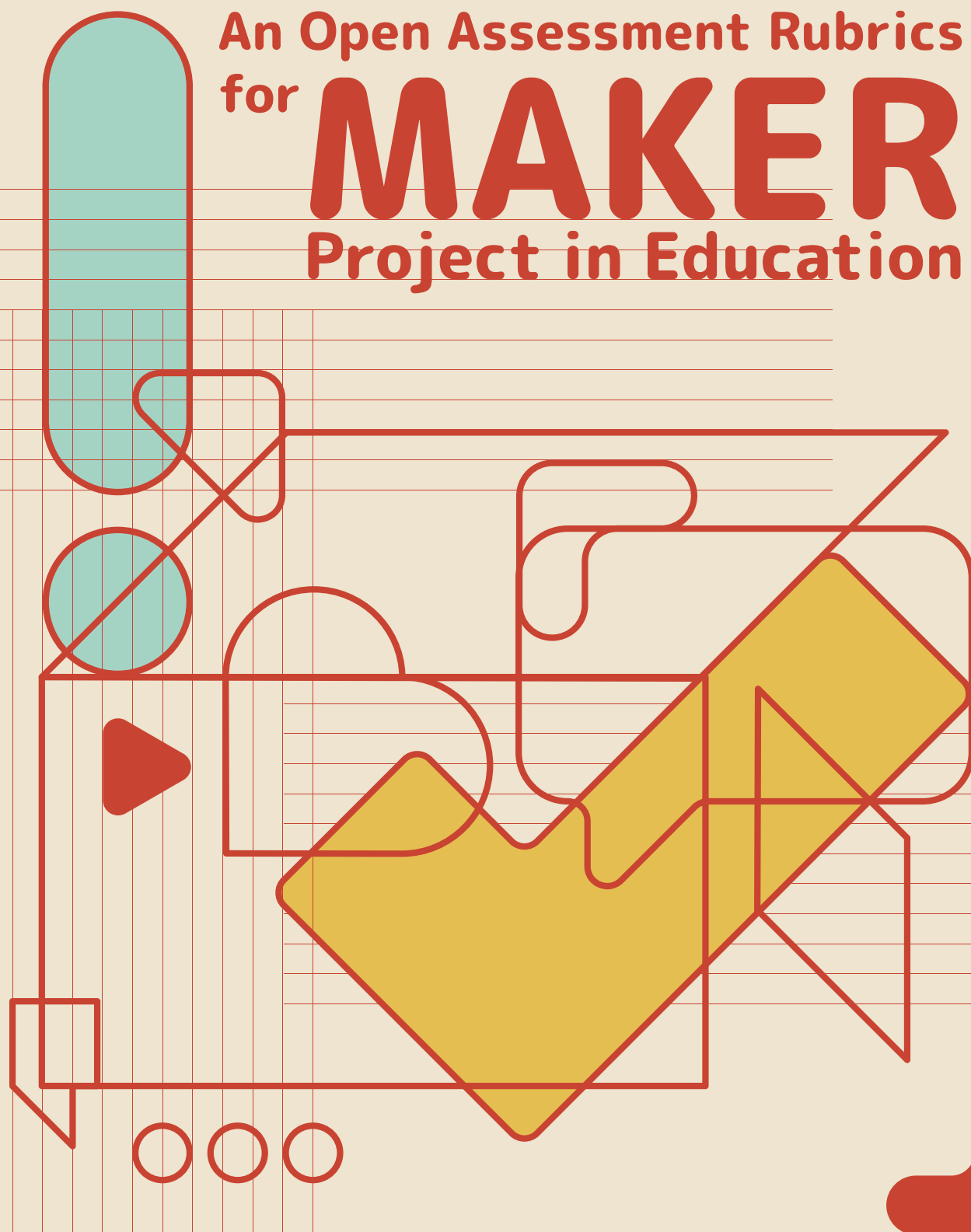


An Open Assessment Rubrics 創
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An Open Assessment Rubrics for **MAKER** Project in Education 創 客 教 育 開 放 評 分 表

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Foreword 前言

SolInno Design Education is one of the four pillar-components of the PolyU Jockey Club "Operation SolInno" that PolyU Jockey Club Design Institute for Social Innovation (JCDISI) has been launching since August 2018 with funding support from The Hong Kong Jockey Club Charities Trust.

The strategic objective of SolInno Design Education is to nurture our younger generation as social innovators by infusing social innovation and design thinking into the curriculum of secondary school education. The journey to achieve this strategic objective proved to be rewarding for JCDISI, our passionate partners, enthusiastic teachers and energetic students who participated in the experimentation in the past three years.

In simple terms, social innovation is to generate new ideas to meet unmet social needs; and design thinking is the process to make these ideas work. We combined these two elements into the SolInno Design Education Workshop. First, we created a unique pedagogy consisting a workable framework of "design playing", "design thinking" and "design making" for teaching, interaction and co-creation. Second, we invited each participating school to bring to the workshop a specific issue that the students would like to tackle, be it relate to a study subject, or an issue concerning their school, their neighbourhood or the wider society.

Up to September 2021, around 20 schools, 180 teachers and 600 students participated in these workshops. The effect on students' learning experience was encouraging and feedback from teachers was tremendously positive. It proved that social innovation and design thinking can be infused as an integral part of secondary school education without affecting the regular curriculum nor adding undue workload to students and teachers.

理大賽馬會社創「騷・In・廬」計劃由香港理工大學（理大）賽馬會社會創新設計院主辦，並獲香港賽馬會慈善信託基金捐助，於2018年8月1日正式開展。計劃設有四大範疇，「啟迪創新習作」便是其中之一。

「啟迪創新習作」的策略目的，是將社會創新和設計思維滲進中學課程，培育青年成為社會創新推動者。在實現這項策略目標的路途上，賽馬會社會創新設計院、我們的合作夥伴，還有在過去三年攜手參與驗證、充滿熱誠的老師和活力充沛的學生均獲益良多。

簡單而言，社會創新就是以新構思來滿足社會上未被滿足的需要；而設計思維則是把這些構思推動成真的過程。我們在啟迪創新習作工作坊中融入社會創新和設計思維。第一步是建立一套具備可行框架的獨特教學法，在教學、互動和共同創作中運用「設計玩學」、「設計思維」和「設計製造」。第二步是邀請每間參與學校把同學有意解決的特定議題帶到工作坊，這些議題可以是與學科相關，也可以是和學校、社區甚至整個社會相關。

至2021年9月，約有20間學校、180位老師和600名同學參與過這些工作坊。相關學習體驗為同學帶來了令人鼓舞的效果，老師的反饋也非常正面，足證社會創新和設計思維可以滲進中學教育成為不可或缺的組成部分，而且不會影響正規課程或為同學和老師帶來不應有的負擔。



This three-year experimentation was successful. We had just produced the Solnno Design Education 2018-2021 Final Report for a holistic documentation of this challenging journey. The report was made in the form of a “gift box” which included a programme record, toolkit to facilitate the design thinking process and brief stories of all cases brought to the workshops by the participating schools and the solutions innovated by their students.

The 12th season of “One from Hundred Thousand” symposium of PolyU Jockey Club “Operation Solnno” was held in July 2021 with the theme of “Co-prototyping Future Classroom: Social Innovation and Design Thinking for 21st Century Learning”. With very interactive and in-depth sharing at the symposium, there was strong consensus that our examination-oriented and classroom-centric education need a breakthrough, and infusing social innovation and design thinking into the learning environment to nurture students’ “can do” spirit and “can do” skills could be an effective trigger point to ignite such breakthrough.

Symposium participants also considered that a structured and evidence-based assessment tool that can be used in school environment is urgently needed to evaluate the outcome and impact of students if the elements of social innovation and design thinking would be infused more widely in the curriculum. JCDISI thus commenced Action Project 12 - SOINNO Assessment Tools for Social Innovation and Design Thinking Education. It aimed to develop an evidence-based assessment model for design thinking programmes that can evaluate how students perform in regards to 21st century competencies and how they deal with complex and real-life issues.

The privilege is ours that JCDISI was invited by TWGHs Wong Fung Ling College to conduct evaluation research on their school-based MAKER+ programme. The Action Project Research Team gathered information and compiled data from their MAKER+ programme through classroom observations and analysis of students’ performance for a full academic year. The outcome of this fruitful collaboration was an

三年的驗證過程是一次成功的經驗。為了整全地記錄這段充滿挑戰的旅程，我們編製了《啟迪創新習作 2018-2021 最終報告》，以「禮盒」的型態呈現。報告內容包括計劃的紀錄、推動設計思維過程的工具套裝，還有由參與學校帶到工作坊的故事簡介，以及由同學提出的創新解決方案。

理大賽馬會社創「騷・In・廬」於 2021 年 7 月舉行了第 12 季「十萬分一」社創研討會，主題為「共塑未來教室：社會創新和設計思維的廿一世紀學習」。與會者經過深入交流分享後的其中一個強烈共識，是我們素來考試導向、教室為本的教育實在需要突破，而在學習環境中融入社會創新和設計思維，培養學生「我做不到」的精神和技能，或許能成為有效的觸發點，促進突破。

研討會參加者也認為，如要在課程中更廣泛地引入社會創新和設計思維，現在便急需制訂一套有系統和以實據為本的評核工具，用來在學校環境中評估成果和對學生的影響。就此，賽馬會社會創新設計院展開了行動計劃 - 「騷・In・廬」社會創新與設計思維教育的評核工具的行動項目，旨在為設計思維課程發展證據為本的評核模式，評估學生在廿一世紀技能的表現，以及他們如何應對真實生活中的複雜問題。

賽馬會社會創新設計院很榮幸受到東華三院黃鳳翎中學邀請合作，對其校本的 MAKER+ 創新課程進行課程研究。行動項目研究計劃小組透過一整年的觀課和分析學生表現，



assessment model (the rubrics) co-developed by JCDISI with TWGHs Wong Fung Ling College, which had been well documented in this Action Project Report.

The SolInno Design Education “gift box” and this Action Project Report, when combined together, will present a comprehensive teaching package which consists of a toolkit for facilitating the design thinking process, real cases for appreciating the experience of student teams from 20 schools, and a structured teaching programme and assessment system that can be used in school environment. We believe that this teaching package will be useful reference for all educators in Hong Kong who seek to endeavor innovative or student-centred pedagogies.

I would like to extend my heartfelt gratitude to Prof King Chung Siu of PolyU School of Design, who had persistently given us very close guidance throughout the study process and patiently scrutinised the outcomes. We would also like to thank Dr Lee Yu Hin for his valuable input to this study. We are indebted to the Principal and teachers of TWGHs Wong Fung Ling College for their trust, collaboration and commitment which had been most essential to enable the completion of this Action Project. Last but not the least, I am also most grateful to the many students, teachers, facilitators who had been going through this challenging journey shoulder-by-shoulder with us in the past several years.

Youths are the hope of our future. Only if they can be creative and innovative, we shall have our future bright and shining.

Ling Kar-kang, SBS

Director of Jockey Club Design Institute for Social Innovation
Professor of Practice (Planning)
The Hong Kong Polytechnic University
August 2022

收集和整理了該課程的資料。賽馬會社會創新設計院與東華三院黃鳳翎中學老師的合作可謂碩果豐盛，雙方共同發展了一套評核模式（評分表），詳情已記錄在本行動項目報告。

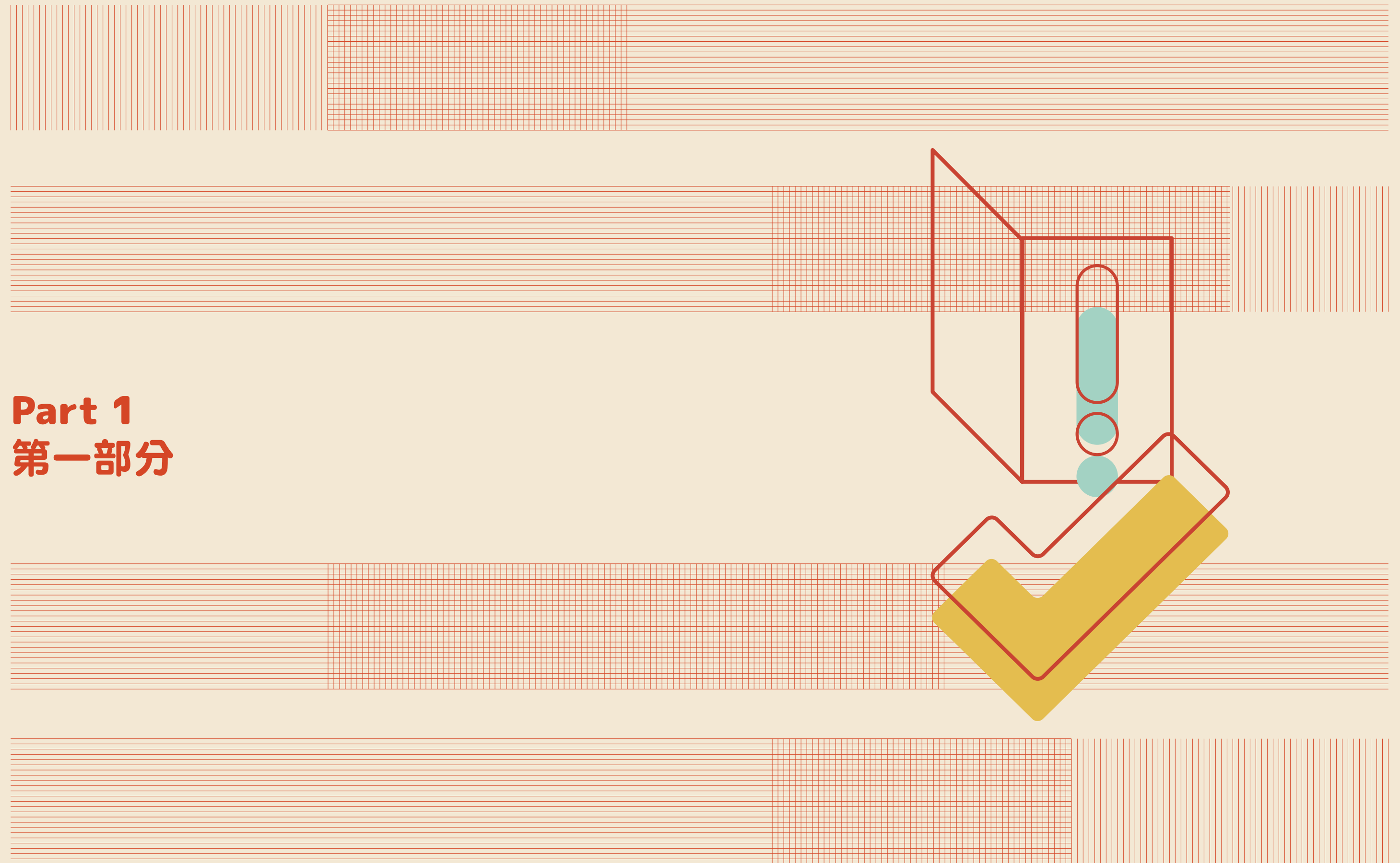
「啟迪創新習作」的禮盒和本行動項目報告結合起來，能呈現一套全面的教學資源，包括推動設計思維過程的工具套裝、記載了 20 間學校學生小組經驗的真實個案，還有一套適用於學校環境、結構嚴謹的教學計劃和評核系統。我們深信這套教學資源是非常有用的參考資料，能有助香港所有有意推創新或學生為本教學法的教育工作者。

謹此向理大設計學院的蕭競聰教授衷心致謝，他在整個研究過程中一直密切地提供指引和耐心審視研習成果。另外就是李宇軒博士為我們提供的寶貴建議。我們也感激東華三院黃鳳翎中學的校長和老師對我們的信任，以及在計劃中真誠協作、投入參與，令是次行動計劃取得圓滿結果。最後要感謝的，還有在過去幾年與我們並肩跨過這段挑戰滿營旅程的每一位同學、老師和推動者。

年輕人是未來的希望。只有他們能夠發揮創意、推陳出新，我們才可以迎來光明閃亮的未來。

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2022 年 8 月



Part 1

第一部分

Introduction 引言

A review of the history of education in Hong Kong reveals that the government has sought to promote maker education by providing technical and handcraft-related courses in schools¹ since 1930. At that time, the government aimed to support social and industrial development and to prepare students for their careers by fostering their making skills. In 1975, Design and Technology (D&T) was introduced to the secondary curriculum with the aim of fostering students' creative, intellectual and technical abilities² to enhance their problem-solving capabilities. Over time, the focus of maker education shifted to the design and thinking skills needed to support new technologies,³ leading to the establishment of a new Design and Applied Technology (DAT) curriculum in 2007.

Various maker education programmes and related pedagogical infrastructure have been developed to reflect technological and social changes and meet the needs of the 21st century. STEM and STEAM⁴ programmes represent the latest developments in maker education. In 2016, the Education Bureau reported on the substantial effort it had made to promote STEM-related programmes in schools. However, many schools have faced challenges in trying to implement these STEM programmes, such as a lack of opportunities for students to apply their knowledge, limited coherence

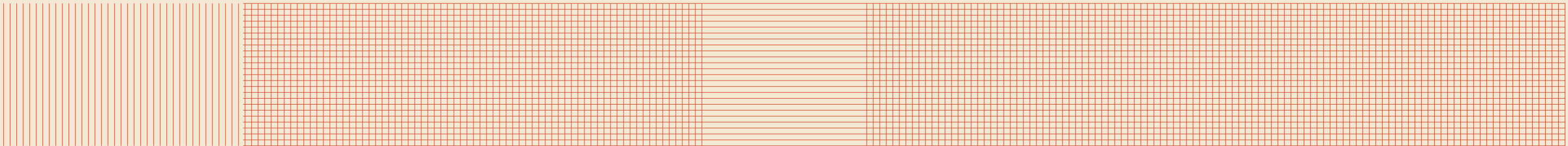
- 1 Waters, D. (2002). A brief history of technical education in Hong Kong: With special reference to the Polytechnic University. Profile = 步伐, 16-23. Retrieved from <https://repository.vtc.edu.hk/ive-adm-otherssp/33>
- 2 Siu, K. W. M. (2009). Review on the development of design education in Hong Kong: The need to nurture the problem finding capability of design students. *Educational Research Journal*, 23(2), 179-202.
- 3 Siu, Kin Wai Michael (2002): Impact of new technology on teaching and learning in technology education: opportunity or threat? Loughborough University. Online resource. <https://hdl.handle.net/2134/3165>
- 4 STEM: Science, Technology, Engineering and Mathematics; STEAM: incorporates 'the Arts' into STEM to stress the dimensions of aesthetics and creativity.



