emphasizing enhanced communication and coordination among teams at every step, from theoretical exploration to practical application. It encourages students to learn and grow through collaboration while breaking through in innovation on their quest for knowledge.

THE BRIDGE PROGRAM

09

IX . THE BRIDGE PROGRAM

In the process of cultivating innovative and entrepreneurial talent, how can we help RBM students transform academic knowledge into practical business practices? This chapter will introduce the design principles and practical measures of the Bridge Program. By creating a real entrepreneurial environment and providing comprehensive entrepreneurial support, the program aims to help RBM students overcome initial obstacles in entrepreneurship, laying the foundation for nurturing future industry leaders and igniting the spirit of innovation and entrepreneurship.

I. DESIGN PRINCIPLES

1. BACKGROUND: ADDRESSING OBJECTIVE BARRIERS TO STUDENT ENTREPRENEURSHIP IN CHINA'S ECONOMIC AND SOCIAL ENVIRONMENT

(1) Macro barriers in China' s economic, cultural, and social venture capital systems

Self-reliance and technological advancement are strategic supports for national development, yet innovation in China remains uneven. High-level innovation and entrepreneurship require collaborative efforts from local governments, research institutions, and large enterprises to foster a conducive environment. However, the subprime mortgage crisis and the pandemic have led to a “K-shaped” economic recovery, resulting in rising costs, shrinking profits, and operational difficulties for startups. The digital transformation of industries increases the demand for technological innovation, yet small and micro enterprises struggle to establish comprehensive digital platforms due to funding and talent shortages during their early stages, leading to a mismatch between economic development and innovation needs.

China's cultural traditions significantly influence entrepreneurship. The historical notion that “he who excels in study can follow an official career” has limited the connection between intellectuals and economic development. Since the founding of the People's Republic of China in 1949, the “unified recruitment and job assignments” policy has made student employment passive, fostering a lack of initiative and insufficient entrepreneurial tradition. Despite modern youth being open-minded, they often lack confidence in entrepreneurship. The stability-oriented traditional culture results in low acceptance of entrepreneurial risks and non-traditional behaviors, leading to a deficiency in entrepreneurial spirit and risk-taking attitude. Issues exist in the construction of entrepreneurial culture within universities: first, there is an excessive emphasis on entrepreneurial missions while neglecting student needs; second, forced cultural initiatives may provoke resistance; third, cultural construction does not adequately integrate traditional and regional cultures. Universities need to update their entrepreneurial culture to create a student-centered entrepreneurial environment.

Chinese universities have produced relatively few unicorn companies due to an immature venture capital system and incomplete entrepreneurial support programs. Young entrepreneurs face limited capital accumulation, necessitating support from government funds, credit, and market investments. Although the government encourages student entrepreneurship, the loan processes are cumbersome, with low limits and high thresholds, lacking pathways that align with venture capital investors. Many investors have stringent return requirements for startups, increasing entrepreneurial pressure. Insufficient risk monitoring and inadequate investment guarantee mechanisms further threaten the survival of startups.

The venture capital system plays an important role in supporting startups. The experience of the United States shows that mature capital markets and abundant entrepreneurial training opportunities are crucial. The U.S. government prioritizes small businesses, providing systematic support, while the social support system offers considerable space and risk mitigation for entrepreneurial students. Chinese universities should learn from international experiences to address the pain points faced by student entrepreneurs and establish a supportive entrepreneurial resource system.

(2) Psychological and value barriers faced by students on an individual level

Under the significant challenges posed by socioeconomic, cultural, and venture capital systems, students often hold conservative or negative attitudes toward actively engaging in entrepreneurial activities, lacking firm beliefs and value recognition. This is primarily due to their insufficient entrepreneurial qualities and spirit. Professor Rauch, a well-known expert in entrepreneurship from the University of Giessen, has demonstrated that factors such as "need for achievement, generalized self-efficacy, innovativeness, stress tolerance, need for autonomy, and proactive personality are significantly related to entrepreneurial behavior. However, young entrepreneurs frequently exhibit a lack of perseverance and resilience, making them susceptible to a diminished sense of self-efficacy during the entrepreneurial process.

Today's entrepreneurial landscape is diverse, and the associated risks are often difficult to predict and manage. To establish themselves in a competitive environment, young entrepreneurs must be adept at confronting difficulties and challenges, remaining persistent in the face of failure, maintaining a positive mindset, and quickly recovering from setbacks. However, most young students, under the dual protection of family and school, tend to rely heavily on external support, making it difficult for them to independently overcome various challenges during the initial stages of entrepreneurship. This reliance makes it even harder for them to maintain a positive attitude and unwavering determination after experiencing failure. Negative experiences from entrepreneurial failures can lead to further losses in self-efficacy and need for achievement, resulting in issues such as excessive anxiety and depression among many young entrepreneurs, and in some cases, even irreversible psychological trauma.

A lack of understanding of risk and insufficient innovative entrepreneurial skills further contribute to their absence of a challenge-oriented spirit, firm beliefs, and commitment to entrepreneurship. Due to their limited social experience, student entrepreneurs often lack the necessary risk recognition abilities, along with a clear understanding of economic knowledge and business operations. Their grasp of complex industry and societal realities is often inadequate, making it difficult for them to foresee future opportunities and risks. Additionally, student entrepreneurs struggle with their innovative capabilities, facing challenges in resource allocation and implementation of entrepreneurial plans, which can lead to resource waste and decision-making failures. These failures adversely affect their self-assessment and confidence.

Moreover, although students are situated in an active market economy, their cognitive levels and skill sets remain detached from market demands. As a result, the marketability of their professional knowledge decreases, and the time it takes to convert knowledge into productive capability lengthens. There exists a significant gap between students' aspirations of "wanting to start a business" and "being able to start a business", which requires effective support from entrepreneurial education systems and programs. Universities need to cultivate students' innovative and entrepreneurial skills in as realistic an entrepreneurial environment as possible, helping them match entrepreneurial resources and ensuring that students with entrepreneurial intentions are well-prepared before fully entering the social entrepreneurial landscape.

2. INTRODUCTION TO THE BRIDGE PROGRAM

HKUST(GZ) implements the national innovation-driven development strategy by establishing the Bridge Program as an initiative to enhance students' innovation and entrepreneurship capabilities within the RBM Program. This program aims to cultivate young entrepreneurs who **possess a sense of patriotism and social responsibility, and are capable of identifying problems, recognizing opportunities, integrating resources, managing risks, and ultimately creating real value.**

In this context, innovation and entrepreneurship abilities represent a comprehensive and dynamic process, encompassing the journey from initial innovation (creating new ideas and proposing new things) to final entrepreneurship (creating real revenue and value). Within this framework, innovative thinking, entrepreneurial skills, and an entrepreneurial spirit correspond to the abilities to generate original ideas, take practical actions, and transform concepts into viable business ventures. First, young people aspiring to entrepreneurship, equipped with a comprehensive foundation of general knowledge and specialized expertise, **fundamentally grasp user pain points and market demands, analyze opportunities, assess various risks, and uncover original ideas for innovation and entrepreneurship** through the integration of personalized knowledge reserves and context-based critical thinking. Second, these young individuals acquire and comprehensively apply entrepreneurial skills, **mobilizing various resources through practical actions to gradually implement their innovative entrepreneurial ideas, empowering resources and creating value.** Third, the spirit of innovation and entrepreneurship permeates the formation and transformation process of innovative thinking and entrepreneurial skills, gradually integrating innovative thinking with entrepreneurial skills and translating them into effective entrepreneurial actions. Among these, innovative thinking mainly includes integrative thinking (inductive and deductive reasoning, divergent and convergent thinking, specific and abstract reasoning, analogical thinking and intuition, etc.) and critical thinking (logical reasoning, critical thinking, problem-solving, analysis and evaluation, etc.). Entrepreneurial skills encompass both knowledge-based skills (decision-making strategies, business management, resource integration, risk control, finance, marketing, etc.) and comprehensive skills (leadership and decision-making, organization and execution, support and collaboration, analysis and expression, communication and interpersonal skills, etc.). The spirit of innovation and entrepreneurship specifically includes qualities and attitudes such as mission and belief, self-efficacy, initiative/achievement needs, risk/challenge spirit, perseverance, and resilience.