回顧香港教育史，可發現政府自 1930 年起已在學校提供技能和手藝相關的課程¹，試圖推動創客教育。政府當時的目的，是支持社會與工業發展，並透過培養學生的創造技能，為他們日後就業做好裝備。1975 年，「設計與科技」引入了中學課程，希望培養學生的創意、智力和技術能力²以提升他們的解難能力。隨著時間過去，創客教育的焦點已轉移到支持新科技發展所必需的設計和思維技能³，當局遂於 2007 年開辦了新的「設計與應用科技」課程。

為反映科技和社會改變和滿足廿一世紀的需要，多種創客教育課程和相關教學基礎設施也應運而生。STEM 和 STEAM⁴ 課程都是創客教育的最新發展。教育局在 2016 年的報告中列出其大力在學校推動 STEM 相關課程。然而，很多學校在推行這些 STEM 課程時均面對形式式的挑戰，例如缺乏讓學生學以致用的機會、因為現有課程限制令各

- 1 Waters, D. (2002). A brief history of technical education in Hong Kong: With special reference to the Polytechnic University. Profile = 步伐, 16-23. 資料擷取自：<https://repository.vtc.edu.hk/ive-adm-otherssp/33>
- 2 Siu, K. W. M. (2009). Review on the development of design education in Hong Kong: The need to nurture the problem finding capability of design students. *Educational Research Journal*, 23(2), 179-202.
- 3 Siu, Kin Wai Michael (2002): Impact of new technology on teaching and learning in technology education: opportunity or threat?. Loughborough University. 網上資源。 <https://hdl.handle.net/2134/3165>
- 4 STEM：科學、科技、工程與數學的簡稱；STEAM：在 STEM 加入藝術，強調美學和創意維度。



and collaboration between subjects due to existing curricular constraints, and a lack of adequate professional development resources on maker education for teachers.⁵

The local school TWGHs Wong Fung Ling College (TWGHs WFLC) has attempted to provide STEAM education by integrating a maker-centric programme into its formal school curriculum. In 2017, the school launched the “TWGHs Wong Fung Ling College Jockey Club MAKER+ Innovative Curriculum” (TWGHs WFLC-JC MAKER+). It started as a year-long programme (36 weeks) at junior secondary level and specifically addresses the process of making, with a focus on human-centric and community-based design.⁶ The curriculum has been revised annually according to students’ needs. The learning objectives are designed to foster the expected competences of Curiosity, Creativity, Collaboration, Empathy, Self-learning and Resilience (CCCESR).⁷ MAKER+ works to inspire and engage teachers from different subject areas (e.g. Maths, ICT, and Visual Art).⁸ With the programme’s having run for more than three years across the Secondary 1, 2 and 3 curricula, it is now appropriate to review its curricular practices and outcomes and share them with other schools.

In 2019, the Jockey Club Design Institute for Social Innovation (JCDISI) and the School of Design of The Hong Kong Polytechnic University (PolyU Design) were engaged as independent consultants for the TWGHs WFLC-JC MAKER+. By studying

5 Education Bureau. (2016). Report on Promotion of STEM Education: Unleashing Potential in Innovation. Retrieved from https://www.edb.gov.hk/attachment/en/curriculum-development/renewal/STEM%20Education%20Report_Eng.pdf

6 見黃佩珮 (Wong, P. P.) (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南 (Planning and Teaching Guide) > 香港賽馬會慈善信託基金。頁 16。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

7 *ibid.*, 頁 12-13, 64.

8 *ibid.*, 頁 21-22.

學科之間的連貫與合作相當有限，而且沒有足夠資源配合教師的創客教育專業發展。⁵

本地學校東華三院黃鳳翎中學嘗試在正規學校課程中融入以創客為主的課程來提供 STEAM 教育。於 2017 年，該校推出了「東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程」（以下簡稱「MAKER+ 創新課程」），最初訂為初中的一年課程（36 周），主要是集中在製造的過程，焦點是以人為本、基於校園或社區的設計⁶，每年因應學生需要調整課程。目的是培養廿一世紀共通能力中的（CCCESR），包括好奇心 Curiosity、創意 Creativity、團隊合作 Collaboration、同理心 Empathy、自學能力 Self-learning 和抗逆力 Resilience⁷。MAKER+ 創新課程開辦以來啟發了不同學科的老師參與（例如是數學科、電腦科、及視覺藝術科）⁸。課程已在中一至中三的課程運作超過 3 年，現在是檢討課程實踐和結果，再與其他學校分享的合適時機。

5 教育局。(2016)。《推動 STEM 教育－發揮創意潛能》。資料擷取自：https://www.edb.gov.hk/attachment/en/curriculum-development/renewal/STEM%20Education%20Report_Eng.pdf

6 見黃佩珮 (Wong, P. P.) (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南 (Planning and Teaching Guide) > 香港賽馬會慈善信託基金。頁 16。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

7 同上。頁 12-13、64。

8 同上。頁 21-22。



the TWGHs WFLC-JC MAKER+, the JCDISI and PolyU Design have developed a deeper understanding of its possibilities and limitations and those of local maker education in general. We have not only offered suggestions for improvement but also, and more importantly, extracted useful insights into and expanded our views on how to improve maker curricula and pedagogies in local school settings. The JCDISI and PolyU Design have also worked with TWGHs WFLC to create assessment tools and planning guidelines. The aim of this report is to share our experiences with education practitioners who plan to implement maker education at their own schools.

Outcomes of our involvement in TWGHs WFLC-JC MAKER+

To assess the TWGHs WFLC-JC MAKER+ curriculum, we established two phases of action research. In Phase 1, we developed criteria for and feasible methods of evaluating the programme. In Phase 2, we conducted classroom observations regularly for 30 weeks to gain insights into the learning and teaching challenges. Through these observations, we assessed the effectiveness of the curriculum and its pedagogies and regularly proposed strategies for improvement. We also administered questionnaires and conducted focus group interviews to record students' perceptions of the programme and their learning performance over time.

After several rounds of reflection and evaluation, we realised that it would be necessary to streamline and realign the curriculum and pedagogy. More specifically, we discovered that

- (1) how to delineate learning outcomes of the technical making elements into observable learning behaviours;
- (2) how to systematically teach design thinking elements at various levels of complexity; and

於 2019 年，賽馬會社會創新設計院和香港理工大學設計學院（理大設計）獲委聘為 MAKER+ 創新課程的獨立顧問。兩個單位在研究 MAKER+ 創新課程後，已對其可能性和局限有了更深入了解，也更明白本地創客教育的整體可能性和局限。我們不但提供改善建議，更重要的，是從中選出有用的見解幫助改善本地學校環境下創客課程大綱和教學法，也令我們在這方面獲得更廣闊視野和看法。賽馬會社會創新設計院和理大設計並與東華三院黃鳳翎中學合作創建評核工具和籌劃指引。本報告的目的，是與有意在所屬學校推行創客教育的教育工作者分享我們的經驗。

我們參與 MAKER+ 創新課程的成果

為評核 MAKER+ 創新課程，我們進行了兩個階段的行動研究。在階段 1，我們為評估課程發展了一套準則和可行方法。在階段 2，我們連續 30 多周定期進行觀課，以深入了解教與學的挑戰。透過這些觀察，我們評估了課程和其教學法的效益，並定期建議改善策略。我們也進行了問卷調查和聚焦小組訪問以記錄學生對課程的觀感，以及他們在過程中的學習表現。

經過幾輪反思和評估後，我們意識到有需要精簡和重組課程和教學法。具體而言，我們發現了

- (1) 製造技巧元素的學習成果如何能夠進一步細分為可供觀察的學習行為；



(3) how to develop a specific and implementable curriculum based on the purpose of the curriculum, and to develop measurable, specific and workable learning objectives.

To achieve our aim of devising measurable, specific and feasible learning objectives, our team conducted various workshops with the MAKER+ teachers to realign relevant parts of the curriculum. From these efforts, we co-developed an assessment tool for evaluating the students' portfolios (see Appendix). While implementing this tool, TWGHs WFLC reviewed its usability and effects and refined the assessment processes of the programme accordingly (as discussed in Part 2 below).

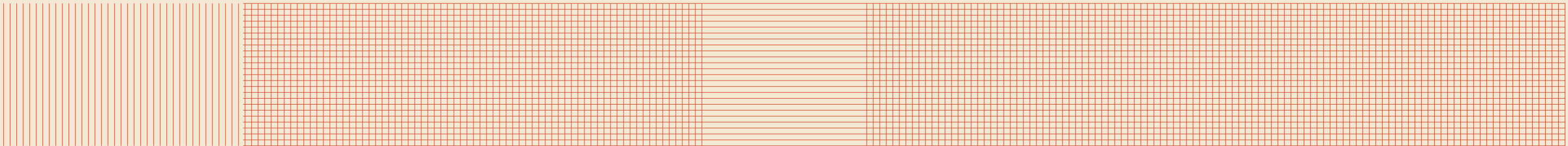
Throughout the process, a set of assessment rubrics was developed and refined. These can be used not only to assess students' performance but also to understand and evaluate the learning and teaching processes at various stages and thus ultimately help to improve the programme's design. The rubrics also facilitate communication between teachers and students on instructional strategy, delivery and assessment. In producing this report, the JCDisi, PolyU Design and TWGHs WFLC have taken the opportunity to consolidate their experiences throughout the MAKER+ programme and aim to share the knowledge attained from these experiences with other interested education practitioners.

(2) 如何有系統地教授複雜程度有別的設計思維元素；和

(3) 怎樣因應課程宗旨，編制更具體和易於實行的課程。
制訂可衡量、具體和可行的學習目的。

我們的團隊聯同 MAKER+ 創新課程的老師舉行了各種工作坊，以重組課程各相關部分。我們從這些工作中共同建立了一套評核工具，用來評估學生的作品集（見附錄）。在推行此工具時，東華三院黃鳳翎中學審視了它的可用性和效果，繼而改進了課程的評核流程（有關討論見以下第二部分）。

過程之中，我們建立和改進了一套評核評分表，除了可以用於評核學生表現，也可以用來了解和評估各階段的教與學流程，最終有助改善課程設計。評分表並可促進老師和學生之間就教學策略、傳授和評核進行溝通。製作本報告期間，賽馬會社會創新設計院、理大設計和東華三院黃鳳翎中學均趁機整合了各自在整個 MAKER+ 創新課程中所獲的經驗，目的是與其他對創客教育有興趣的教育工作者分享從這些經驗中所獲得的知識。



Objectives of this report

The rubrics presented in this report document what we have learned in our assessment of the TWGHs WFLC-JC MAKER+ maker education programme. The objectives are as follows:

- 1. To provide a reference for teachers to develop appropriate curricular goals and learning outcomes when planning a maker education curriculum; and
- 2. to offer a set of sample criteria and performance indicators for assessing the outcomes of a maker education programme.

Practitioners might also consider adopting certain approaches outlined in this report to customise and manage their own programmes.

本報告目的

本報告的評分表記錄了我們評估 MAKER+ 創客教育課程時所學，目標如下：

- 1. 為老師提供籌劃創客教育課程的參考，以制訂合適的課程目標和學習成果；及
- 2. 提供一套樣本準則和表現指標，用來評核創客教育課程的成果。

教育工作者也可考慮採用本報告所載的某些方法，再就自己的課程進行自訂和管理。

What is maker education? 什麼是創客教育？

Potential benefits of maker education in schools

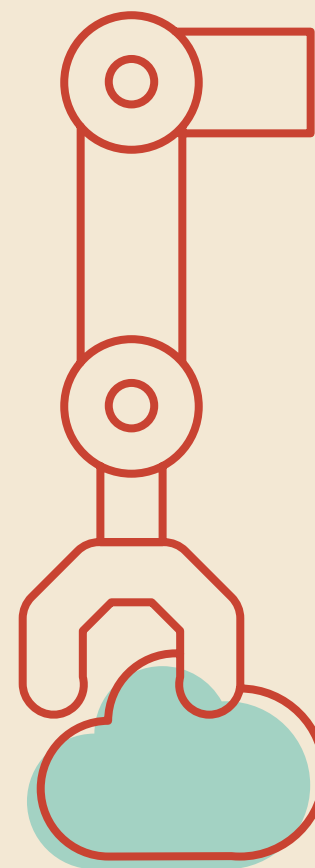
Maker education is unlike the conventional education curriculum in its focus on play, experimentation and authentic inquiry. Through a multi-disciplinary integration of various subjects, students create and develop valuable objects by defining problems and designing solutions. The term ‘making’ is generally used to refer to designing, building, modifying, and repurposing material objects for playful or useful ends. Making often involves traditional handicrafts and techniques (e.g. woodworking, sewing, welding and crocheting), and now also utilises electronic and digital technologies, such as laser cutters, 3D printers, microcontrollers and other robotics, and computer software, to allow students to conceptualise, build and customise products in a more sophisticated and systematic way.

When maker education is implemented in schools, students’ involvement in making things can lead to powerful forms of learning driven by continuous feedback during the making process.⁹ The development of capabilities relevant to learning and managing hands-on skills and technological literacy can support students in navigating future challenges.

Moreover, the high degree of autonomy that maker education gives to students in choosing their topics of interest in groups motivates them to be innovative in their work and to take more personal ownership of their learning.¹⁰ Students can learn in a more self-directed manner while improving their ability to collaborate.

9 Okita, S. Y., & Schwartz, D. L. (2013). Learning by teaching human pupils and teachable agents: The importance of recursive feedback. *Journal of the Learning Sciences*, 22(3), 375–412.

10 Kafai, Y. B., & Burke, Q. (2015). Constructionist gaming: Understanding the benefits of making games for learning. *Educational Psychologist*, 50(4), 313–334.



在學校推行創客教育的潛在好處

創客教育與傳統教育課程不同，它以遊玩、實驗和實境式探究為焦點。透過多領域整合各門學科，學生以定義問題和設計解決方案來發展有價值的物件。創客是創造、製造的意思，指設計、構造、修訂和再利用實物，做成好玩或有用的東西。創造和製造通常涉及傳統手工和技藝，例如是木工、針線、縫紉、燒焊和鉤織，現在也運用電子和數碼技術，好像是鐳射切割機、3D 打印機、微控制器和其他機械人，還有電腦軟件，讓學生以更精密和有系統的方法來構思、打造和自訂成品。

在學校推行創客教育後，學生參與製造物件可以成為強效學習型式，並由創造過程中的持續回饋推動⁹。發展與學習相關的能力、管理動手造技能和科技素養，能支持學生面對未來挑戰。

另外，創客教育給予學生高度自主，讓他們分組選擇自己有興趣的題目，為作品創新提供動機，推動同學更加自發自主地掌管學習。學生可以更自主學習¹⁰，同時改善協作能力。

9 Okita, S. Y., & Schwartz, D. L. (2013). Learning by teaching human pupils and teachable agents: The importance of recursive feedback. *Journal of the Learning Sciences*, 22(3), 375–412.

10 Kafai, Y. B., & Burke, Q. (2015). Constructionist gaming: Understanding the benefits of making games for learning. *Educational Psychologist*, 50(4), 313–334. https://www.edb.gov.hk/attachment/en/curriculum-development/renewal/STEM%20Education%20Report_Eng.pdf



What makes maker education unique?

Maker education in schools adopts a rather unconventional pedagogy that reconceptualises the roles and mindset of teachers in curriculum planning and implementation. As students learn through modelling, engaging in collaborative play and explaining how things work rather than by being fed information,¹¹ teachers become facilitators, mentors or even learning companions who assist students on the making journey. Personal relevance and an authentic learning approach are the key features of maker education, which aims to increase students' motivation and improve their learning experiences by bridging lessons and learning tasks to real-world knowledge and applications. The curriculum or content of maker education should be seen as a form of social inquiry, not a mere subject of inquiry.¹² It incorporates into the experience of learning the means of understanding oneself within the broader context of life and relationships with others, the environment and the evolving world of ideas.

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- 11 Gutwill, J. P., Hido, N., & Sindorf, L. (2015). Research to practice: Observing learning in tinkering activities. *Curator: The Museum Journal*, 58(2), 151–168.
- 12 Christou, T., & DeLuca, C. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies*, 11(1), 13–22.

創客教育有何獨特之處？

在學校推行的創客教育採用一套較非傳統的教學法，重新構想老師在課程籌劃與推行中的角色和思維。由於學生的學習方式，是透過參照模型、參與協作遊玩和解釋事物如何運作，而非被動地接收資訊¹¹，老師便成了學習推動者、師友，甚至是學習夥伴，在創造旅程中協助學生。創客教育的主要特色包括個人相關性和真實的學習法，旨在增加學生的主動性和改善他們的學習體驗，把課堂和學習任務與真實世界的知識和應用關聯起來。創客教育的課程或內容應視為社會探究，而不只是單純的探究課題¹²，在學習體驗中融入了解自己的不同方法，適用於更廣義的生活，也關係到其他人、環境和不斷變化的構思世界。

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- 11 Gutwill, J. P., Hido, N., & Sindorf, L. (2015). Research to practice: Observing learning in tinkering activities. *Curator: The Museum Journal*, 58(2), 151–168.
- 12 Christou, T., & DeLuca, C. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies*, 11(1), 13–22.



Challenges confronting local maker education

Maker education is a type of project-based learning that promotes hands-on practice and physical creation in a pedagogical setting. Although co-working spaces (e.g. Maker Bay) are emerging locally for informal or extra-curricular maker-learning, there are numerous practical challenges to integrating maker education in schools and in formal classroom contexts.

First, it can be difficult for teachers to integrate the principles of ‘making’ into formal curricula that embody an entrenched mindset of ‘schooling’.¹³ Teachers also need to deal with the rigid class schedules and classroom arrangements in local schools as they seek to rearrange and adapt traditional classroom space to suit new approaches.

Second, the principles and setting of an appropriate makerspace¹⁴ are unfamiliar to local schools that are used to traditional classroom arrangements. Teachers with limited skills in and experience of hands-on making, who might already lack confidence in designing the curriculum and planning legitimate learning activities under the framework of project-based learning,¹⁵ may struggle to realise the ideal of a ‘classroom as makerspace’.¹⁶

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- 13 Christou, T., & DeLuca, C. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies*, 11(1), 13–22.
- 14 A makerspace is a co-working space equipped with a variety of digital and hands-on tools in which students can gather in groups to discuss, explore, discover, create and make using the tools and materials provided. 見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 33。URL = <https://www.jc-makerplus.com/zh-hant/teach-materials/772>
- 15 Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, 19(3), 267–77. <https://doi.org/10.1177/1365480216659733>
- 16 Christou & DeLuca. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies*, 11(1), 13–22.

本地創客教育所面對的挑戰

創客教育是一種專題研習，在教學環境中促進動手造實踐和實物創造。儘管共享工作空間（例如 Maker Bay）正在本地出現，可用作非正式或課外創客活動學習，要在正規教室環境融入創客教育，仍然頗多現實挑戰。

首先，老師難以在「學校教育」思維根深蒂固的正規課程中納入「製作」原則¹³。老師並需要處理本地學校嚴格的時間表和教室安排，把傳統課室空間重新安排和調整，以適合新的教學方法。

其次，對傳統教室安排習以為常的本地學校，並不熟悉創客空間的原則和如何設立合適創客空間¹⁴。在動手實踐方面欠缺技巧和經驗的老師，本來已沒太大信心在專題研習框架下設計課程和規劃合理的學習活動¹⁵，在要實現理想「教室作為創客空間」方面舉步維艱¹⁶。

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- 13 參照第 25 頁註腳 12。
- 14 創客空間是一種共享工作空間，內設多種數碼和動手做工具。學生可以使用創客空間提供的工具和物料進行分組討論、探索、發現、創造和製作。見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 33。URL = <https://www.jc-makerplus.com/zh-hant/teach-materials/772>
- 15 Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, 19(3), 267–77. <https://doi.org/10.1177/1365480216659733>
- 16 Christou & DeLuca. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies*, 11(1), 13–22.



Third, it can be challenging for teachers to set learning outcomes and goals for making practices that are suitably unpredictable, open-ended, collaborative and experimental,¹⁷ which reflects a pedagogical shift from a teacher-directed to a student-centric approach.¹⁸

Fourth, a lack of design or making-related knowledge and available benchmarks makes it difficult for teachers to assess students' making and learning achievements. More generally, assessing the creativity of individuals and groups is considered challenging because the assessment is often subjective and creativity is difficult to measure.

Despite these challenges, a handful of schools in Hong Kong have experimented with integrating maker education into their formal curricula. One such school is TWGHs WFLC, which with funding support from The Hong Kong Jockey Club Charities Trust pioneered the integration of a maker programme into its junior secondary curriculum.

The following sections present some features of and reflections on the WFLC-JC Maker+ programme. Through our action research, we also observed some limitations of the originally planned curriculum and propose a set of revised assessment rubrics as a framework for curriculum planning.

17 黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 21。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

18 Godhe, A.-L., Lilja, P., & Selwyn, N. (2019). Making sense of making: Critical issues in the integration of maker education into schools. *Technology, Pedagogy and Education*, 28(3), 317–328. <https://doi.org/10.1080/01475939X.2019.1610040>

第三，老師要為難以預計、沒有預設答案、協作和實驗式的創客實踐設定學習成果和目標或感非常困難¹⁷，反映出這種教學方法的重心由老師主導轉向學生為本的方式¹⁸。

第四，欠缺設計或創造的相關知識和可用基準，令老師難以評核學生的創造學習成果。一般而言，評估個人與小組創造力被視為頗具挑戰，因為評核通常相對主觀，而且創作力難以衡量。

儘管面對上述挑戰，香港有不少學校已嘗試在正規課程中融入創客教育。東華三院黃鳳翎中學是其中一間，該校獲香港賽馬會慈善信託基金資助，率先在其初中課程中納入創客課程。

以下章節是東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程一些特色和反思。我們在行動研究中觀察到原先籌劃的課程有其不足，建議採用一套修訂的評核評分表作為課程籌劃的框架。

17 黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 21。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

18 Godhe, A.-L., Lilja, P., & Selwyn, N. (2019). Making sense of making: Critical issues in the integration of maker education into schools. *Technology, Pedagogy and Education*, 28(3), 317–328. <https://doi.org/10.1080/01475939X.2019.1610040>

TWGHs WFLC's integration of maker education into the formal curriculum

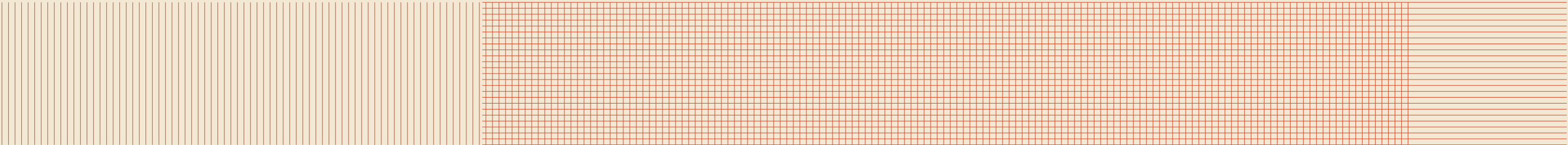
東華三院黃鳳翎中學在正規課程中納入的創客教育



In 2017, the biology teacher, Ms. Wong Pui Pui, was selected as Teacher Fellow of the "JC InnoPower Fellowship for Teachers and Social Workers" programme initiated and funded by The Hong Kong Jockey Club Charities Trust; and piloted a maker education programme for its secondary one students. Subsequently in 2018, the project (TWGHs Wong Fung Ling College Jockey Club MAKER+ Innovative Curriculum) is continued with the Trust's funding to implement for its secondary one to secondary three students. The curriculum was created by Ms. Wong Pui Pui. It is built on the universal principles of maker education and its junior secondary curriculum is designed to deliver a set of intended learning framework, which aligns with the CCCESR learning objective and purpose. The framework includes (1) mastering drawing, making, digital and prototyping skills; (2) working in teams; (3) adopting a trial-and-error mindset; (4) understanding user and stakeholder perspectives in the process of design; (5) developing an authentic learning motivation; and (6) documenting and reflecting on learning processes, such as in an individual portfolio. The curriculum content has been adjusted annually based on students' needs. Meanwhile, the role of the teacher in the classroom is shifted from disseminating information to actively facilitating students' journey of hands-on design, making and understanding.



東華三院黃鳳翎中學生物科老師黃佩珮老師於 2017 年獲選為由香港賽馬會慈善信託基金策劃及捐助的「賽馬會教師社工創新力量」之創新教師夥伴，並為校內中一學生推行創新項目 MAKER+。其後於 2018 年，該項目獲得香港賽馬會慈善信託基金捐助，延續並擴展至中二及中三學生課堂，計劃名為「東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程」。課程由黃佩珮老師編訂，建基於創客教育的通用原則，初中課程配合 CCCESR 教學宗旨及目標，課程設計根據以下學習框架：(1) 掌握繪圖、製造、數碼和原型製作技能；(2) 團隊合作；(3) 採納反覆嘗試摸索的思維；(4) 在設計過程中了解用家和持份者角度；(5) 培養真實的學習動機；和 (6) 以個人作品集等形式記錄學習過程和進行反思。課程內容每年會因應學生需要進行調整。與此同時，老師在教室內的角色由傳授資訊轉變為主動引導學生動手造設計、製造和了解的旅程。



In short, the curriculum aims to help students develop know-how through engagement in making processes and the knowledge and skills necessary for the user-centric design and production of working prototypes of objects useful to their school campus or neighbourhood. The project-based learning approach covers the progressive learning of technical skills, empathy in gathering users’ perspectives and understanding the values of the community, and attaining a sense of self-understanding in the context of a peer group. Table 1 shows the foci for the Secondary 1–3 curriculum.¹⁹

| | |
|-------------|---|
| Secondary 1 | Mastering making skills |
| Secondary 2 | Understanding a user group |
| Secondary 3 | Understanding and designing for the neighbourhood/ entrepreneurship |

Table 1. Foci of the Secondary 1–3 TWGHs WFLC-JC MAKER+ curriculum

19 See pages 52–57 of the TWGHs WFLC MAKER+ Report for the detailed curriculum. 見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南>香港賽馬會慈善信託基金。頁 52–57。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

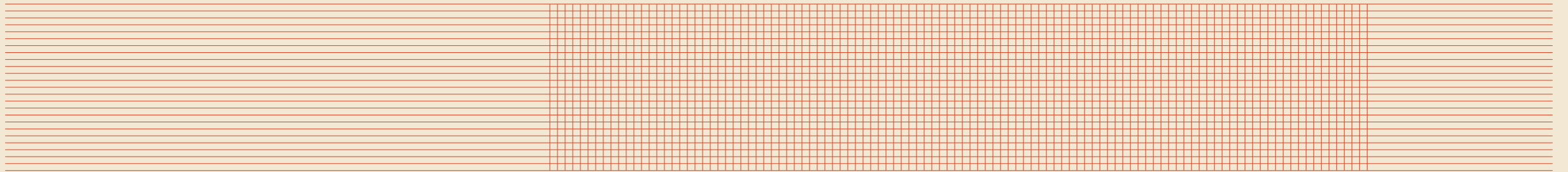
簡而言之，課程旨在讓學生投入製造過程和學習必要的知識和技能，為校園或社區創造用家為本的設計，製成有用的物件原型，從而幫助學生發展專門知識。課程所採用的專題研究習方法，涵蓋循序漸進地學習技能、收集用家意見時發揮同理心，並了解社區的價值觀，以及在朋輩小組中實現自我了解。表 1 為中一至中三課程框架的聚焦點¹⁹。

| | |
|----|------------------|
| 中一 | 掌握創造技能 |
| 中二 | 了解用戶群 |
| 中三 | 了解社區並為其設計 / 創業精神 |

表 1. 東華三院黃鳳翎中學賽馬會中一至中三 MAKER+ 創新課程框架

19 詳細教學計劃見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南>香港賽馬會慈善信託基金。頁 52–57。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

Secondary 1 中一



Secondary 1: Mastering making skills

For Secondary 1, the teachers we observed adopted the principles of ‘Feel, Think, Do and Test’²⁰ (Fig. 1) – a modified approach to design thinking adopted for the TWGHs WFLC-JC MAKER+ programme – to help the students acquire hands-on experience of making with a physical artefact, specifically a chair (Fig. 2). The students were tasked with exploring the materials, forms, functions and structures of different chairs through disassembly (Fig. 3) and reassembly (Fig. 4). The aim was to cultivate at elementary level attributes of makers’ knowledge, including skills in handling the necessary tools (Fig. 5) and the physical object itself. After dismantling the chairs, the students were tasked with recording their observations of the chairs’ components in words and sketches on predesigned worksheets (Fig. 6). Based on the results of their online and offline research on chairs (Fig. 7), they were then given the task of designing and making a ‘wow’²¹ chair (Fig. 8). This had to be done in reference to their understanding of and reflections on potential users’ needs and the context within which the chair would be used (Fig. 9), namely the school environment. The worksheets produced during the semester were kept in individual portfolios (Fig. 10). With the assistance of a technician, the teachers took the role of active facilitators, not only teaching the basics of technical drawing and computer-aided design software (CAD) visualisation but also guiding the students as they worked towards realising their various ideas through prototyping (Fig. 11) and in arriving at the final design (Fig. 12, Fig. 13, Fig. 14).

20 黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 25-28。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

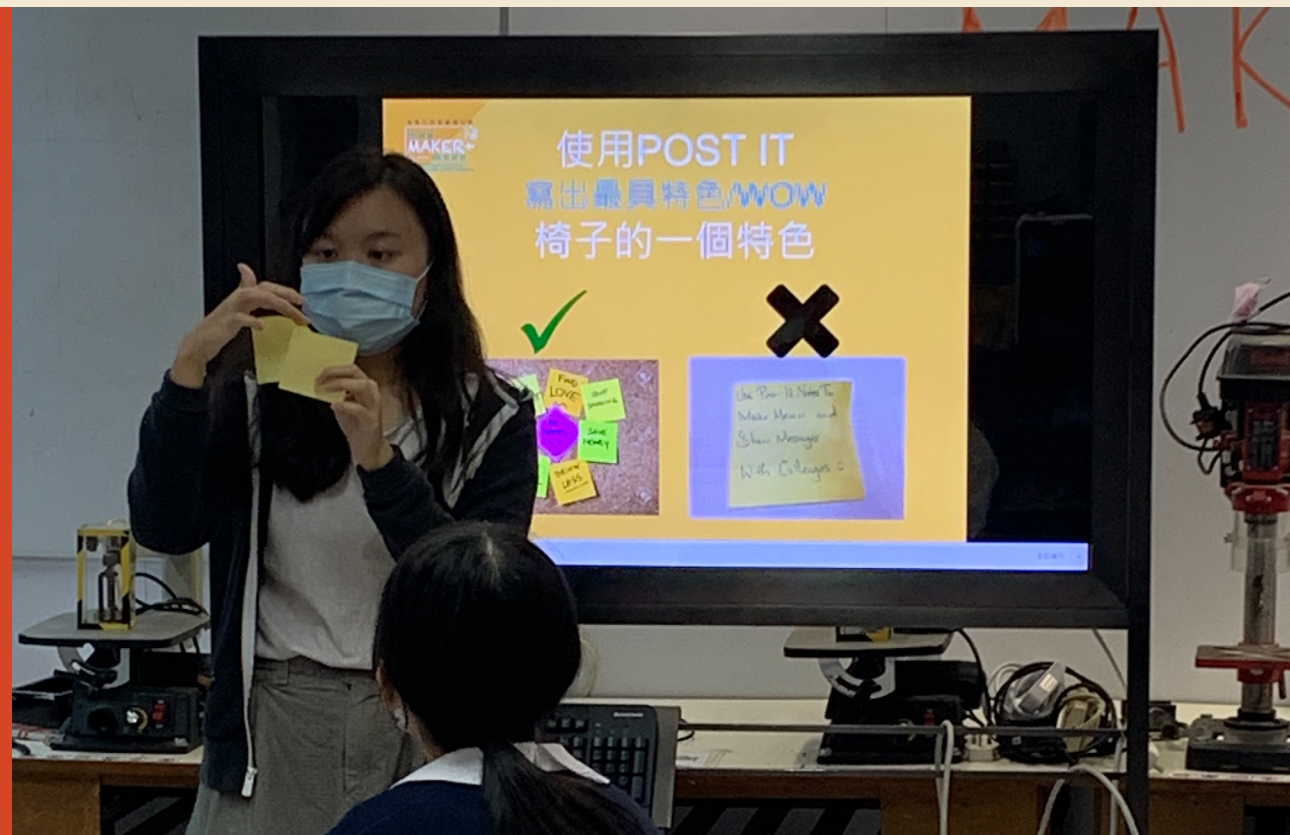
21 ‘Wow’ here means something that students would find amazing or having the most unexpected element(s).

中一：掌握創造技能

我們觀察中一課堂時，看到老師採用了為該校 MAKER+ 創新課程而修訂的設計思維法，包括「感受、思考、實踐和試驗」²⁰ 原則（圖 1）。這些原則有助學生透過製作實物取得動手造的創造經驗。該課程所製造的是一張椅子（圖 2），而學生的任務是透過拆開（圖 3）和重新裝嵌（圖 4）來探索不同椅子的物料、型態、功能和結構。任務旨在培養幾種基本創客知識元素，包括操作所需工具（圖 5），還有操作實物的技能。拆開椅子後，學生的另一項任務是在預先設計的工作紙上，以文字或草圖來記錄他們觀察椅子組成部份時所學到的資料（圖 6）。同學以線上和線下研究椅子的結果為基礎（圖 7），在下一項任務中設計和製造令人「Wow」²¹ 的椅子（圖 8）。製作時需要充分了解潛在用家需要和椅子的應用環境（即學校環境），就此反思（圖 9），並以這些資料作為參考。在學期內完成的工作紙均保留在個人作品集中（圖 10）。在技術員的幫助下，老師肩負主動學習推動者的角色，不僅教授技術繪圖的基本知識和利用電腦輔助設計（CAD）軟件，也指導學生透過原型製作（圖 11）實現各種意念，繼而推展至最終設計（圖 12、圖 13、圖 14）。

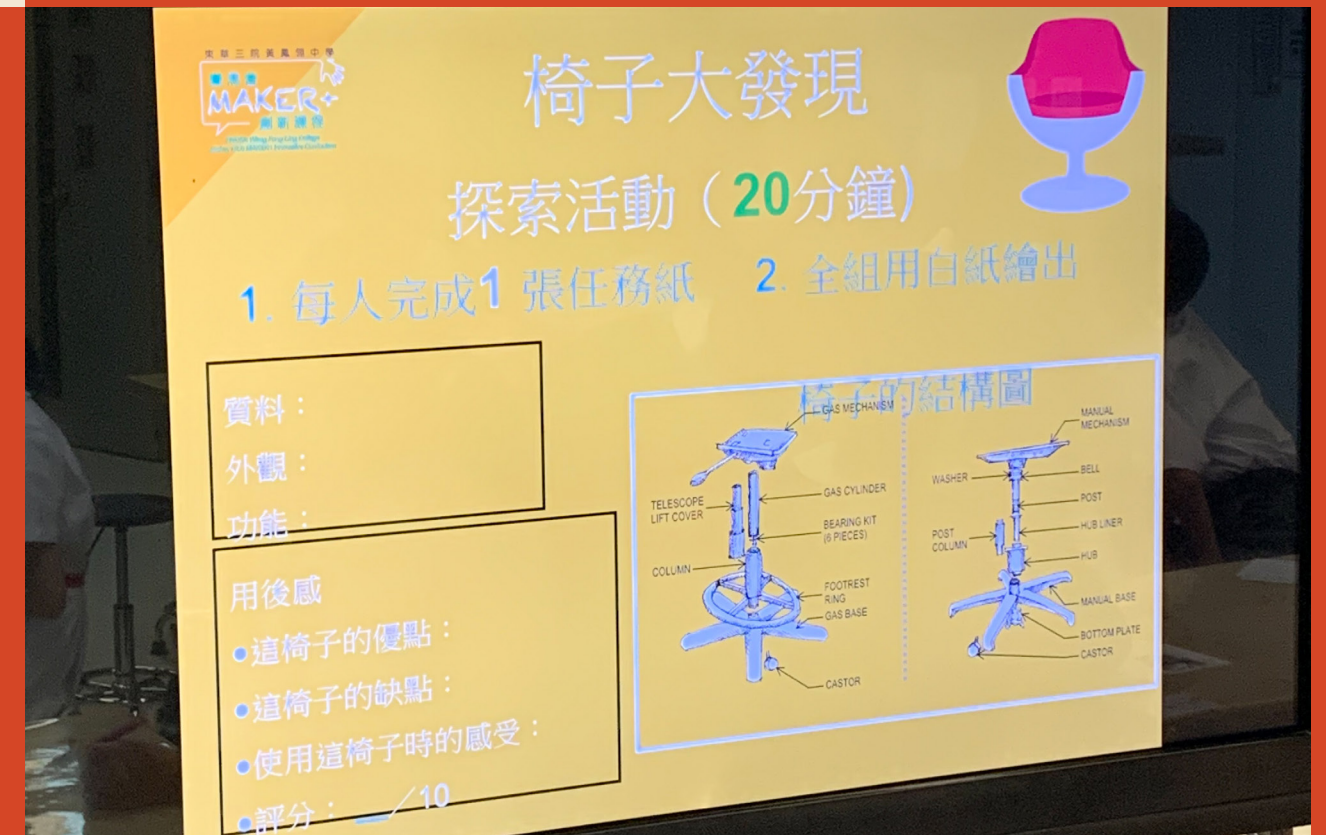
20 黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 25-28。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