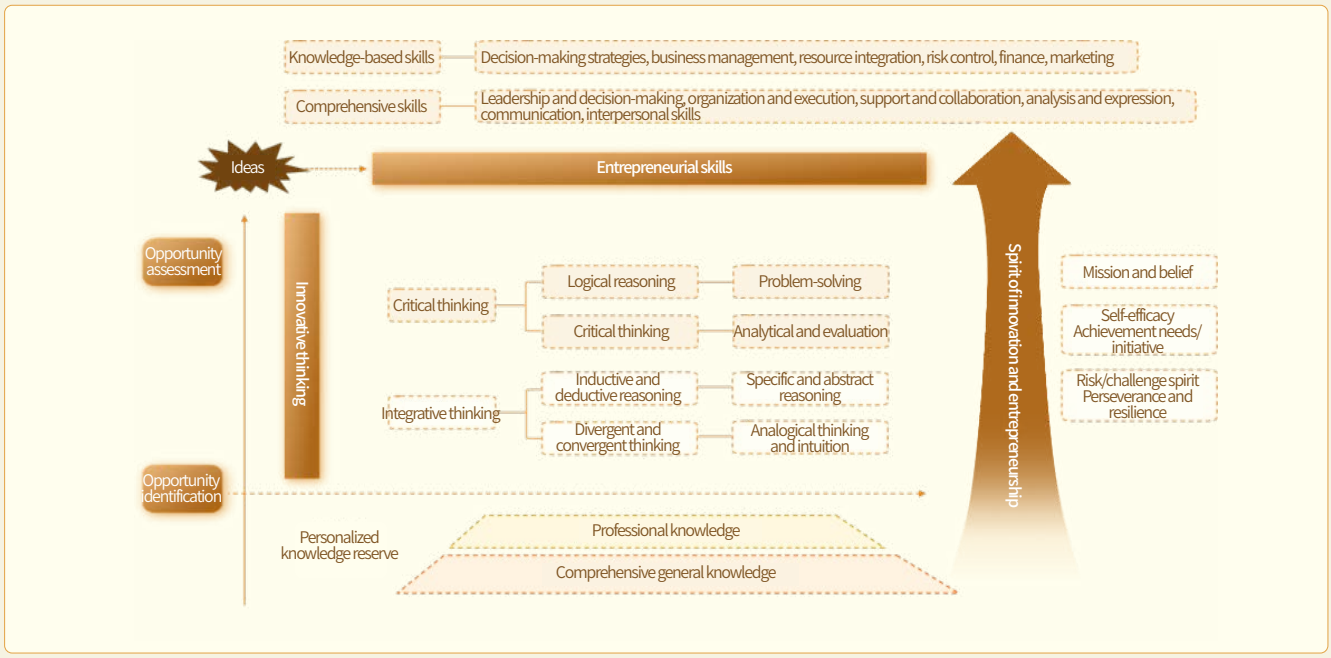


Figure 9-1 Innovation and entrepreneurship capability framework

In light of the dynamic and diverse nature of innovation and entrepreneurial capabilities, HKUST(GZ) has established the Bridge Program for students aspiring to entrepreneurship within the RBM Program. This initiative aims to foster innovative thinking, enhance entrepreneurial skills, and cultivate the spirit of innovation and entrepreneurship by providing ample entrepreneurial resources and high-quality education. **The "bridge" concept of the Bridge Program has two main aspects: first, it serves as a "capability connection bridge" from academia to society, creating a real entrepreneurial environment to develop students' innovative thinking, entrepreneurial skills, and overall entrepreneurial capabilities. Second, it acts as a "resource connection bridge" transitioning from educational programs to entrepreneurial projects, addressing the challenges and pain points students face in entrepreneurship and helping them access supportive resources during the early stages of their ventures.**

(1) Positioning: substantially grounded as one of the career choices after graduation

The current entrepreneurial education system in higher education still faces numerous issues, such as the lack of effective integration between regular educational programs and innovative entrepreneurial activities. Entrepreneurial resources are often concentrated among a small academic group, making it difficult for most students to access entrepreneurial opportunities. Additionally, guiding teachers often lack the professional background needed to combine entrepreneurship with professional education. Furthermore, some incubators focus excessively on short-term performance indicators, such as competition awards and the incubation of unicorn companies, while neglecting long-term talent development and ecosystem building. As a result, universities struggle to bridge the gap between educational training and innovation and entrepreneurship, and fail to genuinely create an innovative entrepreneurial campus ecosystem and atmosphere. In response to these challenges, HKUST(GZ) is committed to establishing the Bridge Program within the framework of the RBM Program, aiming to provide practical support and assistance for student entrepreneurship. The RBM Program encourages students to explore diverse career development paths and fosters talent in various directions, including academic researchers capable of conducting original research, outstanding entrepreneurial talent, and innovative human resources that achieve ideal employment. Within this framework, cultivating entrepreneurial talent with an entrepreneurial spirit has become a key feature of the RBM Program. HKUST(GZ) not only places high importance on entrepreneurial education conceptually, viewing entrepreneurship as equally important as employment and further studies for student graduation choices, but also actively develops various support programs for the Bridge Program in practice, helping students who aspire to translate knowledge and innovative ideas into real value creation during their time in the RBM program.

(2) Purpose: providing students with a "trial and error period, cooling-off period, and transition period" for entrepreneurship

In the context of rapidly evolving global markets, student entrepreneurship often faces unexpected risks such as fierce market competition, team conflicts, funding shortages, and a lack of social resources while finding it difficult to gain societal support. These factors can lead to entrepreneurial failures, harming students' self-efficacy, ambition, and perseverance, and potentially causing negative economic and psychological effects. To mitigate entrepreneurial risks, the Bridge Program offers a "trial and error period", during which students can attempt entrepreneurship with school support, enjoying a degree of risk alleviation. The school provides comprehensive support, including venues, equipment, technical guidance, training, seed funding, and social resources, leveraging its brand and reputation to create a safe entrepreneurial environment and help students manage risks. During the "trial and error period", students can explore and make mistakes without incurring significant costs, enhancing their innovative thinking and entrepreneurial skills while bolstering their entrepreneurial belief and self-efficacy.

Given the new trends and challenges in the current market, entrepreneurship requires patience and a disruptive technology orientation. Early-stage student entrepreneurs often encounter information asymmetry and a lack of understanding of the entrepreneurial environment, leading to overly high expectations and unfounded enthusiasm that can result in impulsive

decision-making. This stems from students' lack of critical thinking, market analysis, and strategic decision-making abilities. To prevent decision-making errors, the Bridge Program provides a "cooling-off period", creating a real and safe entrepreneurial environment to help students adapt to the social entrepreneurial landscape, recognize the limitations of their projects, and assess timing and personal fit. During this time, students can enhance their innovative thinking and entrepreneurial skills, optimize their products, and rationally advance their business plans. In short, the "cooling-off period" offers students a valuable window to systematically evaluate and refine their entrepreneurial proposals before entering the market, allowing them to embark on their entrepreneurial journey with maturity and confidence.

As technology advances and consumer demands shift, market dynamics change quickly. Student entrepreneurs, eager to seize market opportunities, may rush to launch their ventures, leading to potential failures. Such failures not only incur economic and psychological losses but can also impact career trajectories and re-employment prospects. The Bridge Program establishes a "transition period", allowing students to enhance their strategic decision-making, risk management, and resource integration skills in a low-pressure environment. This period also focuses on developing comprehensive entrepreneurial skills, including leadership, analysis, expression, and collaboration, enabling students to systematically transform their ideas into product prototypes while gradually testing and refining them. As projects mature, students become more proactive in entrepreneurship, increasing the resilience and success potential of their startups. Students participating in the Bridge Program can serve as Research Assistants (RAs) for entrepreneurial practice, providing a smooth transition for personal growth and career development while helping to lower barriers for future entrepreneurship, job searching, or further studies.

(3) Function: forming a "closed-loop" reinforcing project-based teaching

Compared to traditional entrepreneurial incubation programs, a more important function of the Bridge Program is to form a "closed-loop" that reinforces the project-based teaching of the RBM Program (see Figure 9-2). Firstly, the Bridge Program serves as a continuation and extension of the RBM Program. Transitioning from two years of PBL into the Bridge Program, **aspiring entrepreneurs need to navigate the transition of "knowledge acquisition—knowledge/technology creation—knowledge/technology transfer" while also extending their development from comprehensive transferable skills to innovative entrepreneurial capabilities that include innovative thinking, entrepreneurial skills, and an entrepreneurial spirit.** Secondly, the Bridge Program acts as the key to the sustained operation of the RBM Program, characterized by its long-term commitment as well as contribution to forming an innovative entrepreneurial soil and atmosphere. Specifically, during the operation of the key projects, project mentors engage in a two-way selection process with students in team educational projects. Through two years of collaborative exploration, mentors guide the first cohort of RBM students in transforming educational projects into entrepreneurial ventures, and continue to advance these projects within the Bridge Program. Successfully maturing entrepreneurial projects can attract the participation of the second cohort of RBM students through project mentors, thereby continuing, inheriting, and expanding the projects initiated by the first cohort, potentially even evolving into new educational and entrepreneurial projects. **Consequently, the entrepreneurial projects within the Bridge Program will seamlessly integrate and operate efficiently with the educational projects of RBM students, forming a spiraling developmental ecosystem involving project mentors, entrepreneurial projects, and students:** ① Project mentors will leverage their extensive industry experience and expertise to continually collaborate with new cohorts of RBM students, enhancing their professional skills and teaching techniques through practical teaching and guidance; ② The entrepreneurial and educational projects will undergo continuous refinement and development through this interaction, as new ideas are explored and experimented with in collaboration with students and mentors, iterating toward more mature business models and educational content; ③ RBM students will cultivate not only professional knowledge and skills within this ecosystem but, more importantly, transferable skills and innovative entrepreneurial abilities. They will become the link between the past and the future, consistently passing down their knowledge, capabilities, experiences, and the "RBM culture".