21 「Wow」在此意指學生可從作品中找到令人驚嘆或意想不到元素。



1

Instructing students in how to use Post-It notes to discuss ideas
指導學生以便條紙討論構思



2

Lecture on the structure of a chair
有關椅子結構的講課

Secondary 1 中一



3

Understanding a chair's structure by disassembling it

拆開椅子以了解其結構

4

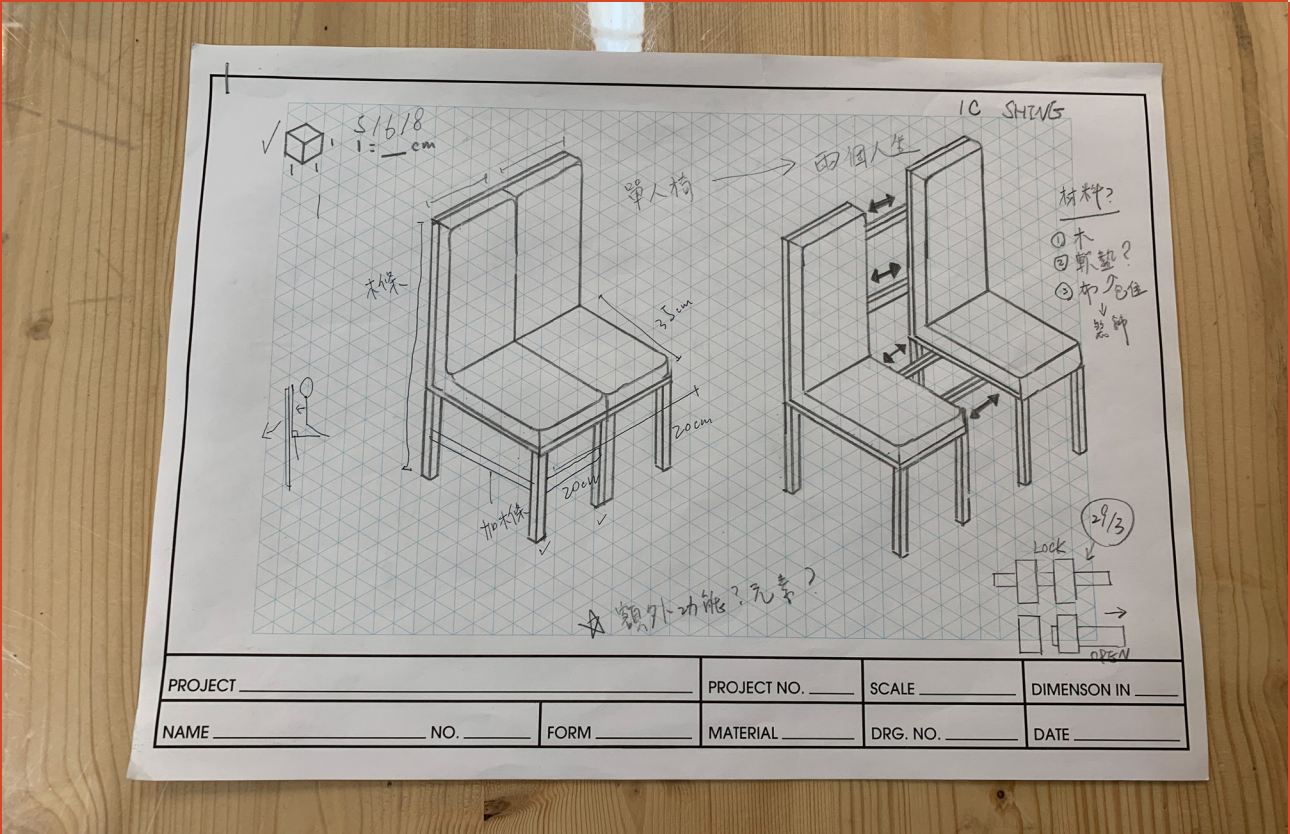
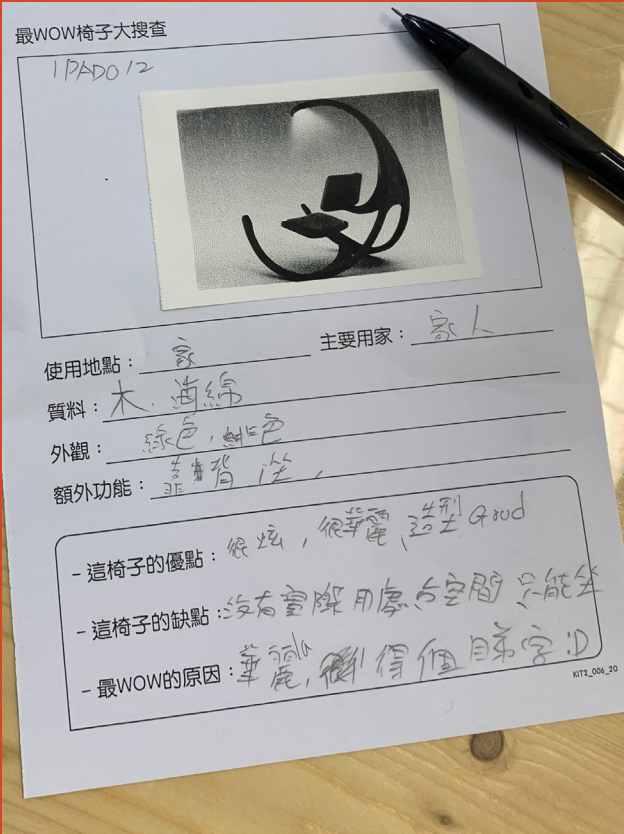
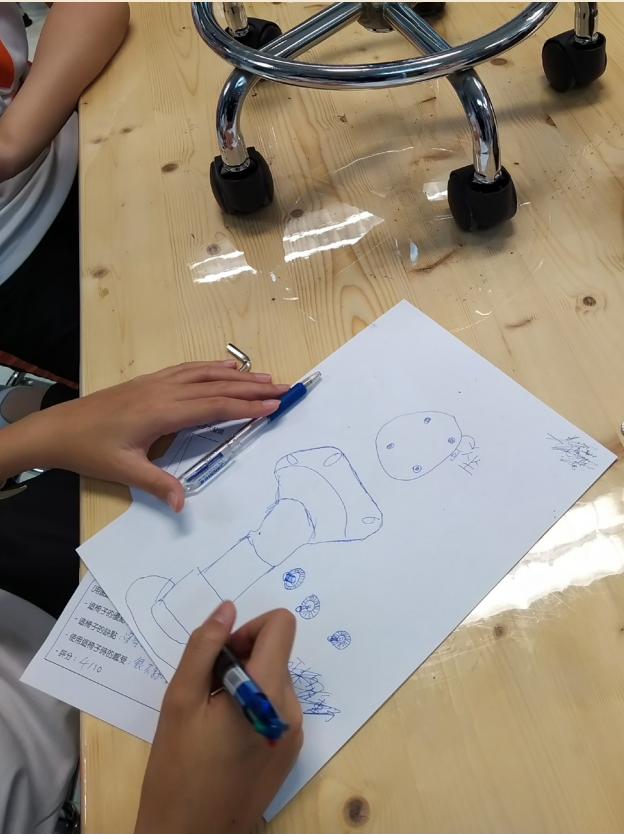
Reassembling a chair using the necessary tools and recording its components

運用適當的工具重新組裝椅子，並記錄其組成部件

5

Introducing different tools and ways to handle them in the making process

介紹如何在創造過程中以不同方法使用不同工具



6

Recording observations on the chair's components using words and sketches
以文字和草圖記錄椅子組成部分的觀察所得

7

Conducting online and offline research and analysis of 'wow' chairs
在線上與線下就「Wow」椅子進行研究和分析

8

Visualising the design of the 'wow' chair with an orthographic drawing
以正投影圖呈現「wow」椅子的設計

Secondary 1 中一



9

Understanding and reflecting on the responses of the user during prototype testing
在原型測試期間了解和反思用家反應



10

Filing worksheets and sketches in individual portfolios
填寫工作紙和手繪草圖，再收錄在個人作品集



11

Collaborating to build a 'wow' chair using various tools
運用各種工具，合作製造「Wow」椅子



12

Presenting the final product (a multi-functional chair with clothes storage space at the back)
為最終成品（背面設有衣服收納空間的多功能椅子）進行匯報



13

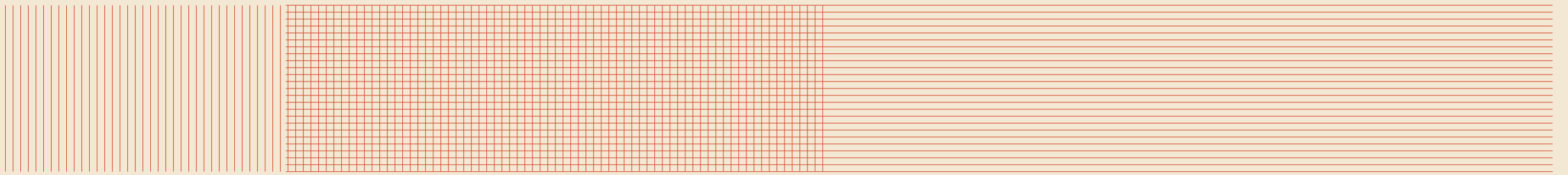
Demonstrating a transformable working-table chair during the product presentation
在成品匯報時示範變型工作桌椅



14

Presenting the final product (a foldable working-table chair) as a 'wow design' 匯報以「wow 設計」製成的最終成品（可摺疊工作桌椅）

Secondary 2 中二

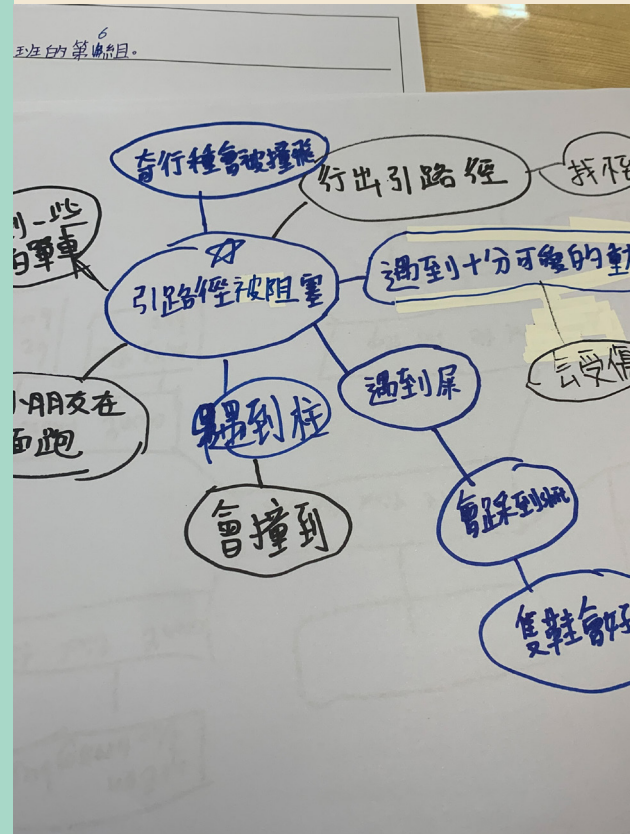


Secondary 2: Understanding a user group

At Secondary 2 level, the curriculum was focused on building the students' ability to carry out inquiry-based learning and human-centric design by understanding the needs of specific groups of users. A design partner from a socially disadvantaged group – the visually impaired (Fig. 15) – was invited to join the learning process. In the 2020–21 school year, the students formed groups and were tasked with brainstorming ideas (Fig. 16), making sketches and prototyping a product for the visually impaired. To come up with a viable design concept, they not only had to perform online research but also work in teams to investigate the needs of the visually impaired in an empathetic way (Fig. 17, Fig. 18). To understand and document user needs, the students were taught how to create user journey maps (Fig. 19). Guided by the teachers, the students learnt and practised interview skills (Fig. 20) to prepare for their conversation with the design partner (Fig. 21). They then presented their products to the design partner for testing (Fig. 22, Fig. 23) and considered his feedback in modifying their design ideas (Fig. 24). Throughout the process of conceiving and designing their prototype, the students were expected to develop a sense of empathy, to take initiative in a meaningful dialogue and to understand the needs and issues from the user perspective. The students were also taught some basic coding skills (i.e. Microbit) (Fig. 25, Fig. 26) in case they wanted to include a digital device (e.g. infrared red sensors) in their design (Fig. 27, Fig. 28, Fig. 29).

中二：了解用戶群

中二課程的焦點是培養學生的探究式學習能力，透過和了解特定用戶群需要而做出以人為本的設計。來自弱勢社群的設計合作夥伴（視障人士）（圖 15）獲邀參與學習過程。在 2020–21 學年，學生分為小組，他們的任務是以腦力激盪想出構思（圖 16）、製作手繪草圖和為視障人士製作一件成品原型。為了想出一個可行的設計概念，同學除了進行網上研究，也分成小組以同理心調查視障人士的需要（圖 17、圖 18）。課上教授學生製作用家旅程地圖（圖 19），用來了解和記錄用家需要；同學並在老師指導下學習和練習訪問技巧（圖 20），準備和設計合作夥伴交流（圖 21）。學生向設計合作夥伴匯報成品以作測試（圖 22、圖 23），然後根據用家回饋修訂設計意念（圖 24）。在整個構想和設計原型的過程中，課程預期學生能培養同理心、主動進行有意義的對話，並從用家角度出發了解使用者的需要。學生並獲教授基本編程技能（即 Microbit）（圖 25、圖 26），以便在設計中加入數碼裝置（例如是紅外線電子模組）（圖 27、圖 28、圖 29）。



15

Introducing the design partner, 'Mr Bread' – a visually impaired client
介紹設計合作夥伴，視障人士「麵包先生」

16

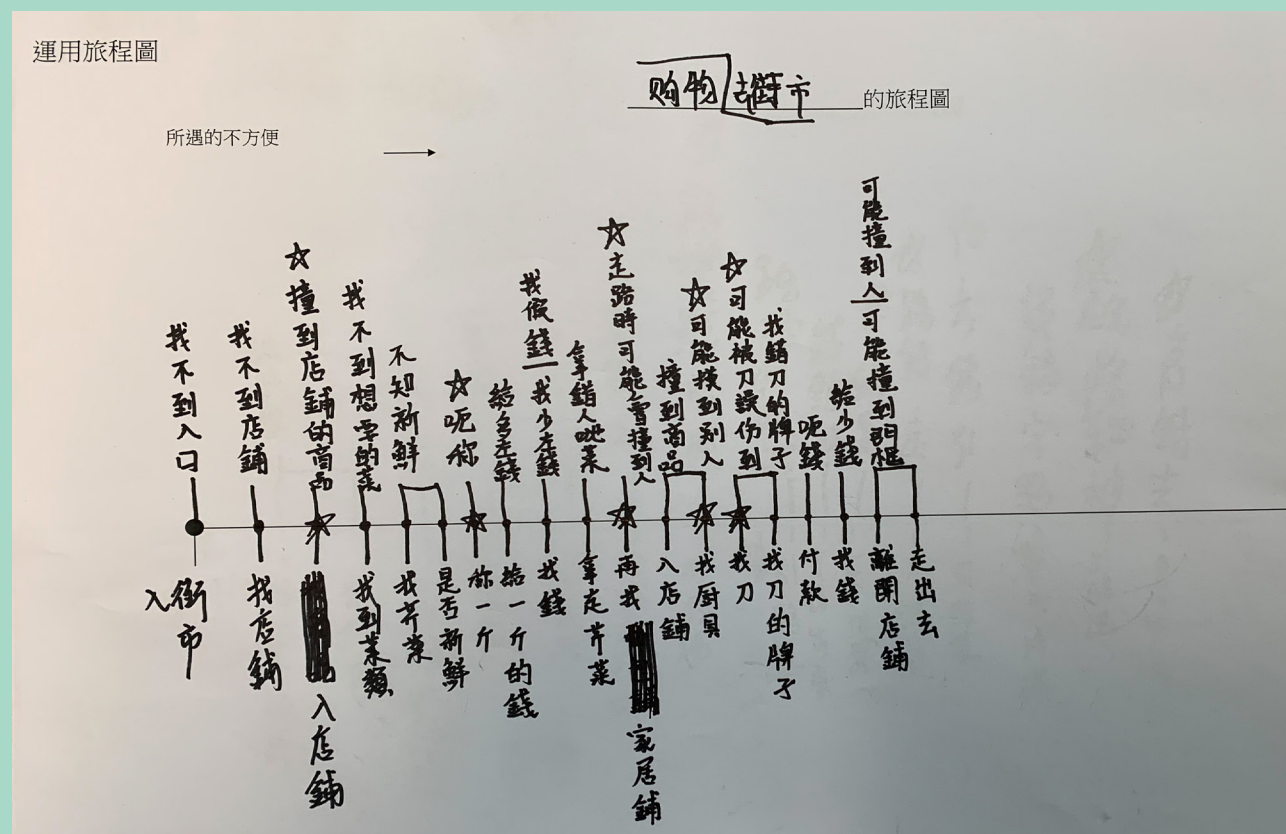
Brainstormed ideas for the needs of the visually impaired client
回應視障用家的需要，以腦力激盪想出的構思

17

Developing empathy to understand the needs of the visually impaired user by climbing stairs blindfolded with a cane
培養同理心，蒙著眼睛使用手杖上樓梯，了解視障用家的需要

18

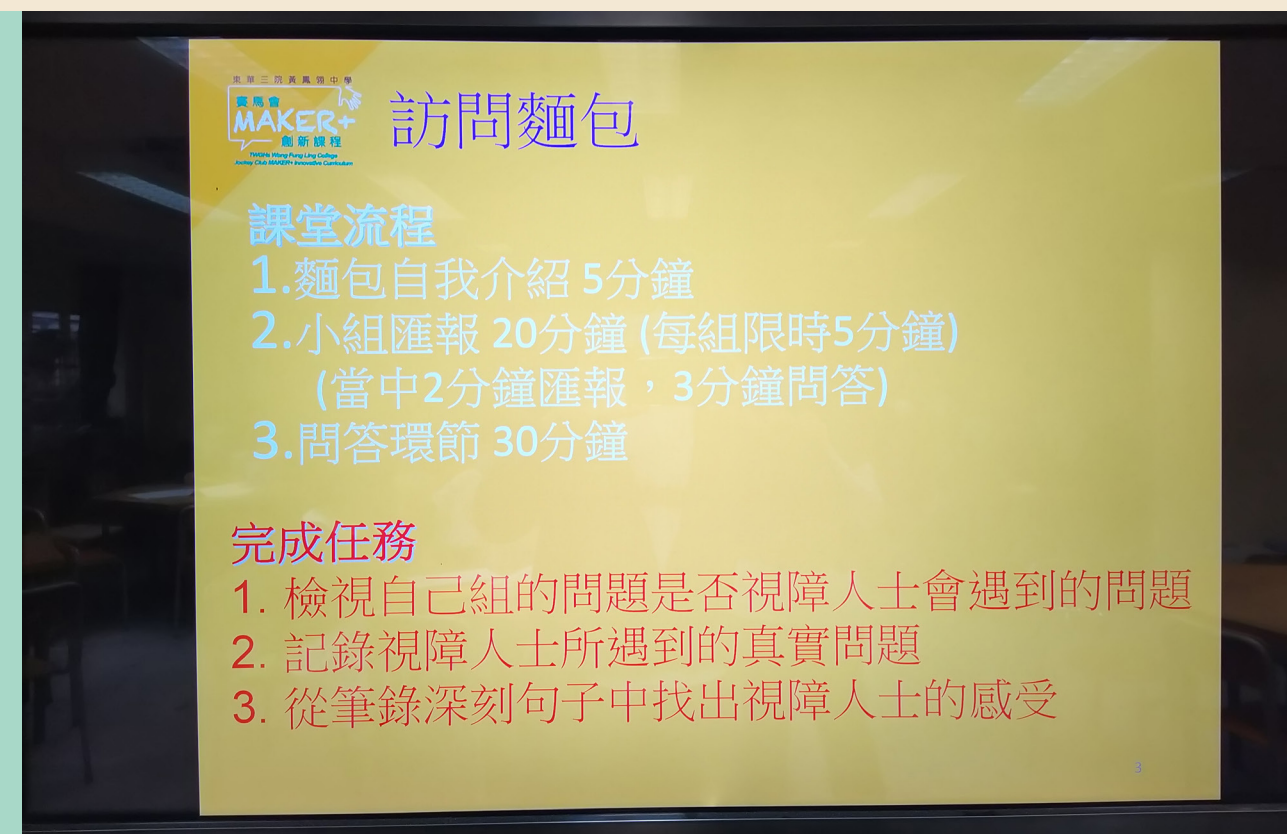
Developing empathy to understand the needs of the visually impaired user by distinguishing different objects while blindfolded
培養同理心，蒙著眼睛辨認不同物件，了解視障用家的需要



19

Developing a user journey map for a visually impaired user's daily routine and experiences