Together, the two-year RBM Program and the Bridge Program construct a dynamic, self-improving educational ecosystem, providing students with an ideal platform for learning and growth, while also nurturing for society a group of future leaders with innovative entrepreneurial spirit and practical abilities. The spirit of innovation and entrepreneurship is a core element of entrepreneurial spirit, and sustained innovation and entrepreneurship enable enterprises to break through growth bottlenecks and maintain long-term competitiveness. Thus, entrepreneurs and enterprises successfully incubated through the Bridge Program will become outstanding representatives of the RBM Program, continually creating new business models, industrial chains, and value chains across various sectors, thereby expanding the social impact of the RBM educational model. Moreover, the ongoing operation of the Bridge Program will foster an innovative entrepreneurial ecosystem and cultural atmosphere at HKUST(GZ). By closely connecting with incubators and industries both within and outside the university, it not only builds a comprehensive support system but also strengthens the practical orientation of project-based teaching, continually promoting innovation in educational paradigms and enhancing students' practical innovative thinking, entrepreneurial skills, and entrepreneurial spirit.

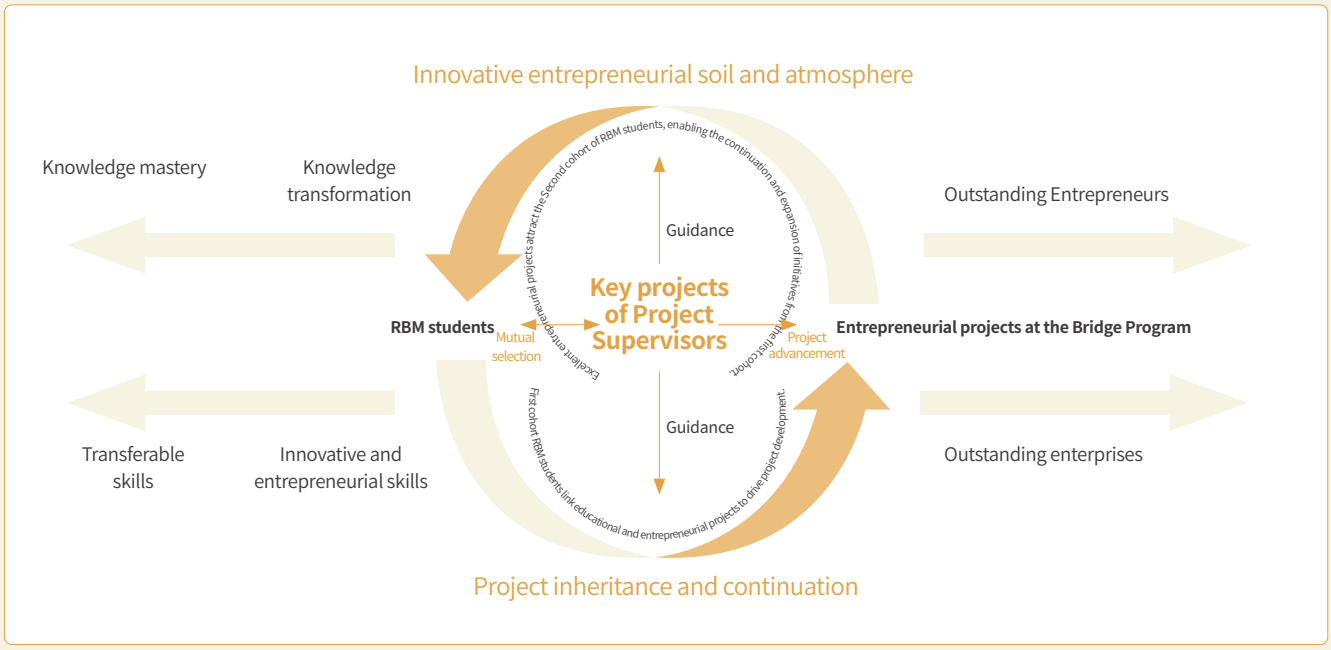


Figure 9-2 The Bridge Program reinforcing project-based teaching

II. PRACTICAL INITIATIVES OF THE BRIDGE PROGRAM

The Bridge Program is an innovative expansion of the RBM Program in the field of entrepreneurship. It simulates a real business environment to help RBM students and graduates transform their knowledge and skills into tangible entrepreneurial outcomes. The program reduces entrepreneurial risks by providing funding, technical support, human resources, and professional guidance, while also strengthening cross-disciplinary learning, design thinking, and teamwork skills.

1. CREATING A REAL ENTREPRENEURIAL ENVIRONMENT TO HELP ADDRESS PAIN POINTS FOR RBM STUDENTS IN THE EARLY STAGES OF ENTREPRENEURSHIP

The Bridge Program creates a real entrepreneurial environment for RBM students and graduates, offering a "trial and error period", a "cooling-off period", and a "transition period" to prepare for the challenges and opportunities of the real world. The program provides essential resources, including funding, technology, entrepreneurial supervisors, and courses, to help them overcome various challenges in the early stages of entrepreneurship, quickly adapt to the entrepreneurial environment, and refine their business ideas.

(1) Setting appropriate rules to create a realistic entrepreneurial environment

① Time constraints

The 12-month timeframe established in the Bridge Program reflects a deep understanding of real business environments. This structure cultivates students' abilities to work efficiently, manage time, collaborate in teams, and handle pressure and uncertainty, which are all crucial for students' future success in the business world. Working in teams, students must demonstrate individual capabilities while achieving effective teamwork within this timeframe, which is a comprehensive test of overall coordination and communication. The program's time constraints also keep teams focused on tangible results. The Bridge Program encourages students to concentrate on key performance indicators, ensuring they meet set goals on time. Additionally, by simulating the time pressure found in real business settings, the program prompts students to make innovative decisions and develop their coping abilities in the face of challenges.

② Rigorous admission mechanism

In the Bridge Program, a rigorous and detailed admission mechanism is crucial to ensuring that each selected team not only possesses high-quality entrepreneurial potential but also has the ability to realize its business vision. The core of the admission mechanism is to select teams that can demonstrate innovative capabilities and practical operational potential, ensuring they not only have outstanding project quality but also the potential to achieve their vision. To complete the project application, teams need to apply theoretical knowledge learned in the classroom to real business environments. Through interaction with experts and practical project execution, they gain valuable hands-on experience, helping further enhance students' innovative and entrepreneurial thinking and cultivate entrepreneurial talent with practical skills and business insights. The admission criteria include several key elements:

- Team member qualifications: There is no limit on the number of team members, but at least 60% must be current students or graduates of the RBM Program, ensuring that the team deeply understands and can actively practice the educational philosophy and methodologies of the program.

- Diversity of members: Teams are encouraged to have diverse backgrounds among their members, including different academic backgrounds, professional skills, cultural experiences, and life experiences. This diversity not only fosters the stimulation of innovative thinking but also enhances the team's ability to solve complex problems.

- Business plan: Teams are required to submit a comprehensive and detailed business plan that clearly outlines the project's goals, market positioning, marketing strategies, and financial planning. The plan should reflect how the team translates the knowledge acquired in the RBM Program into concrete business actions, as well as their profound understanding of market trends, customer needs, and the competitive landscape.

- Interviews and evaluations: An expert interview and evaluation process has been implemented, focusing on assessing the feasibility and innovation of the team's business model and providing industry insights and feedback. The evaluation panel consists of industry experts, Academic Supervisors, Project Supervisors, and experts in knowledge transfer, who will comprehensively evaluate each project team from multiple perspectives to ensure that the selected teams can maximize their potential in the Bridge Program.

③ Regular review mechanism

The regular review mechanism plays a crucial role in the Bridge Program, ensuring that projects progress steadily along the established path while serving as an innovative educational method that helps student teams learn and refine their approaches in practice, ultimately working towards their entrepreneurial goals. This combination of education and practice makes the Bridge Program an effective platform for promoting the comprehensive development of students. The execution of this mechanism not only enhances the transparency and predictability of projects but also deepens students' understanding of the complexities of business operations.

A. Monthly progress reports

a. Process and purpose: Each team must submit monthly progress reports on time, serving as a regular check on project status and an opportunity for reflection and learning. Reports should detail specific activities, challenges encountered, and strategies employed.

b. Learning and reflection: The process of writing these reports requires team members to review and analyze their work, identifying potential areas for improvement or strategies that need adjustment. This continuous self-assessment is key to cultivating an entrepreneurial mindset, encouraging students to learn from each practical experience.

B. Semi-annual reports and goal assessment

a. In-depth analysis: Every six months, teams must submit a semi-annual report providing a comprehensive assessment of long-term goals and strategies. This report should analyze the project's ongoing feasibility and direction, ensuring alignment with initial goals or making necessary strategic adjustments.

b. Planning and management: Through this assessment, teams gain a deeper understanding of how to plan and manage complex projects over a longer timeframe, which is crucial for business success.

C. Stakeholder engagement and support

a. Feedback and guidance: By reviewing monthly and semi-annual reports, project stakeholders (including Project Supervisors, Academic Supervisors, industry experts, and sponsors) can effectively track project progress. They not only provide essential business guidance and professional advice but also offer valuable market and industry insights.

b. Resources and support: The ongoing feedback mechanism fosters beneficial interactions between teams and the external environment, providing opportunities for real-time adjustments and improvements to help teams better adapt to the changing business landscape and market demands.

④ Strict exit mechanism

In the Bridge Program, a strict exit mechanism is crucial for maintaining the overall quality and efficiency of the projects. This mechanism ensures that all participating teams operate efficiently and remain goal-oriented throughout the project cycle. Additionally, it provides opportunities for teams that fail to meet preset goals or standards to learn and grow, ensuring that even when a project is terminated, these teams still gain valuable experience and industry insights.

A. Continuous monitoring and evaluation: Systematic monitoring procedures, including regular progress reports and performance review meetings, have been implemented to assess the progress and performance of each team on a regular basis and ensure teams are on track with their project goals and KPIs.

B. Observation and intervention: If a team significantly lags behind the project timeline or fails to meet established KPIs, they will be placed on the watchlist. These teams will receive additional support and resources, including expert consultations, supplementary educational resources as well as guidance on project management and strategy adjustments. A dedicated support group comprising Project Supervisors, industry experts and other educational resources is formed to assist these teams in identifying challenges, designing effective solutions and implementing necessary improvements.

C. Fair and transparent exit procedures: If a team fails to show significant improvement or meet KPIs after being given reasonable time and support, a fair and transparent exit procedure will be initiated. This includes detailed communication with the team to explain the reasons for the exit and provide specific recommendations and guidance. During the exit process, a comprehensive feedback report will be provided containing summaries of the key areas of team performance, specific suggestions for improvement, and possible projects or other career development opportunities that the team members may pursue in the future.

D. Follow-up support and development opportunities: Teams that conclude their projects within the Bridge Program will still have access to resources for professional development and entrepreneurship education from the RBM Program to prepare themselves for future opportunities. This includes access to alumni networks, career training and retraining courses, ensuring that members can tap into valuable resources and guidance even after project termination. Thus, the exit mechanism not only guarantees project quality, but also serves as a tool for students to learn, grow and develop comprehensively. This approach underscores the commitment to sustained, holistic entrepreneurship education within the Bridge Program, ensuring that every student in the RBM Program has equal access to development and growth opportunities.

(2) Assisting RBM students/graduates in addressing early-stage entrepreneurial pain points

① Difficulties in raising initial funds

In the Bridge Program, a support mechanism backed up by the Lab of Future Technology was established to help student teams tackle the common fundraising issues in the initial stage. This mechanism is designed to significantly reduce the financial pressure on teams in the early stage of entrepreneurship and thus create a more free and flexible entrepreneurship environment for RBM students/graduates. Through this fundraising support mechanism, the Bridge Program provides crucial resources for RBM students/graduates, reducing their burden on fundraising and offering opportunities for them to explore freely and experiment with their business ideas.

- Funding support: The Lab of Future Technology provides initial funding support for RBM students/graduates' projects, covering labor costs, equipment, materials and travel expenses, usually for a duration of 12 months. The scale and duration of this funding are carefully designed based on the needs of most early-stage projects. For projects with special requirements, the lab can provide up to an additional 6 months of resources, subject to approval by the review committee, further facilitating the development of entrepreneurial students and their projects.

- Flexibility in fund usage: The Bridge Program implements a lump-sum reimbursement system, granting teams maximum freedom in fund usage. Once a project is approved, teams can develop their funding budget based on specific needs and strategies. This flexibility allows team members to allocate funds adaptively according to the project's actual progress. While there is considerable freedom, teams must adhere to the university's basic financial regulations and ensure transparency and compliance in fund usage.

② Challenges in forming startup teams

Faced with the challenges of team formation in the initial stage of entrepreneurship, the Lab of Future Technology has launched a range of measures to help RBM students/graduates swiftly establish efficient and coordinated teams. These measures aim to attract like-minded individuals, providing a platform to enhance skills in teamwork, collaboration, communication and project coordination, and inspiring them to build an entrepreneurial culture rooted in cooperation and shared values, thus laying a solid foundation for students' future success.

- Team member recruit platform: The Lab of Future Technology regularly publishes promotional materials and recruitment information for entrepreneurship projects on its official website and WeChat Account. This helps RBM students/graduates as well as PhD students and faculty from HKUST(GZ) find opportunities that align with their entrepreneurial visions and professional skills.

- Online and offline events for team matching: The Lab of Future Technology regularly organizes various sharing sessions on campus, such as entrepreneur talks, thematic discussions and entrepreneurial experience sharing meetings. These events aim to inspire entrepreneurial ideas and facilitate knowledge exchange. Through online seminars, entrepreneur networking events and project showcases, the Bridge Program provides a platform for RBM students/graduates to communicate and connect with their peers, further increasing recruitment opportunities. In these events, RBM students/graduates can not only gain the latest information about entrepreneurship projects but also seek potential team members with complementary skills, such as technical developers meeting peers with marketing or business planning backgrounds. In addition, the lab also provides various kinds of resources and guidance including team-building workshops and conflict resolution training to help the new team develop efficiently.

③ Technological challenges in product development

In the early stages of entrepreneurship, technological issues often pose significant obstacles to project development. To help address this issue, the Bridge Program provides comprehensive technological support and resources for RBM students through the Lab of Future Technology. This support encompasses not only funding and team building but also critical areas of technology development. Specifically:

- Laboratory resources: The Lab of Future Technology, boasting over 1,200 square meters, provides essential facilities for various technological R&D and product testing in smart manufacturing, intelligent sensing, health technology, new materials and automation robotics.

- Project Supervisor and Academic Supervisor support: The Bridge Program offers a wealth of mentor resources for entrepreneurial teams. Project Supervisors boast abundant industry experience and technical knowledge and can provide targeted guidance and advice to help teams tackle technical problems. Additionally, Academic Supervisors can play a key role in helping address complex technical issues as they provide professional knowledge and foster innovative thinking and effective problem-solving among entrepreneurs.

- Sustained technical support: To further support RBM graduates in their entrepreneurial efforts, the Lab of Future Technology offers Research Assistant positions to them, enabling them to access the lab's equipment and materials at university prices even after graduation through the Bridge Program. These measures allow RBM students/graduates to quickly find solutions to technical problems, thus speeding the development process and enhancing the likelihood of project success.

④ Lack of practical business operation experience and insufficient legal and compliance awareness

To address the common challenges of inadequate business operation experience and legal and compliance awareness faced by entrepreneurial teams, the Lab of Future Technology has designed a comprehensive support system aimed at providing solid business foundations for RBM students/graduates, helping them overcome these entrepreneurial hurdles.

- Business and legal training: The Lab of Future Technology offers professional guidance on fundraising and financial usage, helping entrepreneurs understand different fundraising channels and develop effective financial strategies. In addition, financial management training in collaboration with the university's Office of Knowledge Transfer covers key areas such as financial statement analysis and risk management, establishing a foundational financial knowledge base for entrepreneurs to understand and apply financial data to guide business decisions.

- Legal and compliance support: The Lab of Future Technology provides a systematic set of legal, compliance and business strategy consulting services, spanning business contract drafting and review, intellectual property protection and tax compliance in key areas. This aims to help entrepreneurs understand and address possible legal issues and maintain compliance requirements they may encounter in business operations.

2. CORE OF THE BRIDGE PROGRAM—PILLAR PROJECTS LED BY RBM PROJECT SUPERVISORS

The Project Supervisors of the RBM Program form a high-tech talent team with a solid theoretical foundation and rich practical experience. They have deep backgrounds in engineering research and entrepreneurship and play a key role in cultivating the entrepreneurial capabilities of RBM graduates. They are responsible for extending the educational philosophy of the RBM Program from theory to practice, serving as key human resources for transforming academic knowledge into entrepreneurial practice.

Pillar projects are central to the research conducted by Project Supervisors. Based on their research directions, the Lab of Future Technology is equipped with comprehensive facilities in areas such as smart manufacturing, intelligent sensing, health technology, new materials and automation robotics, providing an ideal environment for Project Supervisors to conduct pillar projects and abundant facility resources for entrepreneurial activities based on these pillar projects. Through these pillar projects, students can acquire profound technological expertise that establishes a solid foundation for continuous product innovation.

Additionally, Project Supervisors typically establish extensive collaborative networks within their professional fields, which can be valuable resources for RBM graduates. These networks encompass universities, research institutions, enterprises and investment institutions within the industry, which can support startups from multiple dimensions. For example, Project Supervisors can leverage industry contacts and expert resources to help graduates access cutting-edge technologies, market trends and potential business partners, significantly enhancing the market adaptability and commercial prospects of entrepreneurship projects. Furthermore, through Project Supervisors' network, graduates can swiftly find partners to develop or refine key new technologies. This collaboration not only accelerates technology development but also leads to innovative solutions. In terms of funding, Project Supervisors may help RBM graduates connect with potential investors or funding institutions, allowing teams to quickly secure seeding funds, venture capital and other forms of financial support. More importantly, Project Supervisors' client resources would be helpful for entrepreneurial teams in reaching potential clients and market channels, which is crucial for market validation and iterative improvement, especially in B2B models.

Leveraging these external collaborative networks, the RBM entrepreneurial teams can significantly shorten project initiation and development time, and reduce resource waste while improving market competitiveness and the overall possibility of success. In the Bridge Program, Project Supervisors play a crucial role in cultivating students' entrepreneurial mindset and skills. In the entrepreneurship phase, Project Supervisors guide students on how to identify problems and needs, discover business opportunities, integrate resources and manage and control risks in practical scenarios through pillar projects. The professional assistance provided by Project Supervisors can significantly improve students' entrepreneurial capabilities and project success rates, enabling RBM students to make more confident decisions and effectively advance their projects.