根據視障用家的日常路線和經歷建立用家旅程圖



20

Preparing interview questions for the visually impaired user

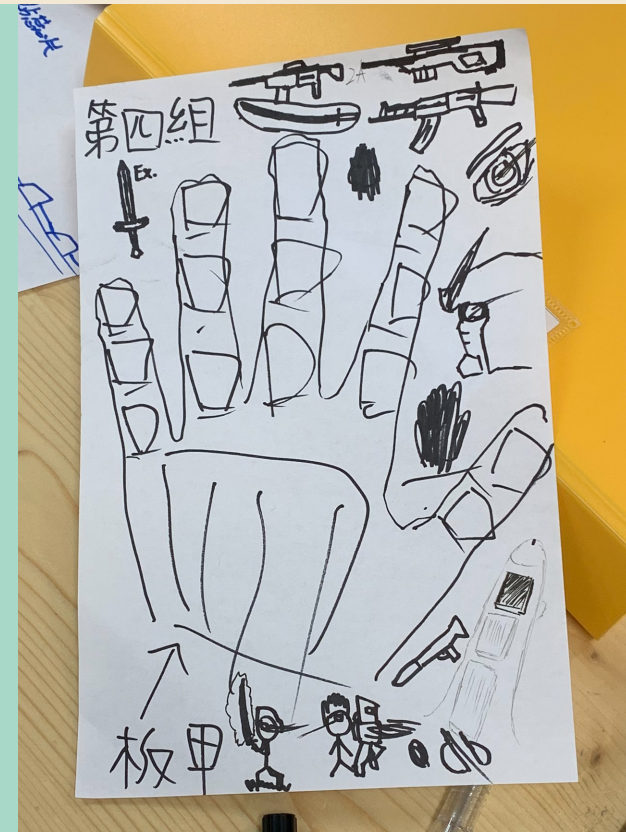
準備訪問視障用家的問題



21

Presenting a design prototype and collecting feedback from the visually impaired user, 'Mr. Bread'

匯報設計原型，並收集視障用家「麵包先生」的回饋



22

Sketching an idea for a sensory device for the visually impaired user

手繪意念草圖：為視障用家設計的傳感裝置



23

Prototyping a sensory device and testing the design with different materials

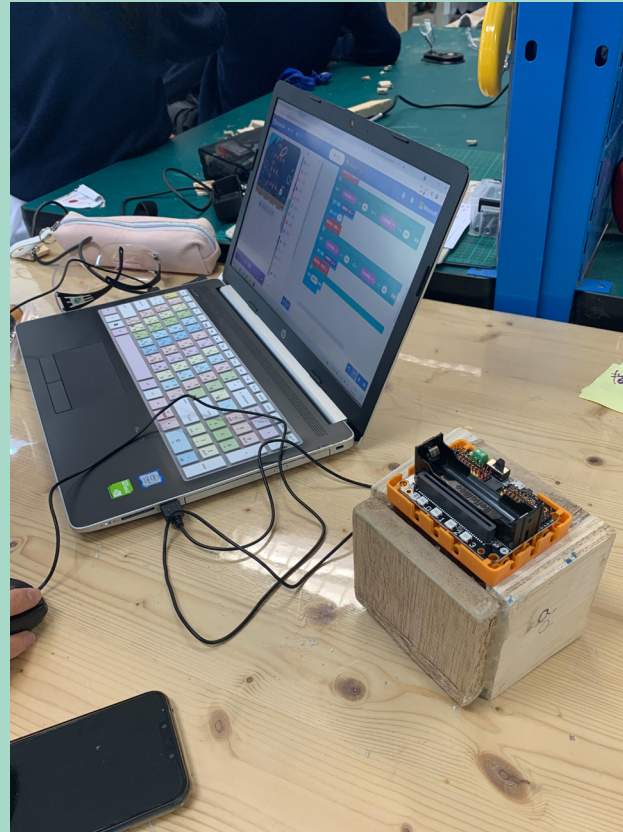
為傳感裝置製作原型，並以不同物料測試設計



24

Testing the technical and material feasibility of the design

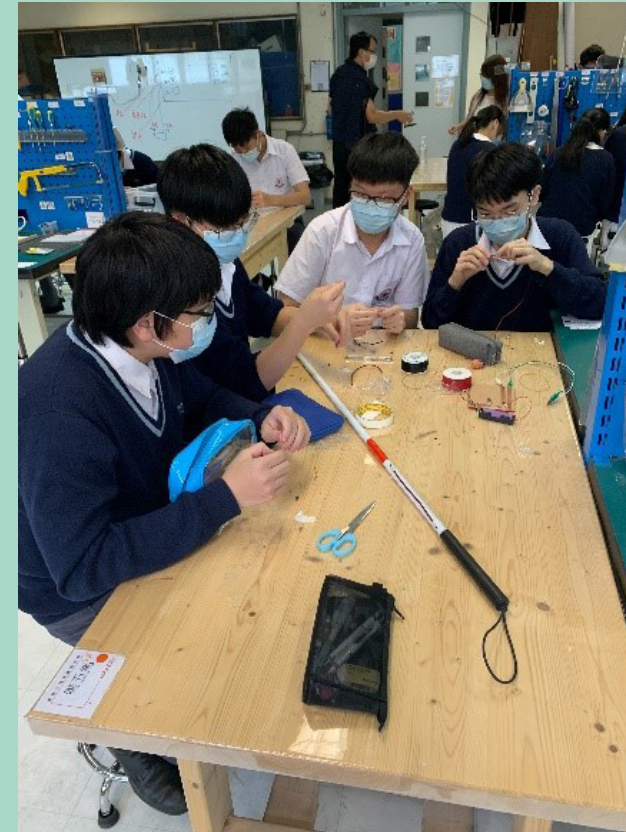
測試設計的技術和物料可行性



25

Using Microbit to program the digital component of the sensory device

以 Microbit 為傳感裝置的數碼組件編程



26

Testing the sensor of a prototype 'smart cane'

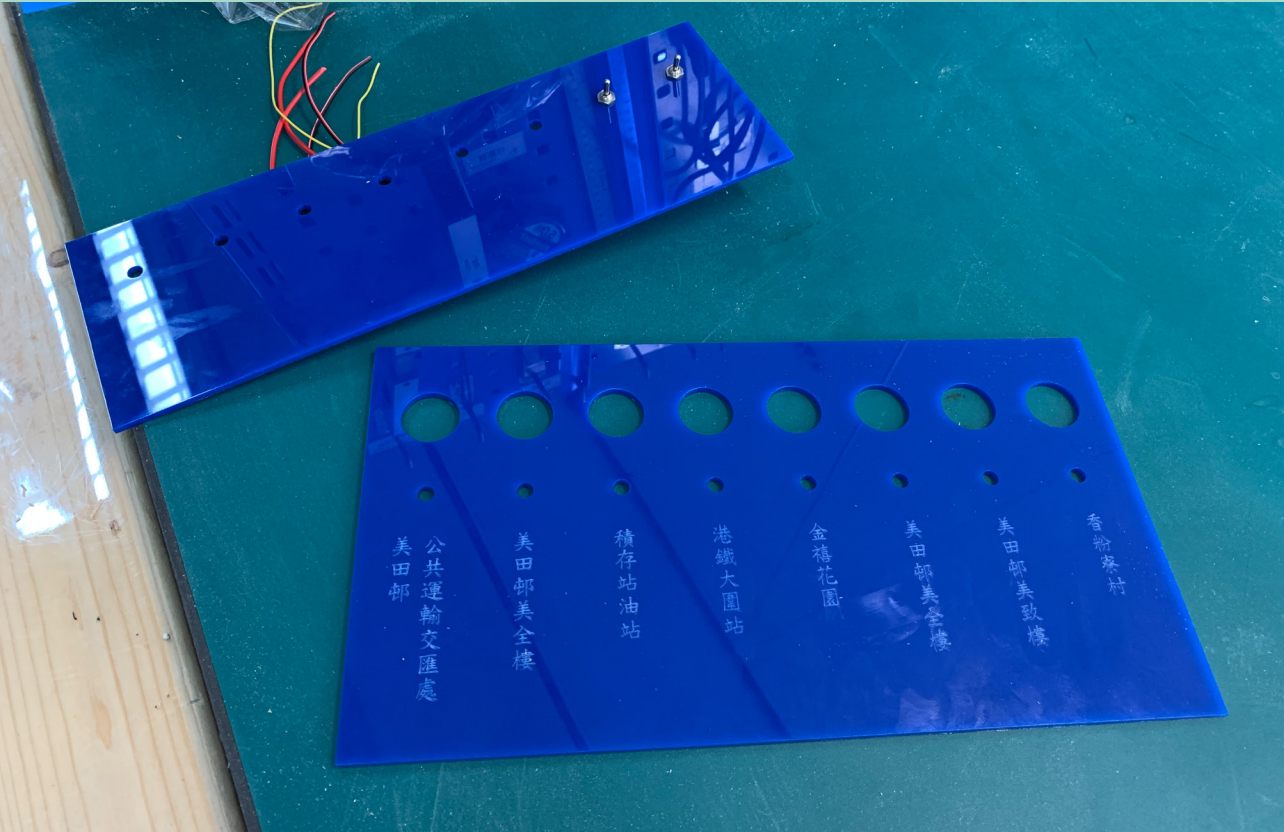
測試「智能手杖」原型的傳感器



27

Testing the smart cane for detecting water and obstacles

測試智能手杖偵測水和障礙物的能力



28

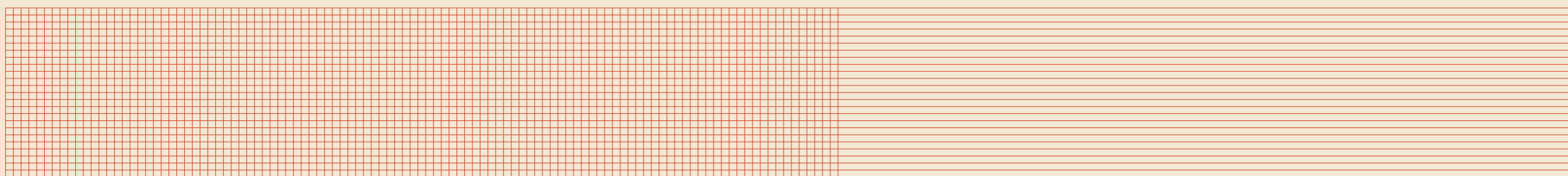
A minibus alighting reminder device to help the visually impaired recognise the stops
小巴到站提示裝置，有助視障人士知悉不同車站



29

Presentation board for the minibus alighting reminder, featuring the design objectives and outlining the device's functions
小巴到站提示器的匯報板，寫有設計目的和簡列裝置功能

Secondary 3 中三

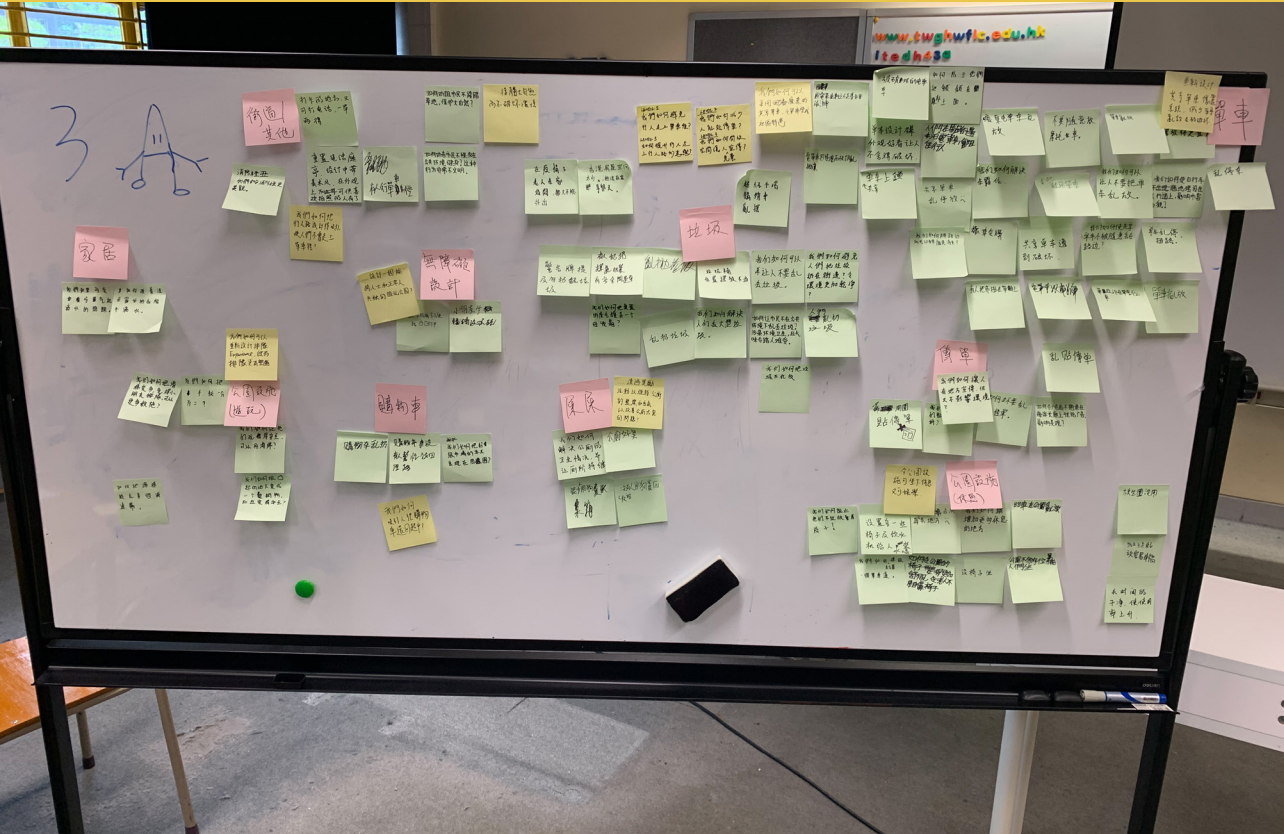


Secondary 3: Understanding and designing for the neighbourhood

In Secondary 3, the scope of the students' learning was expanded. The students applied their know-how (e.g. in idea generation and hands-on production) to investigating and responding to a real-life situation (Fig. 30, Fig. 31). The design goals went beyond meeting the needs of a single user group, as the students were tasked with exploring the needs of the residents of a neighbourhood (Fig. 32, Fig. 33). In this third year, besides learning skills in team building and digital rendering (i.e. TinkerCAD), the students were required to conduct more rigorous background research on existing innovations (Fig. 34) and then proceeded to field observation (Fig. 35, Fig. 36). This approach was complemented by in-depth interviews with neighbourhood residents on a particular issue (Fig. 37). The students conducted multiple rounds of investigation as they attempted to identify specific issues that could be tackled by design (Fig. 38, Fig. 39). The students were also tasked with soliciting online feedback from target community members as they developed their ideas and as they came up with a series of design prototypes (Fig. 40, Fig. 41, Fig. 42, Fig. 43, Fig. 44). Finally, the students were asked to hold a conclusion of studies and feedback day at school (Fig. 45, Fig. 46), and encouraged to obtain suggestions from the audience and/or stakeholders on a feasible (product or service) design for the community (Fig. 47).

中三：了解社區需要，設計適用成品

中三學生的學習範圍更廣。同學運用他們此前所學過的專門知識（例如是構思方案和動手造製作），調查與回認真實生活的情況（圖 30、圖 31）。學生的任務是探索街坊需要（圖 32、圖 33），所以設計目標已超越滿足單一用戶群。來到第三年，除了學習團隊建立技能和數碼繪圖（即 TinkerCAD），同學還需要就現有創新科技（圖 34）進行更嚴謹的背景研究，然後推展至實地觀察（圖 35、圖 36）。這套方法配合深入訪問，就特定議題收集街坊意見（圖 37）。學生進行了多輪調查，嘗試從中找出可以名設計解決的特定議題（圖 38、圖 39）。他們的任務是在構思方案意念和想出一系列設計原型時在網上收集社區人士回饋（圖 40、圖 41、圖 42、圖 43、圖 44）。最後，學生需要在校內舉辦一場學生學習總結及意見回饋日（圖 45、圖 46），課程並鼓勵同學就一項適用於社區的可行設計（產品或服務）向參觀人士及 / 或持份者收集建議（圖 47）。



30

Brainstorming investigation approaches in preparation for a community visit and neighbourhood research
以腦力激盪想出調查方法，準備進行社區探訪和鄰舍研究



31

Developing observational approaches and deciding on interview questions before the neighbourhood visit
在探訪鄰舍前設定觀察方法和決定訪問問題



32

A site visit to explore certain needs in the neighbourhood, in this case an under-utilised public telephone booth
為探討鄰舍需要進行實地考察，圖中所示為未獲物盡其用的公共電話亭



33

A site visit to explore certain needs in neighbourhood, in this case an under-utilised public resting space
為探討鄰舍需要進行實地考察，圖中所示為未獲物盡其用的公眾休憩空間



34

A student team discussing their collected data in relation to some existing innovation cases
學生分組討論收集所得：有關現有創新個案的資料



35

A field observation to identify and investigate issues in a public park
實地觀察，查找公共公園的問題



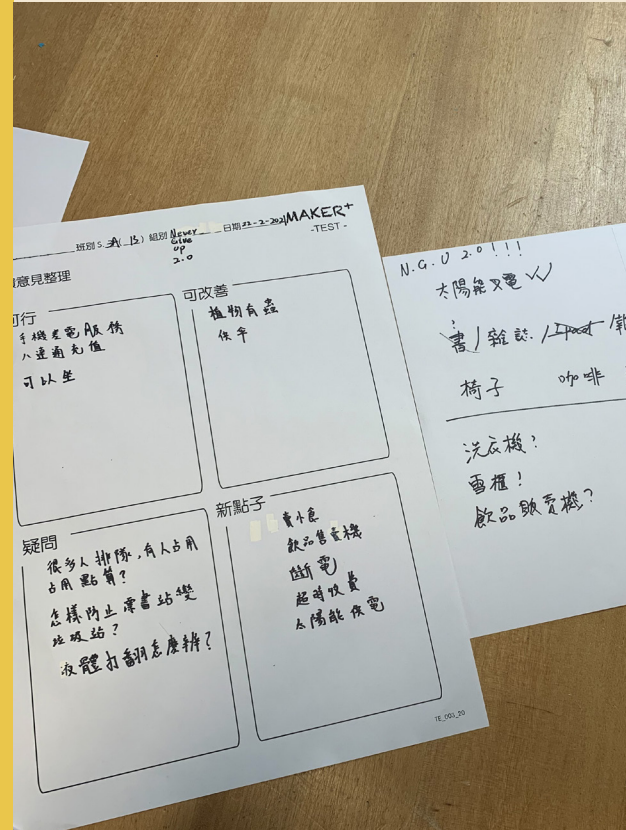
36

A field observation to identify and investigate issues at the shore of the wetlands
實地觀察，查找濕地沿岸的問題



37

Interviewing a resident to acquire a deeper understanding of the neighbourhood
訪問街坊以更深入了解鄰舍



38

Analysing the design criteria of a product and sketching the corresponding form
成品設計的分析準則，以及相應的手繪形態草圖



39

Illustrating the various functions of a design idea
製圖說明設計構思的各種功能



40

Testing the size of the design prototype (a smart watch)
測試設計原型的大小（智能手表）



41

Preparing fabric for the design
prototype (a multi-function umbrella)
為設計原型準備布料（多功能傘）



42

Assembling the product (a smart
mouse trap)
組裝成品（智能捕鼠器）



43

Finishing the surface of the final
design (a boat to collect floating
garbage from the sea)
為最終設計裝飾表面（海上垃圾收集船）