3. COLLABORATION WITH THE HKUST(GZ) ENTREPRENEURSHIP CENTER TO FORM A CLOSED-LOOP SYSTEM FOR ON-CAMPUS ENTREPRENEURSHIP EDUCATION

The Bridge Program, in close collaboration with the university's Entrepreneurship Center, builds a comprehensive and refined closed-loop system for on-campus entrepreneurship education. This system integrates both formal and informal educational programs, providing all students, including RBM students, with systematic and in-depth training in entrepreneurial thinking and skills.

Within this closed-loop system, students have the opportunity to systematically acquire the core knowledge and skills for entrepreneurship. For example, a series of entrepreneurial courses creates an interactive learning platform, allowing students to delve into foundational topics like market research, business model design, and product development. Additionally, specialized seminars cover topics such as entrepreneurial law, intellectual property protection, and funding strategies to broaden students' entrepreneurial knowledge. Regular entrepreneurship lectures invite seasoned entrepreneurs and industry experts to share their experiences, offering insights into the latest industry trends while helping students connect with elite professionals, enhancing their leadership skills and expanding their networks.

Furthermore, various entrepreneurship-related activities on campus provide students with valuable opportunities for knowledge enhancement and deepening their understanding. For instance, entrepreneurship salons create direct dialogue opportunities with entrepreneurial pioneers and investment elites, effectively expanding their networks and resource pools. Through experiential sharing events, the Lab of Future Technology invites successful alumni and entrepreneurs to share their practical experiences and lessons, allowing students to draw practical entrepreneurial wisdom and strategies.

The collaborative educational model of the Bridge Program and the university's Entrepreneurship Center not only injects new vitality into on-campus entrepreneurial education but also enriches teaching content and methods, improving the overall quality and level of entrepreneurship education. This cooperative model offers broader opportunities and support for students and entrepreneurs, promoting the continuous advancement of entrepreneurial education and ensuring a seamless connection from theoretical learning to practical application, laying a solid foundation for their entrepreneurial journeys.

4. THE CUSTOMER DISCOVERY PROGRAM

In the Bridge Program, the Customer Discovery Program plays a crucial role by helping entrepreneurs effectively identify and connect with their target customer groups through a series of customer development skills training and an active information platform. This program aims to accelerate entrepreneurs' market entry and customer development by teaching them how to analyze market data, create detailed customer profiles, and design value propositions that meet market needs. Additionally, the information platform provides a window to showcase the progress and achievements of entrepreneurial projects, allowing potential investors and partners to connect directly with entrepreneurs, thus facilitating effective business communication and collaboration.

The involvement of early-stage investors is vital to the Customer Discovery Program. These investors typically possess keen market insights and extensive industry connections, enabling them to provide entrepreneurs with valuable market information, customer network resources, and a deep understanding of market trends. Their support can enhance entrepreneurs' market access speed and efficiency while strengthening their market adaptability and business sustainability.

Through market testing and direct customer feedback, entrepreneurs can make real-time adjustments to their products or services to better meet market demands. By integrating these resources, the Customer Discovery Program not only enhances entrepreneurs' market competitiveness but also ensures that the Bridge Program becomes a powerful platform that integrates market resources, investor expertise, and entrepreneurial innovation.

Through this fusion of education, technology, and investment resources, the Customer Discovery Program not only accelerates entrepreneurs' market entry but also provides them with a robust support structure in a competitive market environment, ensuring their long-term success and growth.

5. SUPPORT FOR ENTREPRENEURIAL FAILURE AND RESILIENCE

In the Bridge Program, a support system for entrepreneurial failure and resilience plays an important role. This system aims to provide the necessary tools and resources to support entrepreneurs who have experienced failure. Through such a system, the Bridge Program helps entrepreneurs recover quickly from setbacks and be better prepared for possible future challenges in their business careers. This enhances the resilience and success rate of projects in the entrepreneurial ecosystem.

- Post-failure project review: This is to provide support for entrepreneurs to recover from failures. By analyzing the reasons for failure, extracting key lessons, and turning these experiences into a foundation for future attempts, entrepreneurs can face challenges with greater resilience. This system includes a series of workshops and one-on-one consultations focused on post-failure needs, such as strategy adjustments and resource reallocation.

- Psychological counseling: This counseling is designed to help entrepreneurs navigate post-failure stress and emotional challenges. The Bridge Program provides psychological support and resilience recovery services to assist entrepreneurs in overcoming self-doubt and restoring confidence, better equipping them for possible future challenges. Services include cognitive therapy and training in emotional management techniques, such as deep breathing and meditation. Tailored support is provided through one-on-one consultations and collaborative group meetings. These comprehensive psychological support services aim to help entrepreneurs recover from setbacks and establish a strong foundation for their ongoing development and success.

- Project follow-up: By regularly tracking successful cases and converting this information into learning materials, the program helps current and future entrepreneurs gain insights from successful experiences, ensuring knowledge transfer and practical improvement. This comprehensive support and feedback mechanism not only mitigates the impact of entrepreneurial failure but also paves the way for entrepreneurs' future attempts.

REFLECTIONS FROM A FIRST COHORT RED BIRD STUDENT

10

X. REFLECTIONS FROM A FIRST COHORT RED BIRD STUDENT

The talent development of the Red Bird MPhil Program emphasizes a mutual learning process between teaching and learning. The Red Bird approach aspires for students not only to be beneficiaries of the paradigm shift in higher education spearheaded by the program but also to be active participants, explorers, proposers, and drivers of this innovation. What are the personal journeys and experiences of Red Bird students in this reciprocal educational process? This chapter will delve into the personal reflections of Red Bird MPhil students, providing a multifaceted perspective on this transformative shift in higher education through their eyes.

I. REFLECTIONS BY FIRST COHORT OF RBM STUDENTS

1. STUDENT A: GROWTH THROUGH THREE FAILURES

(1) The First Failure: My Red Bird Project, Oysteria

> “My university experience wasn't about earning credits but accumulating failures.”

Unlike traditional universities, HKUST (GZ) places tremendous emphasis on student autonomy. It encourages and expects students to form their own ideas, rather than imposing a rigid curriculum that dictates every step of their educational path, or adopting an apprenticeship model wherein students are more of passive learners. This philosophy is epitomized in the Red Bird MPhil program, and most notably in one of its initiative—the “Red Bird Challenge Project.”

When the first Red Bird cohort began in September 2022, there were no classes and no assigned academic advisors. So, what were we doing? We were attending seminars. For the first time in my life, I had the opportunity to immerse myself in such a concentrated array of expert-led talks from various fields, all within a single month. We could engage directly with leading academics and seasoned industry professionals, asking them questions face-to-face.

That month, I shed all labels associated with my background (business) and ignored the expectations tied to my identity (non-STEM). Like a sponge, I absorbed as much knowledge as I could.

Looking back, I must admit that cramming so many disciplines into a single month inevitably lacked depth. Every field demands years of dedication to master. Yet, this does not diminish the profound impact those lectures had on me—and on all of us. My mind underwent a remarkable transformation. I stopped thinking of myself merely as “a business student.” I abandoned the notion that I couldn't truly contribute to a STEM project or that my future would inevitably align with my academic specialization. These mental barriers dissolved quietly yet powerfully, washed away by the interdisciplinary knowledge that surrounded me.

I also began actively connecting with others at the university. I founded regional

and alumni associations, using every opportunity to talk to peers from diverse backgrounds about their projects. These exchanges not only broadened my knowledge but also allowed me to build meaningful relationships with a wide range of people.

In October, the Red Bird program abruptly announced the launch of the "Challenge Project." We had just two weeks to conceptualize a practical project and form a team. This was relatively easy for me. By then, I had already connected with over a hundred students and knew who knows what and who can help whom.

Soon, I joined forces with a linguistics student—a passionate founder of a marine conservation nonprofit—and a marine science major. Together, we came up with a whimsical idea: in our hometowns, as well as in many coastal regions of China, oyster farming is a key livelihood. However, oyster survival rates and yields are highly dependent on environmental factors, leaving farmers vulnerable and often struggling to maintain stability.

Could we leverage technology to help them? Inspired by this romantic yet naive vision, we recruited a diverse team, including the founder of an underwater robotics company, a materials science whiz, a former intern at ByteDance, and even a few PhD students with firsthand experience in oyster farming. Brimming with excitement, we named our project Oysteria—a playful blend of oyster and hysteria to reflect our passion for oysters—and got to work. But our initial question loomed large: what technology could we use to improve oyster survival rates and yields?

Through consultations with various experts, we discovered that oxygen depletion is a critical pain point for oysters, which are highly oxygen-dependent creatures. Armed with this insight, we approached our project advisor, Dr. Man Chan, a jovial and encouraging mentor who previously served as a leading director in semiconductor equipment R&D. He recalled his exposure to microbubble technology during his doctoral studies in Japan three decades ago—a technology he was fascinated by but hadn't pursued further due to career constraints. He encouraged us to investigate this avenue further.

Fueled by his enthusiasm, we dove headfirst into research. In the vast sea of academic papers, we unearthed an old Japanese study suggesting that microbubble technology could promote oyster growth. Thrilled, we tracked down a Japanese microbubble machine supplier. However, when we called, we realized they didn't speak English. Dr. Chan kindly stepped in, using his Japanese to inquire. The supplier responded, "Our microbubble technology can be applied to many fields, but we've never tested it on oysters."