44

Fine-tuning the product
(a multi-function umbrella)
微調成品（多功能傘）



45

Presenting the design idea to a visitor at the pop-up exhibition (a boat to collect floating garbage from the sea)
最終成品（智能捕鼠器）



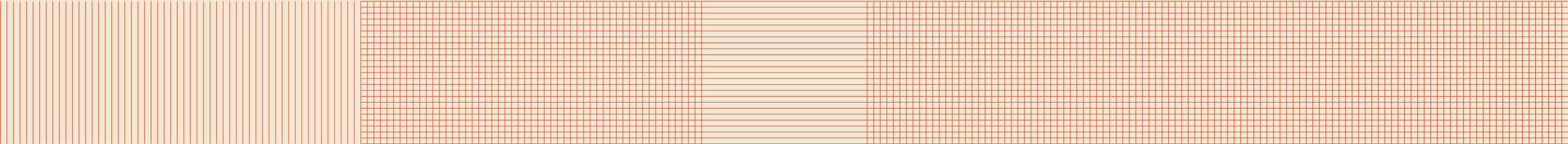
46

Demonstrating the final product in the actual community space (reusing the telephone booth for reading or enjoying coffee)
在真實社區空間示範最終成品（重用電話亭作閱讀或享受咖啡的地方）



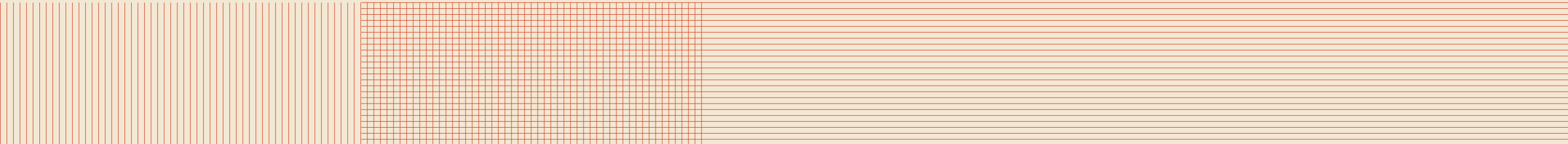
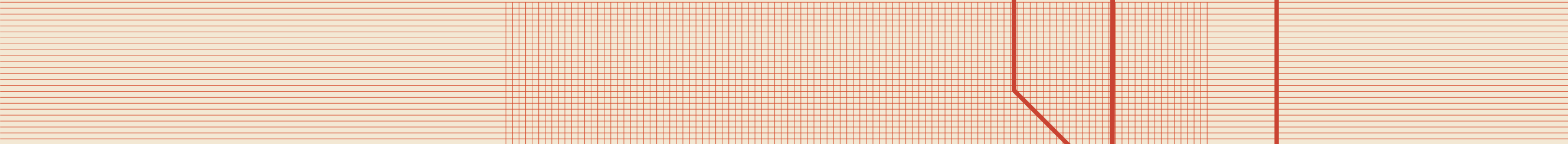
47

Presenting the design idea to a visitor at the pop-up exhibition (a boat to collect floating garbage from the sea)
在期間限定展覽中向參觀人士講解設計意念（海上垃圾收集船）

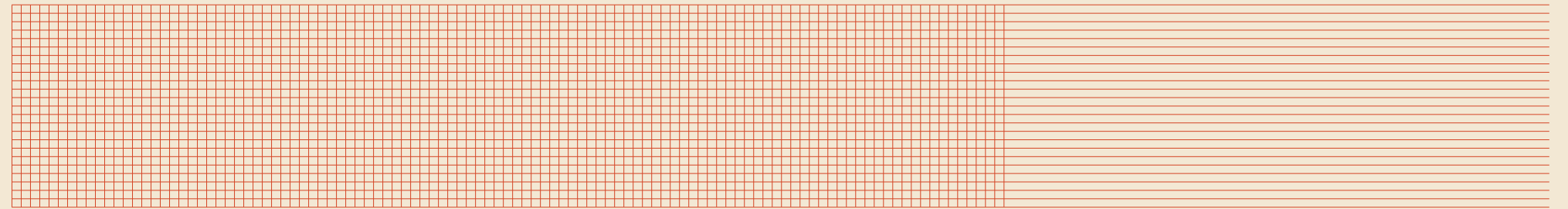


Part 2

第二部分



Assessing maker education 評核創客教育



Achieving curricular goals and learning outcomes

Over the year-long implementation of, experimentation with and reflection on the abovementioned learning and teaching practices across the three secondary levels, the MAKER+ team had a mandate to consolidate some of the curricular goals and to realign the programme's learning outcomes to make it more robust for local application. The overriding curricular goal of the programme is to help students not only to understand the physical and mental tools used in design and production but also to apply their hands-on skills playfully, collaboratively and meaningfully to achieve project outcomes.²²

A strong emphasis was placed on hands-on making at the beginning of the programme in the hope that the students would gain learning satisfaction authentically and progressively, thereby boosting their self-esteem and learning motivation for the more difficult tasks to come. Through the MAKER+ project, the students developed their skills in three key learning areas (KLAs), which are listed with their corresponding learning outcomes in Table 2.

22 See pages 36–51 of the WFLC MAKER+ Report for their learning stories. 見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 36–51。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

實現課程目標和學習成果

在經過中一至中三的全學年推展、驗證和反思上述教與學實踐之後，MAKER+ 團隊意識到必須整合部份課程目標和重組課程學習成果，以令其更適合本地應用。課程大綱的總體目標，是幫助學生了解設計和製作成品時所使用的實體和思考工具，同時以有趣的方式和有意義的協作運用動手造技能，實現專題研習的成果²²。

課程一開始便重點強調動手造製作，希望學生可以逐步獲得學習上的真正滿足感，從而提升自豪感和學習動機以應付後續的更困難任務。透過該 MAKER+ 專題研習，學生培養了三個主要學習領域的技能，有關技能和相應學習成果已載於表 2。



22 學習故事詳情，請參閱東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程報告頁 36–51。見黃佩珮 (2022). <東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南> 香港賽馬會慈善信託基金。頁 36–51。URL= <https://www.jc-makerplus.com/zh-hant/teach-materials/772>

| KLA 1: Skills of Making and Thinking | |
|---|--|
| a | Develop and apply a broad range of maker skills – carpentry, electrical and digital skills, etc. – in the making of an artefact |
| b | Learn a range of approaches – online research, field observation, interview, visual conversation, etc. – to collecting relevant data for idea development and to inform design |
| c | Learn to organise and analyse research data collected from real-life situations |
| d | Make use of certain physical and thinking tools to explore ideas and to prototype, develop and test solutions for a design problem |
| KLA 2: Understanding of Objects, Users and Issues | |
| e | Understand the physical, formal and design properties of selected artefacts |
| f | Empathise with users and understand their needs while conceiving design approaches and solutions for individual users or a wider community |
| g | Identify problems amenable to designed solutions by applying appropriate methods of research and analysis to a given context |
| KLA 3: Idea Generation, Prototyping, Presentation and Evaluation of Designs | |
| h | Generate ideas and design solutions based on analysis and understanding of users’ needs in a real-life context and in line with civic values |
| i | Experiment with the form, function and usability of different materials and designs |
| j | Iteratively develop ideas and design prototypes to account for users’ feedback and assessments of design possibilities |
| k | Work in teams and develop a sense of ownership of the project |
| l | Organise records of the process in a portfolio and conduct a public presentation |

Table 2. The three key learning areas (KLAs) of the MAKER+ project and the corresponding learning objectives

The strategic integration of maker education into the TWGHs WFLC curriculum and class schedule undoubtedly greatly benefited the students who participated in the programme.

| 主要學習領域 1：創造與思考技能 | |
|----------------------------|--|
| a | 透過製作物件培養和應用木工、電工和數碼技能等創造技能 |
| b | 學習多種方法，包括網上研究、實地觀察、訪問、視覺對話等，收集相關資料來構思方案，並為設計提供理據 |
| c | 學習整理和分析從真實情景獲得的研究資料 |
| d | 利用某實體和思考工具發掘意念，並為設計問題進行原型製作、研發和試驗不同解決方案 |
| 主要學習領域 2：了解物件、用家和問題 | |
| e | 了解選定物件的物理、形態和設計特色 |
| f | 為個別用家或廣大社區構思設計方法和解決方案時，以同理了解用家和明白他們的需要 |
| g | 就特定情景採用適合的研究和分析方法，找出可以由設計方案解決的問題 |
| 主要學習領域 3：構思方案、製作原型、匯報和評估設計 | |
| h | 分析和了解真實生活情景中的用家需要，配合公民價值，產生構思和設計方案 |
| i | 就不同物料與設計的形態、功能和可用性進行實驗 |
| j | 以迭代形式發展意念和設計原型，把用家回饋和設計可能性評價納入考慮 |
| k | 分組工作，並就專題研習培養當家作主的感覺 |
| l | 以作品集形式整理過程紀錄，並作公開匯報 |

表 2. MAKER+ 專題研習的三個主要學習領域和相應學習目的

在東華三院黃鳳翎中學課程和課堂時間表中策略性地融入創客教育，無疑讓參與該課程的學生獲益良多。



Challenges of portfolio assessment and design of assessment rubrics

To increase the validity of assessment, each student kept a portfolio (Fig. 48, Fig. 49, Fig. 50) of their sketches, exercises, drawings, worksheets, quizzes, records of idea development and reflections on the assigned projects throughout the semester or academic year. In the absence of an end-of-semester examination, the portfolio assessment method allowed the MAKER+ teachers to holistically review and evaluate their students' understanding and performance throughout the project.

However, lacking sufficient guidelines for and hands-on experience of portfolio assessment, the teachers at TWGHs WFLC expressed uncertainty about the use and design of this approach to assessment. Other local teachers may encounter similar difficulties if they are unfamiliar with this continuous (portfolio) assessment approach, particularly in the context of an outcome-based maker education project.

Some common questions asked by the TWGHs WFLC teachers were, 'How do we itemise students' performance vis-a-vis the intended learning outcomes of each project task?', 'How can we quantify students' work and learning performance into a score required by the school generally?', 'How do we justify a grade for individual student who works in a team?' and 'What criteria and benchmarks can we refer to for assessing and grading maker projects?' These were pressing questions, especially given that the design brief was too open to allow for the provision of standard answers, design solutions or outcomes from the student teams.

From our review of the TWGHs WFLC-JC MAKER+ curriculum and pedagogies, the learning performance of the students and the project outcomes from the teams, we recognised the need to realign some of the learning tasks (both sequentially and iteratively) and to devise a set of criteria for framing curriculum planning and assessment. After examining the specific class exercises and working drafts (i.e. the

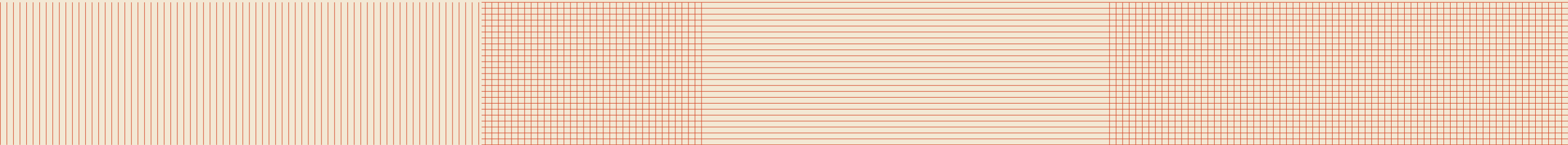
作品集評核和設計評核評分表的挑戰

為提高評核的有效性，每位學生都保存一份作品集（圖 48、圖 49、圖 50），收錄他們在整個學期或學年的手繪草圖、練習、繪圖、工作紙、小測試、改善意念的紀錄，以及對被分配專題研習的反思。由於不設期考，作品集評核法讓 MAKER+ 老師全面審視和評估學生對整個專題研習的了解和表現。

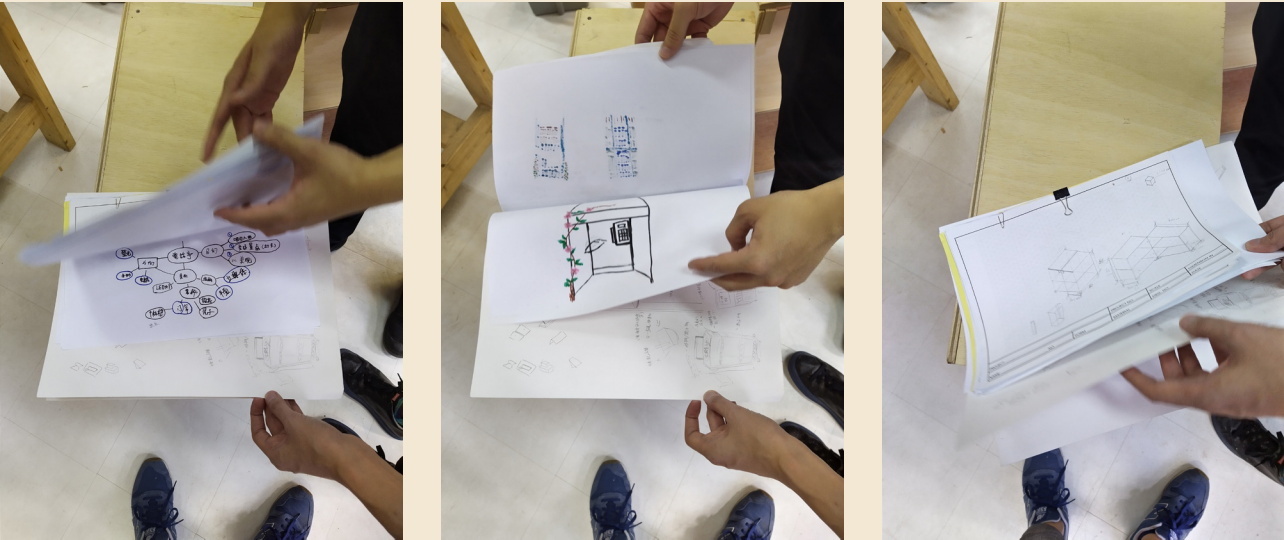
然而，東華三院黃鳳翎中學老師表示他們缺乏評核作品集和動手造的指引和經驗，所以不肯定怎樣使用和設計這種評核法。其他本地老師如不熟悉這種連續（作品集）評核法，或許會碰到類似困難，特別是在成果為本的創客教育專題研習情景下。

東華三院黃鳳翎中學老師共同提出的一些問題包括：「我們怎樣按照每個專題研習任務的預期學習成果，逐項列出學生表現？」、「我們怎樣把學生的工作和學習表現量化為學校所需的整體分數？」、「我們怎樣解釋小組合作的同學所得的個人分數？」和「我們在評核創客專題研習和給分時，應參照哪些準則和基準？」這些問題都是迫切的，特別是設計簡介過於開放式，難以提供標準答案、設計方案或來自學生團隊的成果。

我們在檢討東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程和教學法、學生學習表現和各隊專題研習成果時，發現有需要重組部分學習任務（在先後次序與迭代方面），並設



worksheets produced by the students) documented in the students’ portfolios (Fig. 51) at each of the three secondary levels, we derived specific intended learning outcomes within the framework presented in Table 2. Separate guidelines were then established for the portfolio assessment at each year level (see Appendix). Readers might wish to refer to the planning and assessment guidelines when setting specific learning objectives (or intended learning outcomes) and tasks for their own maker classes.



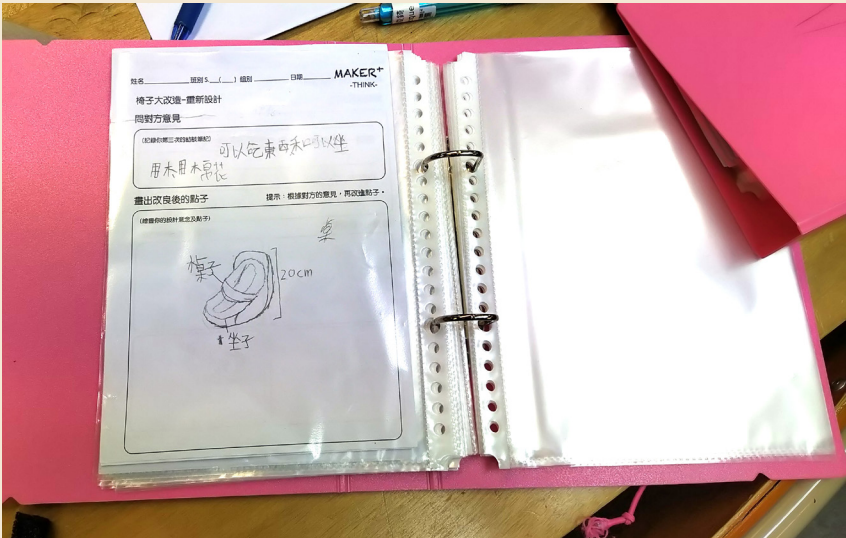
48, 49, 50.

Working drafts collected in a student’s portfolio: from exploring concepts to sketching ideas to an orthographic drawing of the final design

來自學生作品集的草圖：由發掘概念、把意念製成草圖到最終設計的正投影圖

However, after several rounds of discussion and considering teachers’ workloads and the ease of administration, the teachers recommended a single assessment rubric covering the entire project and for use across the three secondary levels. Accordingly, the team realigned the learning tasks and objectives and developed a simplified rubric based on the abovementioned three KLAs.

計一套能為課程籌劃和評核制訂框架的準則。我們審視了中一至中三各級學生作品集（圖 51）所記錄的堂課練習和草圖（即學生填寫的工作紙），並把框架下的指定預期學習成果列在表 2，然後為每個級別制訂了專屬的作品集評核指引（見附錄）。讀者為自己的創客課設定特定學習目的（預期學習成果）和任務時，可參考相關籌劃和評核指引。



51.

Each student keeps their worksheets and class assignments in a portfolio

每位學生都把自己的工作紙和堂課收集到作品集內

然而，幾過數輪討論並考慮到老師工作量和為方便行政工作，老師建議使用單一評核評分表來涵蓋整個專題研習，以及用於中一至中三。團隊於是重組學習任務和目標，並根據上述三個主要學習領域發展了一套的簡化評分表。

| Student Name: | | Class: | Student No: | | |
|--|--|---|-------------|--------|----------|
| Project Name: | | | | | |
| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes Students are able to ... | Assignment | Grades | Comments |
| KLA 1: Understand the issues | Understand an object | Observe an object from different perspectives. | | | |
| | | Describe and compare the characteristics of objects. | | | |
| | | Use the necessary tools to deconstruct and reconstruct an object. | | | |
| | | Use sketches to record findings. | | | |
| | Understand users | Understand the user perspective. | | | |
| | | Raise relevant questions in user interviews. | | | |
| | | Organise and analyse interview data. | | | |
| | | Summarise findings from interview data. | | | |
| | | Collect supporting information from various sources. | | | |
| | | Observe issues from multiple relevant perspectives. | | | |
| | | Record and describe observations systematically. | | | |
| | | Summarise findings from an investigation of the site. | | | |
| | Identify a problem and develop a problem statement | Organise and develop insights from collected data. | | | |
| | | Set an appropriate scope of investigation for an issue. | | | |
| | | Generate a relevant and precise problem statement. | | | |

| | | | | | |
|-------------------|---------------|-------------------|------------|-----|------|
| 學生姓名： | | 班別： | | 學號： | |
| 專題研習標題： | | | | | |
| 學習階段 評核準則 | | 預期學習成果 學生能夠…… | 相對應的 作業 | 評級 | 其他意見 |
| 主要學習領域 1：了解 議題 | 了解物件 | 以不同的角度觀察物件。 | | | |
| | | 描述與比較物件的特性。 | | | |
| | | 運用適合的工具拆開並重新裝嵌物件。 | | | |
| | | 以手繪草圖記錄觀察所得。 | | | |
| | 了解用家 | 了解用家角度。 | | | |
| | | 在訪問用家時提出相關問題。 | | | |
| | | 整理和分析訪問獲得資料。 | | | |
| | | 從訪問獲得資料總結發現。 | | | |
| | | 從各種途徑收集補充資料。 | | | |
| | | 從多個相關角度觀察問題。 | | | |
| | | 有系統地記錄和描述觀察所得。 | | | |
| | | 總結現場調查的結果。 | | | |
| | 界定及仔細陳述 問題 | 整理所收集到的資料，並發展為見解。 | | | |
| | | 為議題設定合適的調查範圍。 | | | |
| | | 相關及準確地陳述問題。 | | | |

| | | | | | |
|--|--------------------|--|-------------|--------|----------|
| Student Name: | | Class: | Student No: | | |
| Project Name: | | | | | |
| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes Students are able to ... | Assignment | Grades | Comments |
| KLA 2: Idea generation process supported by idea formulation and maker skills | Learn maker skills | Operate carpentry and/or electrical tools effectively. | | | |
| | | Complete class work according to the skill requirements. | | | |
| | Formulate ideas | Collect information from a variety of sources. | | | |
| | | Sketch and develop ideas with informed assumptions. | | | |
| | | Skilfully interview users and the community. | | | |
| | | Evaluate data with reason and empathy. | | | |
| | | Derive findings from interviews and other sources of information. | | | |
| | | Synthesise comments and arrive at better ideas. | | | |
| | | Generate suitable ideas decisively from the information obtained. | | | |
| | | Sketch and modify an idea as informed by an understanding of user needs. | | | |

| | | | | | |
|--|--------|------------------------------|------------|-----|------|
| 學生姓名： | | | 班別： | 學號： | |
| 專題研習標題： | | | | | |
| 學習階段 評核準則 | | 預期學習成果 學生能夠…… | 相對應的 作業 | 評級 | 其他意見 |
| 主要學習領域 2：構思 方案過程， 由制訂構思 和創客技能 支持 | 學習創造技能 | 有效操作木工或 / 和電工工具。 | | | |
| | | 根據技能要求完成堂課。 | | | |
| | 制訂構思 | 從各種途徑收集資料。 | | | |
| | | 了解資料和預設後產生構思， 並以手繪呈現。 | | | |
| | | 有技巧地訪問用家和社區人士。 | | | |
| | | 以理據和同理心評估資料。 | | | |
| | | 從訪問和其他資料來源得出發現。 | | | |
| | | 整合意見，從而想出更好的構思。 | | | |
| | | 從所獲資料果斷地產生適合的 構思。 | | | |
| | | 根據對用家需要的了解，為構思 手繪草圖和修訂意念。 | | | |

| Student Name: | | Class: | Student No: | | |
|---|--------------------------------|--|-------------|--------|----------|
| Project Name: | | | | | |
| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes Students are able to ... | Assignment | Grades | Comments |
| KLA 3: Idea development and design implementation | Make a product | Set an appropriate project timeline with milestones. | | | |
| | | Proceed to implement ideas appropriately and decisively. | | | |
| | | Iteratively modify a design with an understanding of user feedback. | | | |
| | | Consider feasibility when implementing ideas. | | | |
| | | Apply making skills to produce a final product. | | | |
| | | Visualise a design clearly and accurately (in terms of detail and measurements). | | | |
| | Present a final design outcome | Present issues and solutions logically and visually. | | | |
| | | Consider appropriate formal and structural issues in a design. | | | |
| | | Develop the necessary craftsmanship. | | | |
| | | Achieve an acceptable quality in completing a product. | | | |
| Develop a solution that is practical and appropriate for a target user. | | | | | |
| General learning capacity | Engagement | | | | |
| | Cooperation | | | | |
| | Leadership | | | | |
| | Resilience | | | | |
| | Communication | | | | |
| | Flexibility | | | | |
| Overall Grade: | | | | | |

*The generic rubric is applicable for both individual project or group project

Table 3: Generic Rubric for MAKER+ Projects

| | | | | | |
|----------------------|----------|-----------------------|------------|-----|------|
| 學生姓名： | | 班別： | | 學號： | |
| 專題研習標題： | | | | | |
| 學習階段 評核準則 | | 預期學習成果 學生能夠…… | 相對應的 作業 | 評級 | 其他意見 |
| 主要學習領域 3：構思發展和實踐設計方案 | 製作成品 | 設定合適的進度時間表和里程碑。 | | | |
| | | 果斷及適當地實踐構思。 | | | |
| | | 理解用家意見後反覆改善設計。 | | | |
| | | 實踐構思時考慮可行性。 | | | |
| | | 運用創造技巧製成最終成品。 | | | |
| | | 清楚與準確地呈現設計（就細節和尺寸而言）。 | | | |
| | 最終設計成果匯報 | 有邏輯地以視覺呈現和匯報問題與解決方案。 | | | |
| | | 在設計中考慮合適的正式和有條理的議題。 | | | |
| | | 發展必需的工藝。 | | | |
| | | 在完成成品時達致可接受質素。 | | | |
| 發展實用和適合目標用家的解決方案。 | | | | | |
| 整體學習能力 | 主動性 | | | | |
| | 合作性 | | | | |
| | 領導力 | | | | |
| | 抗逆力 | | | | |
| | 溝通 | | | | |
| | 靈活性 | | | | |
| 整體評級： | | | | | |

* 以上通用評分表適用於個人項目或小組項目

表 3：MAKER+ 專題研習的通用評分表



Curriculum planning and customising the rubric

The curriculum planning and pedagogical processes familiar to all teachers are summarised in Chart 1. With this flow of implementation in mind, this section addresses some planning and pedagogical issues relating to ‘2. Assessment rubrics development’ and ‘3. Delivery’.

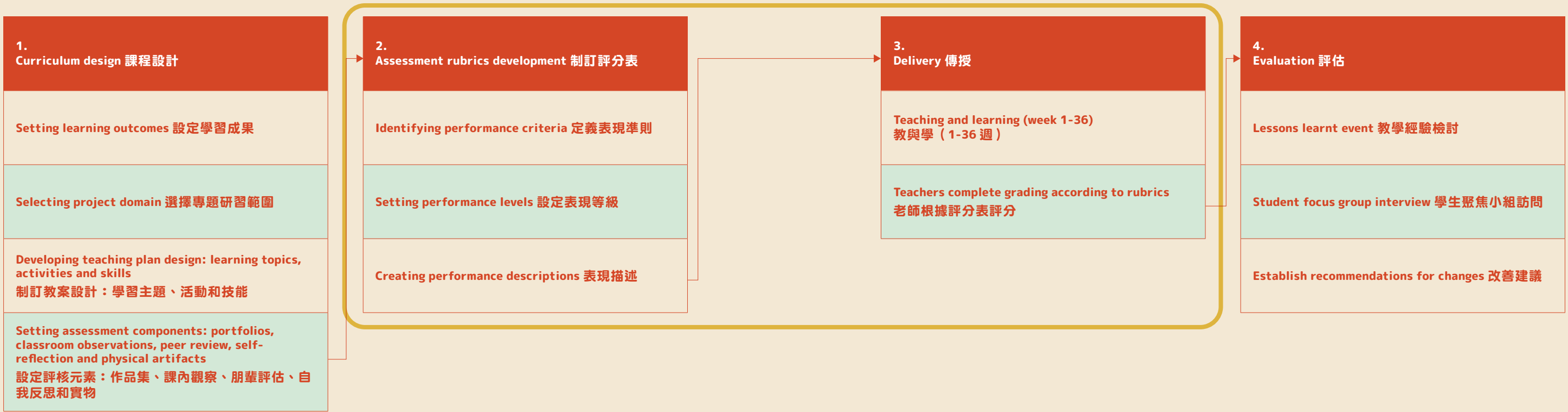


Chart 1: Curriculum planning and pedagogical processes

圖表 1：課程籌劃和教學流程

Teachers who are less familiar in delivering maker education may encounter challenges in trying to align the learning objectives with a corresponding rubric for portfolio assessment. The assessment rubric in Table 3 offers a generic framework for maker educators, but teachers are encouraged to articulate specific learning

課程籌劃和自訂評分表

圖表 1 總結了所有老師均熟悉的課程籌劃和教學流程。本節以此實施流程出發，回應一些與「2. 制訂評核評分表」和「3. 傳授」相關的籌劃和教學問題。

較不熟悉傳授創客教育的老師可能在嘗試理順學習目的和相應作品集評核評分表時面對挑戰。表 3 的評核評分表為創客教育工作者提供一套通用框架，但我們鼓勵老師在採納框架時，因應本身的教學法和評核需要闡明特定學習成



outcomes for their own pedagogical and assessment needs when adopting the framework. Teachers might choose to select and realign appropriate criteria and/or intended learning outcomes to cater for the specifics of their programme. Following are some suggestions and examples for customising the rubrics.

Deciding on suitable corresponding assignments

A student should never be assessed on anything that they have not been trained in or taught in a curriculum. To a certain extent, they should also not be assessed for anything they are not aware of being trained in or taught. This makes it important to design assignments to correspond to the intended learning outcomes, and to communicate the learning outcomes effectively to students.

For example, a facilitator/teacher faced with devising an assignment for the assessment criteria ‘understand the user perspective’ and ‘organise and analyse interview data’ (see Fig. 52) might decide to task students with administering questionnaires or interviewing fellow classmates without covering the logic of issue identification or questioning in class. In this case, students would find the task ‘boring’ or find it difficult to manage the conversation.

It is crucial to address whether students have an incentive to carry out the assigned tasks and have adequate knowledge of the purpose of the assignment and the methods to follow in tackling it.

果。老師可以選擇和重新整理合適的準則和／或預期學習成果以回應本身課程所需。以下是一些自訂評分表的建議和例子。

決定適合的相對應作業

不應評估學生沒有在課程中獲得訓練和教授的任何項目。某程度而言，如果學生沒有意識到自己獲得訓練和教授的任何項目也不應評估。所以在設計作業時，必須回應預期學習成果，也需有效地向學生說明學習成果。

例如，學習推動者 / 老師為「了解用家角度」和「整理和分析從訪問獲得資料」這兩項評核準則設計作業時（見圖 52），可能會決定讓學生進行問卷調查，又或訪問同班同學，卻沒有說明查找問題又或在班上提問的邏輯。在此情況下，學生或會覺得這種任務「悶」或覺得難以應付對話。

學生有否執行被指派任務的誘因，以及他們是否對作業目的和處理方法有足夠認識，對於他們能否投入到學習非常重要。

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes Students are able to ... | Assignment | Mark | Comments |
|--|----------------------|---|------------|------|----------|
| KLA 1: Understand the issues | Understand an object | Observe an object from different perspectives. | | | |
| | | Describe and compare the characteristics of objects. | | | |
| | | Use the necessary tools to deconstruct and reconstruct an object. | | | |
| | | Use sketches to record findings. | | | |
| | Understand users | Understand the user perspective. | | | |
| | | Raise relevant questions in user interviews. | | | |
| | | Organise and analyse interview data. | | | |
| | | Summarise findings from interview data. | | | |
| | | Collect supporting information from various sources. | | | |
| | | Observe issues from multiple relevant perspectives. | | | |
| | | Record and describe observations systematically. | | | |
| | | Summarise findings from an investigation of the site. | | | |

Fig. 52. Designing appropriate assignments for addressing the assessment criteria ‘understand the user perspective’ and ‘organise and analyse interview data’

Creating incentives through the use of tools

One way of giving students an incentive is to design engaging learning activities. This can be achieved by carefully arranging the steps to complete a task or adding mini challenges within a task, or by introducing interesting tools for use in fulfilling the task. In Fig. 53 we give the example of the use of a drawing tool to engage students in an interviewing task.

| 學習階段 評核準則 | | 預期學習成果 學生能夠…… | 相對應的 作業 | 分數 | 其他意見 |
|---------------|------|-------------------|------------|----|------|
| 主要學習領域 1：了解議題 | 了解物件 | 以不同的角度觀察物件。 | | | |
| | | 描述與比較物件的特性。 | | | |
| | | 運用適合的工具拆開並重新裝嵌物件。 | | | |
| | | 以手繪草圖記錄觀察所得。 | | | |
| | 了解用家 | 了解用家角度。 | | | |
| | | 在訪問用家時提出相關問題。 | | | |
| | | 整理和分析訪問獲得資料。 | | | |
| | | 從訪問獲得資料總結發現。 | | | |
| | | 從各種途徑收集補充資料。 | | | |
| | | 從多個相關角度觀察問題。 | | | |
| | | 有系統地記錄和描述觀察所得。 | | | |
| | | 總結現場調查的結果。 | | | |

圖 52. 設計合適的作業來回應「了解用家角度」和「整理和分析從訪問獲得資料」的評核準則

使用工具創造誘因

要為學生製造誘因的其中一個方法，是設計令他們投入的學習活動。要實現這點，需要小心安排完成任務的步驟，又或在同一任務中加入小挑戰，又或在完成任務時引入有趣的工具。以圖 53 為例，我們讓學生使用訪問工具－「用家工具」，令他們更投入訪問任務。



Students often feel intimidated in interviewing strangers, and people on the street are often also reluctant to be interviewed. Asking students to draw portraits can sometimes overcome these problems, as the interesting experience of using a drawing tool gives students an incentive to interact with strangers. The simple tool can arouse the curiosity of students, who may try it even if they do not know how to draw. The act of drawing can make an otherwise stilted interaction into an engaging one.



Knowing the learning outcomes and the arrangement of the tasks

Sometimes students have difficulty performing a task well because they simply do not know or cannot sense the reason for doing the task. In some situations, even a very clear explanation of the purpose of a certain assignment or exercise will be of little help. Referring again to the interviewing task, it is vital that students feel the need to understand users rather than merely being assigned to do so.

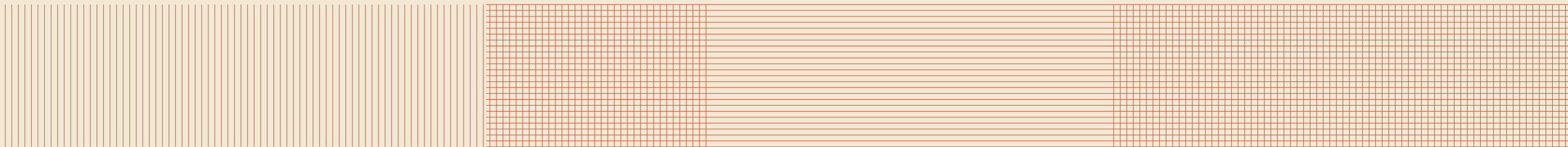
學生往往對訪問陌生人望而生畏，而且路人通常都不願意接受訪問。請學生畫出人像畫有時候可以克服這些問題，因為使用繪畫工具的有趣經驗讓學生有動力與陌生人交流。這種簡單的工具可以引發學生的好奇心，連不懂畫畫的學生也可能會嘗試。繪畫可以令本來不自在的互動變成投入參與的任務。

Fig. 53. 'People' profile card for interviewing people and gathering their thoughts. The transparent part can be used to draw the face of the people being interviewed.

圖 53. 訪問和收集受訪者想法時可使用「用家工具」，在透明部分描繪受訪者的臉。

認識學習成果與任務安排

學生有時難以把任務做好，因為他們不明白或感受不到做任務的理由。某些情況下，即使為某份作業或練習清楚解釋目的仍然幫助不大。再以訪問任務為例，學生必須感受到有需要認識用家，而不只是被指派訪問任務。



Putting action and exploration before rationalisation

Some programmes will ask the students to perform the exploratory tasks first, thus placing interviews and other forms of user engagement at the beginning of the project. Although this might be logical in a real-world scenario, students simply do not have sufficient investment in and imagination of the project at such an early stage. Gathering information is likely to feel more purposeful for students at a slightly later stage of the project (although still early enough to inform the design), by which time they will have specific issues to clarify or questions to raise.

Using facilitators and tools to help trigger thinking from raw data

Another example is how to set up an assignment for the learning outcomes of idea generation (see Fig. 54). An effective approach to early-stage idea generation is to emphasise quantity and encourage students to come up with many options. This helps eventually to produce high-quality ideas while preventing students from aiming at a perfect idea right at the beginning.

說理前先行動探索

有些課程要求學生首先進行探索任務，即在專題研習項目開始時先進行訪問和其他形式的用家參與。儘管此舉在真實世界可能合乎邏輯，學生在專題研習初階時其實沒有足夠的投入感和想像力。對學生來說，在專題研習較後期才收集資料，他們會較易感受箇中作用（但時機仍需能為設計提供重要資料），這時候，他們便可以提出具體的問題加以澄清，也懂得如何提問。

善用學習推動者和工具，幫助從原始資料激發思考

另一例子是如何就「構思發展」的學習成果設計習作（見圖 54）。在構思發展的初步階段時，其中一種有效的方法是強調數量，並鼓勵學生想出很多選項。此舉有助最終產生優質意念，同時避免學生由一開始便以找出完美構思為目標。

| | | | | | |
|---|--------------------|--|--|--|--|
| KLA 2: Idea generation process supported by idea formulation and maker skills | Learn maker skills | Operate carpentry and/or electrical tools effectively. | | | |
| | | Complete class work according to the skill requirements. | | | |
| | Formulate ideas | Collect information from a variety of sources. | | | |
| | | Sketch and develop ideas with informed assumptions. | | | |
| | | Skilfully interview users and the community. | | | |
| | | Evaluate data with reason and empathy. | | | |
| | | Derive findings from interviews and other sources of information. | | | |
| | | Synthesise comments and arrive at better ideas. | | | |
| | | Generate suitable ideas decisively from the information obtained. | | | |
| | | Sketch and modify an idea as informed by an understanding of user needs. | | | |

Fig. 54. Knowing the learning outcomes – the criteria for the idea formulation KLA

Mind-mapping seems like a perfect tool for idea formulation, but despite its power and apparent simplicity it actually works better for more experienced users. Sometimes, the use of mind-mapping becomes a kind of ritual, with classes using it just for the sake of using it. The results generated from mind-mapping need experienced facilitators to translate them into sources of inspiration or insights that can be used in a project, and students sometimes feel lost in the free association process or are simply unable to generate elements from different angles.