Undeterred, we embraced the challenge of exploration. We conducted field studies across several coastal regions in southern China, including Jiangmen, Chaozhou, and Zhangzhou. Over a week, we immersed ourselves in the local oyster farming industry, learning from experienced technicians, gathering data, and conducting small-scale experiments. By the time of the Challenge Project's interim evaluation, our group had earned first place.

We were still basking in the glow of our romanticized Oysteria dream when reality delivered its hard-earned lessons.

As our project grew, so did our team. Everyone wanted to contribute something unique, leading our vision to expand uncontrollably. We envisioned a "marine ranch" where oysters would be cultivated, alongside recycling oyster shells and coastal plastic waste to produce sustainable materials. We planned to grind these materials into calcium carbonate powder, combine them with recycled plastics, and use electrospinning technology to create eco-friendly clothing—all while selling oysters and apparel to fund the venture.

We compiled all these ideas into a proposal and invited Vice President Wu to dinner for his advice. He skimmed through our plan, his thoughts evident, but instead of pointing out flaws directly, he shared three stories of his own—each about ambitious projects where he had tried to apply "technological hammers" to "industry nails," only to fail. His advice was clear: "Focus on financial feasibility, not just technical feasibility." Dr. Chan, ever encouraging, gently advised us to "narrow the scope a bit."

Looking back, our vision was undeniably fantastical. Yet at the time, it was the only way to accommodate everyone's contributions. This inclusivity, however, sowed the seeds of our project's eventual demise. By the second semester, the group faced mounting academic pressures, from choosing advisors to defining research topics. Procurement delays slowed our experimental progress, leaving many ideas untested. Each member had to prioritize their own path, and we inevitably drifted apart.

Ultimately, due to an unfocused vision, unverified feasibility,

and insufficient academic depth for all members, Oysteria transitioned into a hobby group—effectively dissolving.

The dissolution of our project was painful. Months of brainstorming and research amounted to nothing, and we were left scrambling to redefine our individual paths within a tight timeframe. Yet, with time, I've come to appreciate the profound lessons this failure taught me.

Leading a team that fell apart made me deeply aware of the responsibility a project initiator bears for each member's journey. Whether in startups or smaller projects, we cannot act on passion alone. We must align the vision with everyone's long-term plans. If the project can't offer that clarity, it's not yet a worthy endeavor—or perhaps, it requires a better-suited team. Either way, mismatches are the initiator's responsibility, not the participants'.

I also learned that wielding a hammer in search of nails isn't inherently doomed, but the odds of failure are high. When resources are insufficient to support repeated failures, this approach is a luxury, not a routine. I need to accumulate a stronger foundation before pursuing such risks.

In the exploration of uncharted fields, there are rarely absolute rights or wrongs. Without experimentation, we'll never know. But the key lies in determining how many failures we can afford. I've grown to appreciate the value of failing quickly—a lesson that shaped my understanding and worldview without leaving me broken. For this, I'm deeply grateful to the Red Bird Challenge Project.

(2) The Second Failure: Generative AI + Educational Entrepreneurship

November 2022 was a pivotal month in my life. At the time, I had no idea how profoundly it would shape my future. At the end of that month, OpenAI released ChatGPT, marking the dawn of widespread adoption of large language models for the general public. Initially, it didn't create an immediate global sensation but spread gradually through word-of-mouth on social media, gaining momentum by early 2023 alongside other generative AI tools like MidJourney and Stable Diffusion.

On December 5, 2022, I registered my ChatGPT account and was instantly captivated. I spent countless hours conversing with it, neglecting all other concerns. During the Chinese New Year of 2023, I enthusiastically introduced ChatGPT to friends and family, eagerly demonstrating how it could solve their work-related challenges or inspire fresh ideas. It was exhilarating to see how my "promotion" of this tool helped government workers struggling with writing official documents and business owners looking for innovative solutions.

However, I soon realized that these one-on-one promotions were inefficient, especially when so many around me hadn't yet embraced this industrial revolution. I needed a scalable method to spread the word. Encouraged by Vice President Jingshen Wu's advice to "take your leadership," I founded a Generative AI Salon at the university. I invited all potentially interested students, faculty, and industry leaders to join. In February and March, we hosted two offline events. Vice President Wu attended in person and, with his characteristic professionalism and enthusiasm, inspired attendees to embrace this technological revolution.

These efforts impacted many people. I lost count of how many I helped register or set up their generative AI tools or how many received basic training from me. One task left a particularly deep impression: Lisa, who managed logistics at the university, entrusted me with designing the logo and uniforms for the university's upcoming kindergarten.

I had no experience in design—my handwriting is poor, I can't draw, and I had never done anything like this before. However, using MidJourney, I iterated tirelessly, refining prompts, generating hundreds of designs, selecting the best, and collaborating with others for feedback. After two months of effort, I completed the task to everyone's satisfaction.

Now, visitors to our university can see the elegant swan logo, transitioning from blue to gold, proudly displayed at the kindergarten. Children wear adorable blue-and-white uniforms designed through this process. This experience reinforced my confidence, echoing Vice President Wu's words: "Don't limit yourself to what you can do; focus on what you want to do and learn as you go." It emboldened me to embrace challenges, break free from limitations, and adopt a "learn as you go" mindset.

With this confidence, I began integrating generative AI into my educational startup, Yuguan, which I had been running for five years. First, I revamped an ongoing project, a writing guide titled Break Mold, by using AI to generate key content sections. The product received excellent user feedback.

Encouraged by this success, I initiated the development of No More Material, an ambitious project to create a 260,000-word high school writing resource entirely generated by AI, supported by a team of three "prompt engineers." We invested significant capital into inventory and successfully brought the product to market, earning widespread acclaim.

During this period, I met two HKUST EMBA alumni who were investors. They were highly interested in my project and offered an initial investment of two million RBM to support the development of more AI-based educational products. However, the offer came with conditions: I would need to forgo a job offer at a tech company and convince my core team to commit full-time.

The memory of Oysteria's disbandment loomed large. I knew that even with experienced investors' support, the project couldn't provide the conditions necessary for my team to fully commit. This time, I felt the weight of my responsibility as the project leader. That very afternoon, I traveled to Shenzhen and had a heartfelt discussion with my team late into the night.

Ultimately, the team members—young and ambitious—decided to prioritize other career opportunities, such as roles at unicorn companies or studying abroad. I fully understood and respected their decisions. I even proposed launching the project alone and reserving roles for them if they wanted to join later. The investors and I continued brainstorming about AI and education, postponing any immediate decisions.

Despite this, the project's allure couldn't compete with the stability of traditional career paths. I adjusted my plans, communicated my thoughts honestly to the investors, and expressed gratitude for their understanding. One investor offered profound advice: "Education is a slow industry. As a responsible investor, I must pursue rapid returns, but with education, we must balance the pace." Their support went beyond the project, fostering a lasting friendship that transcended business.

(3) The Third Failure: Generative AI + Social Science Research

In fact, the previous section only objectively highlighted the surface reasons why my project failed to secure investment. Here, I'll delve into a conversation with Vice President Wu that revealed deeper insights.

Vice President Wu often told me that with every technological revolution, people tend to overestimate its short-term impact while underestimating the long-term paradigm shifts it brings. While I understood every word of this statement, truly grasping its meaning took me a long time, and to this day, I feel I may still only partially understand it.

"I'd be the first to not invest in you."

Developing accessible learning materials using AI—for subjects like Chinese, math, or English—lowering barriers to education, increasing efficiency, and competing with traditional educational publishing companies to carve out a niche, all sounds excellent, Vice President Wu told me. However, the real issue lies elsewhere. "Don't you think AI will, at some point in the foreseeable future, completely disrupt these disciplines? People may no longer need to learn this knowledge or take these exams. The traditional 'teaching-learning-assessment-evaluation' system will collapse, and with it, the niche you're painstakingly building in exam-oriented education will crumble."

Most people might dismiss this concern, thinking, "So what? At least this won't happen within the next five years, right?" While this may be true, Vice President Wu urged me to think far beyond most people's timelines. "If you don't want to settle for mediocrity, you can't just look at the present. You need to think: How will people learn five years from now? What knowledge will still be necessary? What knowledge will become obsolete? Will teachers and classrooms still exist? How will schools evaluate students?"

My mind exploded.

These were questions I couldn't begin to answer, or even fully imagine. At this moment, Vice President Wu clenched his fist and said, "The impact of a technological revolution isn't about minor tweaks—it's like this." With that, he thrust his fist forward, creating a rush of air in the room.

"What's worse," he continued, "is that with your current abilities, you can't predict what education will look like in the future, nor how technology will evolve. What you're doing now is essentially wrapping Big Tech's innovations in a shell. All these 'shell AI' companies will likely become casualties in the brutal competition among tech giants vying for foundational breakthroughs."

As I absorbed these profound insights, I felt as though I were in the chaotic final years of the Han dynasty, surrounded

by warlords like Dong Zhuo, Li Jue, Guo Si, and Yuan Shao. None of them were likely to emerge as ultimate winners. Building something atop their ecosystem entailed immense risks, as the eventual victors would be the well-equipped foundational innovators in AI, who would dominate the landscape in a winner-takes-all scenario. This grim reality was far more brutal than I had initially imagined.

Vice President Wu's final advice to me was encapsulated in four Chinese characters: 躬耕南阳 ("plow your fields in Nanyang"). He encouraged me to safeguard my current position in turbulent times, focus on cultivating my own skills, and bide my time until I had the strength to pursue grander ambitions. After all the running around I had done, it was time to calm down and deeply consider how to answer the question, "What does the future look like?"

Following the failure of the Oysteria project, I was fortunate to choose the Innovation, Policy, and Entrepreneurship (IPE) domain at the university. In IPE, I found many passionate mentors and peers dedicated to answering the question, "What is innovation?" I also had the freedom to propose research topics aligned with my passions, which brought me immense happiness.

In every course, I experienced what a true university should be: professors lecturing passionately, and students unbound by grades, credits, assignments, or exams, focusing instead on the pursuit of knowledge itself. This was a stark contrast to my undergraduate years.

In this Athenian-style atmosphere, I had the space to envision the future, surrounded by inspiring mentors and peers, living as a "happy villager." However, even happy villagers are subject to societal expectations. My research progress was fraught with challenges, particularly in defining my topic. As mentioned earlier, my academic aspirations were forward-looking, aimed at engaging with the "future" and the "unknown." In contrast, social science research paradigms focus on retrospection, examining the "past" and the "known" through rigorous and complex methodologies.

Drawing lessons from history and extracting patterns from data is admirable. I have no intention of dismissing the value of academic paradigms. However, I found myself in a situation devoid of historical precedents to reference.

Faced with a wave of entirely new technology, I struggled to determine a starting point for my research. I read the latest papers on AI-generated content (AIGC), searching for inspiration, but this consumed considerable time. My kind and responsible advisor grew concerned, encouraging me to quickly align with established academic paradigms and produce tangible results to keep pace with my peers. I made great efforts to adjust, exploring various specific topics under the broad theme of "the impact of AIGC on public perception," and experimenting with several common social science methodologies. All attempts ended in failure.

The root cause was my inability to forget my original aspiration when joining this "Athens." These weren't the kinds of studies I wanted to pursue. I even struggled to embrace the social science framework of "X's impact on Y." While I respect it, I believe it excludes many more flexible ways of thinking. With traditional papers already abundant, why not explore something different?

I wanted to change my research topic, but this conflicted with the established paradigm of existing social science research. Ultimately, I had to conform to academic norms and frame my educational entrepreneurship project as a case study to complete my thesis. In a sense, this was another failure of mine.

From this experience, I learned that academic paradigms are like towering, well-established edifices, guarded by diligent and friendly gatekeepers. Any innovation hoping to enter must register and adhere to the building's rules, often at the cost of one's original expected outcomes.

In emerging fields, academia appears to engage with external changes by organizing discussions and embracing new topics. However, everything must still conform to internal rules. This limits academia's ability to truly grasp the essence of external changes, relegating it to a third-party observer of society's transformation.

Those who cannot enter the academic edifice must build their own modest shelters on its outskirts, often overshadowed by its grandeur.

Red Bird, however, aims to connect these academic towers and encourages gatekeepers to redefine themselves as "architects," helping "workers" construct vibrant and diverse buildings. Students are encouraged to "question the question," breaking free from the confines of frameworks like "X's impact on Y" to explore more intriguing ideas. With our collective efforts, I believe we will one day create more space for the "happy villagers" of this world.

(4) Failure Education vs. Credit-Based Education

If you've read this far, you might think: my university experience wasn't about earning credits but accumulating failures.

This is where the Red Bird MPhil program fundamentally differs from traditional universities. Although Red Bird never explicitly promotes itself as a "failure education" institution, my personal journey reflects a wholly different approach from credit-based education.

In most people's understanding, universities design something called a curriculum plan, which outlines a rigid learning trajectory for students. This plan typically specifies the number of credits required for graduation, with each course and activity assigned a specific value—like a travel itinerary where travelers achieve fulfillment by ticking off enough landmarks.

Red Bird, however, took a radically different approach: it handed the creation of the curriculum plan to the students themselves.

What's the benefit of this approach? I believe it ensures that no two students will end up sharing identical experiences when reflecting on their journey—each person's story would be uniquely their own, like a personalized travel journal.

What's the drawback? Many students, like myself, might face failures and endure the pain of realizing their ideas were too immature or their skills insufficient. The feedback we receive from the real market is direct and unfiltered—it hits hard, like punches landing squarely. But it is through these challenges that we grow faster. Red Bird is not an ivory tower; instead, it provides us with a buffer—a safety net that ensures our failures won't cause irreparable harm.

(5) My Zero-th Failure

I completed my undergraduate education at a typical 985 university in China. Undergraduate education, almost synonymous with the concept of "university," occupies a critical stage in a young person's life. Its duration (four years) and the intense effort required for admission (after more than a decade of grueling studies) make it an essential milestone. For most Chinese youth, these years represent the golden age of their lives.

Yet despite its significance, my four years of undergraduate education fell far short of my expectations. In my first year, I experienced an overwhelming sense of disillusionment. By the later years, I had largely abandoned attending classes, devoting all my time to activities outside the academic framework and the campus itself. I sold goods in urban villages, interned in top domestic investment firms dressed in formal suits, and worked in promotional campaigns, persuading commuters at bustling subway stations to download apps. I also ran my own startup while studying, surviving on just five hours of sleep each night, juggling multiple roles, burning the midnight oil, and braving torrential rains to make deliveries.

Those four years were not spent in classrooms or with textbooks—they were spent in the world beyond. To escape the confines of the campus, I even took the risk of climbing over locked gates several times. To manage scheduling conflicts, I hired disheartened postgraduate exam dropouts looking to make extra cash to attend classes for me. By doing so, I barely managed to scrape together the credits needed for graduation, eventually leaving university in a rather chaotic state.

What drove me, a student with a strong thirst for knowledge and exploration, to take such unconventional steps to navigate my university life? Allow me to explain, and perhaps you would make the same choices if you were in my shoes.

In my first year, I witnessed countless classmates playing addictive games late into the night, as if still reveling in their newfound freedom from exam-driven education. I was shocked by their apathy and tried to discuss more idealistic topics with them, but I found that many had no interest. After years of relentless academic pressure, they simply wanted to release that tension.

I saw classrooms at their worst: rows of students glued to their phones or laptops, while instructors lifelessly recited from PowerPoint slides before leaving on the dot. Students pretended to learn, and teachers pretended to teach, completing one hollow performance after another. Precious time slipped away unnoticed, and few seemed to lament it.

I was trapped in a stifling credit-based system, forced to take courses that didn't interest me and spending excessive

time on impractical academic exercises. It was painful, yet I couldn't escape. Universities are often romanticized as ivory towers, but what I saw were instructors with little passion—some treating academia as just a job, others viewing students as mere commodities. Many no longer believed in their work but continued to trap students in the very system that had already disillusioned them.

I also saw diligent students led by empty metrics like GPA and credits, striving tirelessly to meet the expectations of being a "good student." They sacrificed sleep and occasionally clashed over rankings during evaluation periods. Meanwhile, peers with visionary ideas often felt out of place, exhausted by the system's constraints, unable to find meaningful outlets for their energy.

Amid all this mediocrity, what struck me most was the normalization and institutionalization of dependency. When adults can't decide their own learning interests, waste their youth without regret, or stay up gaming until 5 a.m., only to sleep until the afternoon and retrieve takeout in pajamas, something is fundamentally wrong.

When university advisors began addressing students as "babies" or "little friends" in group messages, and everyone accepted this as normal, I was deeply alarmed.

It was then that I realized, with great pain: something is profoundly wrong with China's universities—and with us, the adults within them.

(6) Mindset Revolution vs. Knowledge Injection

One of the most successful aspects of the first cohort of Red Bird was its bold design: regardless of background, profession, or goals, over 200 students with diverse needs and aspirations were brought together. No schools, no departments, no classes—just pure interaction and the opportunity for "chemical reactions" to occur.

Of course, these interactions didn't only spark beautiful ideas but also generated significant frustration, discomfort, confusion, and dissatisfaction. As a student elected by my peers to represent the cohort in teaching review meetings with the school, I experienced these dynamics firsthand.

The teaching review meetings were a unique gift the school offered to the first Red Bird cohort. Representatives were elected through open ballots to engage directly with the administration. This enabled us not only to benefit from higher education reform but to participate in shaping it. We could propose ideas, suggest improvements, and offer critiques, helping optimize the Red Bird MPhil program during its early, unpolished stages. As someone who served as a representative multiple times, I am profoundly grateful for the invaluable education and growth these opportunities provided.

During the reviews, one recurring sentiment was that Red Bird should not group together students with vastly different goals—those aiming for academia, employment, or entrepreneurship—because it was too challenging to accommodate everyone's needs. This was a valid point and one that I brought up repeatedly in the first review meeting. However, the reality is that such conflicting needs are the norm in the real world. Everyone has unique aspirations, and the world itself is a mosaic of diverse backgrounds and motivations. The friction and clashes we experienced were an essential lesson Red Bird offered us.

I must admit with some shame that my inability to address every team member's needs during the Red Bird Challenge Project caused our group to dissolve, and the project ultimately failed. However, this failure was one of the most valuable lessons I have ever learned. It taught me that only an immature mindset expects everyone to align automatically toward the same goal. In reality, each individual has their own unique trajectory. Vice President Wu encouraged us to study works like Analysis of China's Classes and learn to analyze people's specific needs and motivations. Understanding and navigating the complexities of human nature is an essential skill for anyone preparing to face an uncertain future.

One memory remains particularly vivid. During the first teaching review, it was just the second month after enrollment. There were no professional courses to take—only an abundance of seminars. There were no advisors to choose from—only the mysterious "Challenge Project." Many students questioned why the school hadn't provided a clear curriculum plan. At the same time, some began to realize: Why must there be a curriculum plan? Logically, a university as prominent as HKUST 2.0 would surely have rigorous operating procedures and attract significant

attention from various stakeholders. It must have a well-thought-out curriculum plan. But if we question the question, we might ask: Should students be constrained by a curriculum plan? And must such plans adhere to traditional forms? Immersing students in the real world, leaving them "unaware of their constraints," is itself the most innovative curriculum design.

Some younger peers interested in applying to the Red Bird MPhil program often express concern about the uncertainty it entails. They typically ask:

"How did you balance the contradiction between being a first cohort student at a new school—with incomplete resources and ambitious promises—and having no restrictions and complete freedom? This seems to require a lot of courage. What was your thought process?"

My answer is this: If we see ourselves as mere students, then yes, we will feel this contradiction. But once we embrace a sense of ownership and define ourselves as pioneers—building this home alongside the "non-students" involved, fully aware that our actions will either set a precedent or provoke critique for those who come after us—the contradiction dissolves entirely. Instead, we see that it is precisely because the school is new and incomplete that it has no rigid structures, giving us boundless freedom to pioneer, develop our talents, and achieve more meaningful growth with less frustration.

I don't believe we should see ourselves merely as students. A teacher imparts knowledge and resolves doubts, but teaching and learning should be a reciprocal process. If I only wanted to acquire knowledge, I could learn everything I need from YouTube, buy books to read, or hire experts to teach me directly. None of these require enrolling in a university.

This leads to the fundamental question: What is the true purpose of a university? It is not about red-brick walls, green tiles, or reinforced concrete. A university is not merely a registered teaching institution. At its core, a university is a network of meaningful connections between people. This is why many European universities lack a centralized campus, instead spreading across cities—one teaching building downtown, a college several streets away, and a library shared with the city. What we truly value are meaningful connections with thinkers and practitioners. These connections are not just about exchanging contact information but about working together on innovative projects, engaging in intellectual exchanges, and mutually inspiring and correcting one another. Ultimately, these efforts help everyone progress beyond where they were yesterday.

Viewed in this way, choosing a brand-new school carries no "risk" and requires no "courage." On the contrary, choosing an already rigid, established university constrained by outdated frameworks, where innovation is scarce, requires far more boldness and determination.

Red Bird doesn't limit you with rigid frameworks—it shapes you through the real world! Red Bird doesn't give you KPIs; you must guide yourself, proactively finding your own direction rather than waiting for someone to set OKRs for you.

At Red Bird, you have to find your own teammates rather than waiting for others to "hire" you.

Red Bird is nothing short of a complete mindset revolution!

(7) Giving Chinese Students the Courage to Fail More

During my time as an HKUST(Guangzhou) Ambassador, I had the privilege of accompanying President Lionel Ni and my peer, L, to host former Hong Kong Chief Executive Mr. C.Y. Leung. Among all the moments of that visit, one remains deeply etched in my memory. While visiting the Highbay, Mr. Leung observed the various innovations and practices at HKUST (Guangzhou). With a knowing smile, he asked President Ni, "Doing so much good for the students—it must be expensive, right?" President Ni paused for three seconds, looked Mr. Leung in the eye, and said, word by word, "Education is investment."

At that moment, everyone burst into laughter, including Mr. Leung.

These three words, though easy to overlook, left a profound impact on me and sparked deep reflection.

Education, at its core, is indeed an investment. Yet, our education system often seems obsessed with outcomes—much like companies fixated on KPIs and ROI. Is this really a reasonable approach?

As I've discussed earlier, failure education may be more important than credit-based education, and a revolution of the mind more fundamental than the mere transmission of

knowledge. When we focus too much on outcomes, do we risk losing sight of the essence of education? In traditional universities, the space for students to experiment and fail is often extremely limited. Take undergraduate students in China, for example. Failing a single course could permanently disqualify them from postgraduate recommendations. The reasons for failing a course can be numerous—disinterest in the subject, a simultaneous entrepreneurial venture, or even falling ill. Yet their entire future is constrained by this low tolerance for failure. Is predictable educational success the only type of outcome worth investing in? Why can't we invest more in students' opportunities to fail?

The fear of failure often seems synonymous with the fear of innovation. When I sought advice from President Ni about integrating generative AI into my education project, he told me, "Please don't think your idea is unique. There are at least a thousand other people in the world with the same idea. Among them, only a hundred will actually act on it. But! Of those hundred, ninety will fail. Ten will survive, and only one will succeed and be noticed. Now, here's the question: knowing this, will you still choose to be one of the hundred who try?"

If we fear failure, we become conservative. Our mindset shifts to one that demands certainty. We refuse to admit that "plans can't keep up with changes" or acknowledge the role of serendipity. This rigidity may even rob us of the calm and patience needed to wait for good things to happen. An obsession with success and an aversion to failure are deeply ingrained in Chinese culture. This mindset is also a significant barrier for Chinese students who wish to innovate or start venture creation.

As Vice President Wu once remarked, breaking free from the deeply rooted mentality of always seeking certainty and control is no small feat, especially for societies undergoing rapid transformation. Yet, this shift is essential if we wish to foster a more dynamic and innovative global future.

These words resonate deeply with me. I hope to see a world where people are unafraid of failure and where fertile ground exists for trial and error. In such an environment, bold and pioneering spirits—those willing to challenge boundaries and think differently—can thrive, inspiring progress and creativity across all corners of society.

To my delight, Red Bird has fostered a growing number of peers who dare to pour their hearts into entrepreneurial ventures inspired by intriguing ideas. Sometimes, I worry for them, wondering what will happen if they don't achieve their desired outcomes before graduation.

As if on cue, the university introduced "The Bridge program". This initiative provides one year of institutional support—human resources, financial backing, and other resources—to help students continue their projects. We were overjoyed that the university had taken the lead in institutionalizing this support, offering students a transitional bridge that allows them to pursue their ideas without the immediate pressure of survival. Even if their projects ultimately fail, I believe this is far more valuable than achieving success in outdated coursework or producing superficial academic papers.

Moreover, even in the case of failure, this program offers students an invaluable and rare form of failure education. It is far better for students to experience failure within the safety of a university than to drop out and fail in the harsh realities of the outside world. By failing within the university, they carry forward the lessons, resilience, and mindset shaped by failure, positively impacting both China's entrepreneurial ecosystem and broader societal development. In other words, "failing early" in school reduces the true waste of societal resources. It allows every individual to undergo a transformation during their university years, paving the way for a brighter future for our society.

Finally, I want to say this loudly to university leaders, educators, and the broader public:

Let's work together to give Chinese students the courage to fail more often!

CONCLUSION

Since its launch in 2022, the RBM Program has made impressive progress and achievement. Built on the innovative "Hub-Thrust" and "two colleges and one institute" structure, HKUST(GZ) has successfully graduated 606 students in two sessions, with applications now open for a third. The program's PBL model has proven effective in real practices. Taking a problem-oriented approach, students not only improve their knowledge application and academic research capabilities, but also strengthen their communication skills and innovative thinking through cross-disciplinary collaboration. The program's innovative course design and teaching methods empower students to tackle complex real-world problems, demonstrating their adaptability and creativity. Furthermore, initiatives aimed at capacity building for teachers and the integration of digital technologies have improved teaching management efficiency and quality, facilitating the program's ongoing progress and optimization.

However, several challenges remain. First, achieving a balance between fairness and efficiency in student recruitment is crucial, as is establishing unified standards among reviewers regarding students' "professional knowledge" and "capacity building". Second, ensuring that all students can fully engage in and benefit from the PBL process is essential; improved guidance on time management between teamwork and individual research is needed. Third, the current PQA mechanism lacks effectiveness in accurately measuring students' comprehensive quality and potential, necessitating ongoing efforts to refine evaluation standards and processes. Additionally, while the curriculum is designed for transdisciplinary talent development, balancing the needs of students from diverse disciplines in practical teaching scenarios remains a future challenge. Teachers must also enhance their skills and experience in transdisciplinary teaching to better align with program objectives. Lastly, while digital technologies play a vital role in teaching management, concerns about data privacy and security must be addressed to protect sensitive information while maximizing its use for educational improvement.

Looking ahead, the RBM Program is committed to advancing its transdisciplinary talent cultivation paradigm. HKUST(GZ) plans to continuously optimize its teaching content and methods through projects and feedback systems to meet the evolving needs of a dynamic environment. The university aims to strengthen partnerships with enterprises and R&D institutions, providing students with valuable practical experiences and career exploration opportunities, thereby enhancing the program's value and societal impact. Moreover, HKUST(GZ) remains dedicated to educational innovation and transdisciplinary talent development, advocating for higher education reform globally and nurturing leading talent with robust innovative capacity and adaptability. Through these initiatives, the RBM Program aspires to offer valuable insights and models for the development of China's higher education system, sparking global discussions and inspiring other institutions to undertake similar reforms to tackle the complex challenges of the future.