Students need triggers for their imagination, and the essential path to proliferating ideas is to manipulate a single element and look for maximum possibilities. ‘Tech-cards’ (Fig. 55) provide an illustration of this way of leading students to brainstorm. Tech-cards are a set of playing cards that contain different electrical components for developing simple devices. Students start with a paper prototyping tool to become familiar with the language of input–processing–output and then

| | | | | | |
|------------------------------|--------|--------------------------|--|--|--|
| 主要學習領域 2：構思方案過程，由制訂構思和創客技能支持 | 學習創造技能 | 有效操作木工或 / 和電工工具。 | | | |
| | | 根據技能要求完成堂課。 | | | |
| | 制訂構思 | 從各種途徑收集資料。 | | | |
| | | 了解資料和預設後產生構思，並以手繪呈現。 | | | |
| | | 有技巧地訪問用家和社區人士。 | | | |
| | | 以理據和同理心評估資料。 | | | |
| | | 從訪問和其他資料來源得出發現。 | | | |
| | | 整合意見，從而想出更好的構思。 | | | |
| | | 從所獲資料果斷地產生適合的構思。 | | | |
| | | 根據對用家需要的了解，為構思手繪草圖和修訂意念。 | | | |

圖 54. 認識學習成果 - 構思方案主要學習領域的準則

腦圖 (mind-map) 似乎是構思方案的完美工具，然而這種看似簡單容易和效果強大的工具，效果在較富經驗的使用者上較為顯著。有些時候，使用腦圖成為一種儀式，在課上每每是為用而用。從腦圖產生的想法，需要富經驗的學習推動者轉化為靈感來源，又或適用於專題研習的見解。學生有時會在自由關聯的過程中感到迷失，甚至完全沒法從不同角度看出任何元素來。

學生的想像力需要被引發，而以單一元素多加變化再找出最多可能性，是產生大量意念的重要手法。「科技卡」（圖 55）說明怎樣以這種方法引導學生進行腦力激盪。「科技卡」包括多種可用來製作簡單裝置的電力組件。學生以紙本原型製作工具開始，慢慢熟悉輸入 – 處理 – 輸出的語言，



use the cards to explore the possibility of combining components. These cards are a simple technology that give students a chance to play with and think about different settings for devices and help them to brainstorm new ideas.



Consistency of grades

Grading design often involves the dilemma of subjectivity. Although it is impossible to attain 100% objectivity, grading should at least strive for consistency. The teaching team should ensure that they are making judgements based on the same set of criteria and an agreed understanding of those criteria.

然後利用卡片探討結合組件的可能性。這些卡片是一種簡單的技巧，讓學生有機會採用不同方法和思考裝置的不同設定，有助他們以腦力激盪法找出新構思。

Fig. 55. Tech-cards allow students to play with and think about different settings for devices and can help them to brainstorm new ideas

圖 55. 科技卡可讓學生以遊玩方式就思考裝置的不同設定，有助他們以腦力激盪法想出新構思

評分一致性

評分設計通常都涉及主觀難題。雖然要達至百份百客觀並不可能，但評分最低限度也應致力實現一致性。教學團隊應確保組員的判斷均以同一套準則為依歸，而各人均對有關準則有商定了解。



Recurrent reviews and discussion of the assessment criteria is necessary to ensure the alignment of learning outcomes and assessment criteria. The teaching team should perform grade moderation to review their assessments before determining a final grade. This practice helps to align grading standards across a teaching team (Fig. 56, Fig. 57) and to monitor and refine grading performance at the optimal time, which is during grading. Teaching teams can also conduct trial marking to generate common understandings around the expected standards. Post-grading reviews are also important; although this does not affect student grades, it is important for future rounds of grading.



為確保學習成果和評核準則對應，需要定期檢討和討論評核準則。教學團隊應進行評分評審，以在決定最終評分前先檢討評核。此舉有助在教學團隊中調整評分標準（圖 56、圖 57），並在最適當的時間（即評分之時）監察和調節表現評分。教學團隊也可以試行評分以就預期標準達成共識。評分後檢討也同樣重要；儘管此舉不會影響學生得分，但對未來的評分工作相當重要。

Fig. 56, Fig. 57 A teaching team discusses and aligns their grading standards

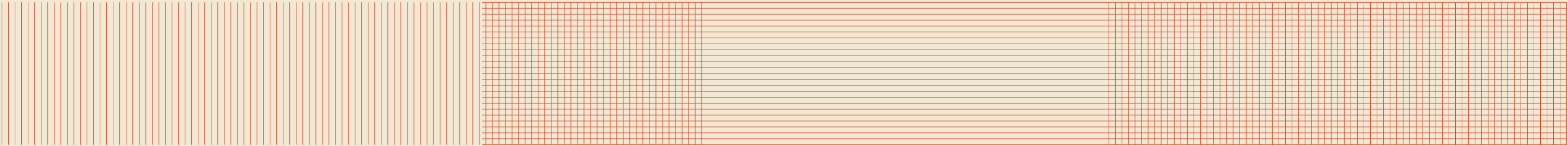
圖 56、圖 57，教學團隊討論和理順評分標準

Qualitative feedback

Although the rubrics presented here try to cover every learning outcome and reflect different perspectives, the assigned grades will represent performance only quantitatively. Quality feedback is crucial for students, and many students treasure the personal element in written reviews of their work.

質化 (Qualitative) 回饋

儘管本文所載的評分表嘗試涵蓋每一個學習成果和反映不同角度，但評分只是量化回饋。質化回饋對學生非常重要，而且很多學生都重視作品書面評價中的個人化元素。



Qualitative feedback can take the form of annotated comments on students’ task and work performance, advice and commentary. It can be written, but when circumstances allow can also take the form of audio or video files. Qualitative assessment feedback can be provided by teachers, through self-assessment, by peers or by experts. For the latter approach, external experts could be invited to the final presentations and asked to comment on the outcomes, with these comments recorded and presented back to students. However, experts can only comment on the outcome, whereas feedback from teachers can cover the process and how students have learned and changed over the course of the project.

質化回饋的形式可以是就學生的任務和工作表現作出註解意見、建議和評論。它可以是書寫的，但如情況許可，也可以透過音頻或視頻檔案提供。質化評核回饋可以由老師提供，也可以是自我、朋輩或專家評核。如屬後者，可邀請外間專家出席最終匯報會，並請他們就成果給予意見，可以把意見錄下再給學生回放。然而，專家只能就成果提出意見，而老師的回饋則可涵蓋學生的學習過程，以及他們在專題研習進行期間出現的改變。

Conclusion

結論

To empower students with transferable skills that will hold up in the rapidly changing world of the 21st century, pedagogical ideas have changed from teacher-centric to student-centric and from emphasising isolated work to stressing collaborative work. Maker education strongly emphasises open-ended student learning outcomes, as teachers are encouraged to use instructional and learning approaches that are appropriate to the interests and strengths of each learner. This can create challenges for teachers in setting assessment criteria to fit the new pedagogies and curricula, which may also feel too abstract to assess in the absence of a body of knowledge and established benchmarks.

The rubrics described in this report address challenges that teachers may face when they try to assess the outcomes, performance and learning processes of students in maker education, especially given that these assessments can be considered overly subjective. The rubrics turn an abstract and intangible learning process and outcome into a set of objective and organised measurements. The TWGHs WFLC-JC MAKER+ case can serve as a reference for education practitioners who seek to implement maker education. Schools are also encouraged to customise the rubrics to match the characteristics of their curricula, culture and students. These customised rubrics will not only allow teachers to assess performance effectively but also serve as a framework for teachers to understand and evaluate different learning and teaching processes and ultimately to improve the programme design.

Although continuous refinement is needed, it is hoped that the current publication will catalyse the development of maker education in Hong Kong. More extensive collaboration between schools and teachers will enhance the assessment tools for maker pedagogies and hence improve the quality and effectiveness of maker education.

為賦予學生可轉移技能，讓他們在 21 世紀瞬息萬變世界中適應和生存，教學思維已從老師為本變成學生為本，由著重獨立工作變成以協作為重點。創客教育的一大重點，是著重開放式、沒有預設答案的學生學習成果，鼓勵老師採用適合每位學員興趣和優勢的教與學方法。老師在訂立評核準則來配合新教學法和課程大綱時，或會覺得挑戰重重，而且感到或認為在沒有完整知識和既定基準下，評核工作會流於抽象。

我們明白老師嘗試評核學生的創客教育成果、表現和學習過程時所面對的挑戰，特別是這些評核會被認為過份主觀，所以在本報告中描述了一套評分表，務求把抽象和無形的學習過程和成果轉化為一套客觀和有組織的指標。有意推行創客教育的教育工作者可以參考本 MAKER+ 創新課程個案。我們並鼓勵學校把評分表加以自訂來配合本身的課程、文化和學生特色。自訂評分表不僅讓老師有效評核表現，也可以用作方便老師了解和評估不同教與學流程的框架，最終有助改善課程設計。

儘管項目需要持續改良，我們希望本報告可以催化香港創客教育發展。學校與老師更廣泛協作將可提升創客教學法的評核工具，繼而改善創客教育的質素和效益。

Acknowledgements

鳴謝

The rubrics described in this report are the result of the efforts of the maker education team at TWGHs Wong Fung Ling College and the participating students. Their invaluable contributions to the project are greatly appreciated. We would also like to thank the contribution of Ms Chan Kit Ling, Mr Ng Chun Yu and Dr Sung Wai Ki, Vienne to this report.

In addition, we would like to thank The Hong Kong Jockey Club Charities Trust for its support for maker education.

Finally, we extend our thanks in advance to the students and educators who will use this guide to implement maker education.

本報告所描述的評分表是東華三院黃鳳翎中學創客教育團隊和參與學生的努力成果。本項目謹此衷心感謝各位的寶貴貢獻。另外我們也想鳴謝陳潔苓女士、吳津宇先生及宋惠琪博士為此報告所作出的貢獻。

此外，本項目也感謝香港賽馬會慈善信託基金支持創客教育。

最後，我們特別向所有將會使用本指引推行創客教育的學生和教育工作者預先致謝。

Appendix 附錄

MAKER+ planning and assessment guideline for S1, S2 and S3 中一、中二和中三 MAKER+ 籌劃與評核準則

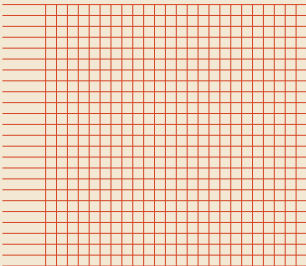
[illegible]

The below assessment guideline is co-developed and co-owned by JCDISI and TWGHs Wong Fung Ling College, based on the processes and experiences of the “TWGHs Wong Fung Ling College Jockey Club MAKER+ Innovative Curriculum”. Please refer to Ms. Wong Pui Pui’s publication “TWGHs Wong Fung Ling College Jockey Club MAKER+ Innovative Curriculum planning and Learning and Teaching Guide” or visit the website of TWGHs WFLC-JC MAKER+ (<https://www.jc-makerplus.com/zh-hant/teach-materials/463>) for more information on the teaching plan and curriculum.

以下評核準則由賽馬會社會創新設計院及東華三院黃鳳翎中學根據「東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程」中的過程及經驗共同開發及擁有，有關「MAKER+ 創新課程」教學計劃及課程大綱請參閱黃佩珮老師著作〈東華三院黃鳳翎中學賽馬會 MAKER+ 創新課程籌劃及教學指南〉或到「MAKER+ 創新課程」網頁下載（<https://www.jc-makerplus.com/zh-hant/teach-materials/463>）。

Appendix 附錄

MAKER+ planning and assessment guideline for S1, S2 and S3
中一、中二和中三 MAKER+ 籌劃與評核準則



MAKER+ assessment guideline for S1
中一 MAKER+ 評估指引

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|--|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Understand an object by observation and desk research (form, function, materials) 以觀察及資料搜集了解物件（形式 / 形態、功能、物料） | Collect data and bring up relevant and appropriate examples 資料搜集及提出多個相關和合適的例子 | | | |
| | | Make observations from different perspectives 能夠以不同的角度觀察 | | | |
| | | Clearly describe the characteristics observed 清晰描述觀察到的特性 | | | |
| | | Make proper comparisons between the characteristics of different items (form, function, materials and user experience) 懂得比較不同物件的特性（形式 / 形態、功能、物料及用家體驗） | | | |
| | | Sensibly value and judge different items 以合理原因判斷物件的優劣 | | | |
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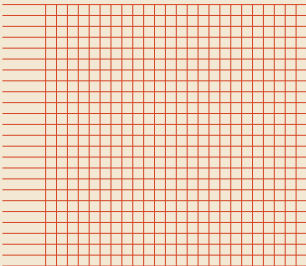
| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|--|--|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Understand an object through hands-on experience (structure, parts) 以「動手試」了解物件（結構和部件） | Clearly describe the characteristics observed 清晰描述觀察到的特性 | | | |
| | | Make an orderly record of the findings (sketch, photography, visual display) 能夠有條理地記錄（手繪、攝影、圖像展示） | | | |
| | | Make proper comparisons between the characteristics of different items (structure, parts) 懂得比較不同物件的特性（結構和部件） | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) 構思方案（小組討論 / 訪問 / 製作模型） | Demonstrate fluency of ideas (sketch/imagination/ assumptions) 多「橋」（手繪、想像、假定） | | | |
| | | Search for and collect relevant and appropriate information from a variety of sources 有能力從不同途徑搜相關和合適的集資及例子作參考 | | | |
| | | Interview skilfully 訪問技巧 | | | |
| | | Raise relevant questions 能夠提出相關問題 | | | |
| | | Organise interview data 有能力整理訪問獲得資料 | | | |
| | | Understand the user perspective 以用家角度理解 | | | |
| | | Mostly evaluate data intellectually rather than emotionally 經常理性並具體地分析所得資料 | | | |
| | | | | | |

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|--|---|--|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) 構思方案 (小組討論 / 訪問 / 製作模型) | Synthesise and filter received comments to inspire new or better ideas (from teammates and teachers) 整合和過濾收集到的意見，從而啟發新 / 更好的意念 (組員和老師的意見) | | | |
| | | Be decisive and efficient in using the information obtained and ideas generated 善用已有資料及構思，果斷及適當地推進項目 | | | |
| | | Sketch and modify an idea as informed by an understanding of user needs 理解用家意見後，在手繪上改善構思 | | | |
| | | Produce a working model (form development/experimentation and measurement) 製作模型 (構思 / 探索形式和考慮尺寸) | | | |
| | Learn maker skills (e.g. carpentry, electrical works) 學習技巧 (例如：木工、電工) | Use tools effectively and appropriately 掌握正確使用工具的方法 | | | |
| | | Complete class exercise using the skills learnt 能運用所學的技巧完成堂課 | | | |
| | Implement final design ideas in the process of making 動手造：製作成品和製作過程 | Set an appropriate project timeline with milestones 有能力為項目設定合適的進度時間表 | | | |
| | | Demonstrate clarity and accuracy in sketching a design (in terms of detail and measurements) 清晰和準確的設計圖 (細節和尺寸) | | | |

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 | |
|--|--|---|----------------------|--------------|------------------|--|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | | |
| KLA 3: Idea Implementation 實踐方案 | Implement final design ideas in the process of making 動手造：製作成品和製作過程 | Be decisive and efficient in implementing an idea 果斷及適當地推進項目、實踐構思 | | | | |
| | | Modify a design through an understanding of the user's views 理解用家意見後改善設計 | | | | |
| | | Apply the skills learnt in making the final product 製作成品時能運用所學的技巧 | | | | |
| | Present a final design outcome 最終設計成果及匯報 | Take appropriate form/structure into consideration 是否有考慮合適的形式 / 結構 | | | | |
| | | Exhibit a degree of quality/ craftsmanship in a finished product 質量 / 手工 | | | | |
| | | Take concept implementation into consideration 是否能實踐構思及考慮其可行性 | | | | |
| | | Bring a project to completion 完成度 | | | | |
| | | Present the project skilfully 匯報技巧及表達能力 | | | | |
| | General learning capacity 整體學習能力 | Engagement 主動性 | | | | |
| | | Flexibility 靈活性 | | | | |
| Cooperation 合作性 | | | | | | |
| Leadership 領導力 | | | | | | |
| Resilience 抗逆力 | | | | | | |
| Communication 溝通 | | | | | | |
| Overall Grade 整體評級 | | | | | | |

Appendix 附錄

MAKER+ planning and assessment guideline for S1, S2 and S3
中一、中二和中三 MAKER+ 籌劃與評核準則



MAKER+ assessment guideline for S2
中二 MAKER+ 評估指引

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|--|--|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Understand a user (real client – individual) 了解用家（實際獨立用家） | Interview skilfully and raise relevant questions 訪問技巧及能夠提出相關問題 | | | |
| | | Understand the user’s perspective 以用家角度理解 | | | |
| | | Learn from interview data (organise and analyse) 從訪問獲得資料（整理和分析） | | | |
| | | Make an orderly record and description of the findings/ observations from real scenarios and an on-site observation 在真實情境及實地考察後，有系統地整理及描述觀察所得 | | | |
| | | Find and organise relevant information from a variety of sources (e.g. latest trends, new technologies) 從不同途徑尋找及整理相關資料（例：最新現況、新科技…） | | | |
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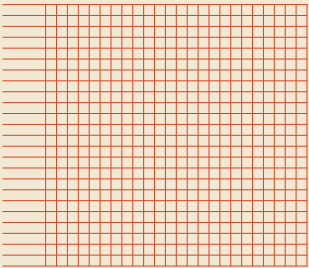
| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|---|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Identify problem and make a problem statement 界定及仔細陳述問題 | Organise and build on the collected data 整理及發展收集到的資料 | | | |
| | | Set an appropriate scope for the issue 為議題設定合適範圍 | | | |
| | | Make a relevant and precise problem statement 相關及準確地陳述問題 | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) 構思方案（小組討論 / 訪問 / 製作模型） | Demonstrate fluency of ideas (sketch/imagination/ assumptions) 多「橋」（手繪、想像、假定） | | | |
| | | Understand the user’s perspective and the user experience 以用家角度理解 | | | |
| | | Find and organise relevant information from a variety of sources (e.g. latest trends, new technologies) 從不同途徑尋找及整理相關資料（例：最新現況、新科技…） | | | |
| | | Synthesise and filter feedback to inspire new or better ideas (from real clients, teammates and teachers) 整合和過濾收集到的意見，從而啟發新 / 更好的意念（用家、組員和老師的意見） | | | |
| | | Visualise ideas by sketching 有能力把意念呈現出來 | | | |
| | | Mostly evaluate data intellectually rather than emotionally 經常理性並具體地分析所得資料 | | | |
| | | | | | |

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 | |
|---|---|---|---|--------------|------------------|--|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) 構思方案 (小組討論 / 訪問 / 製作模型) | Be decisive and proceed appropriately with the information obtained and ideas generated 善用已有資料及構思，果斷及適當地推進項目 | | | | |
| | | Produce a working model (form development/experimentation and measurement) 製作模型（構思 / 探索形式和考慮尺寸） | | | | |
| | Learn maker skills (e.g. carpentry, electrical works) 學習技巧 (例如：木工、電工) | Use tools effectively and appropriately 掌握正確使用工具的方法 | | | | |
| | | Complete class exercise using the skills learnt 能運用所學的技巧完成堂課 | | | | |
| | KLA 3: Idea Implementation 實踐方案 | Implement final design ideas in the process of making 動手造：製作品和製作過程 | Demonstrate clarity and accuracy in the design sketch (details and measurement) 清晰和準確的設計圖（細節和尺寸） | | | |
| | | | Be decisive and efficient in implementing an idea 果斷及適當地推進項目、實踐構思 | | | |
| Set an appropriate project timeline with milestones 有能力為項目設定合適的進度時間表 | | | | | | |
| Modify design through an understanding of the user's views 理解用家意見後改善設計 | | | | | | |
| Apply the skills learnt in making a final product 製作品時能運用所學的技巧 | | | | | | |
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| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|--|---|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 3: Idea Implementation 實踐方案 | Present a final design outcome 最終設計成果及匯報 | Take appropriate form/structure into consideration 是否有考慮合適的形式 / 結構 | | | |
| | | Exhibit a degree of quality/ craftsmanship in a finished product 質量 / 手工 | | | |
| | | Take concept implementation into consideration 是否能實踐構思及考慮其可行性 | | | |
| | | Bring a project to completion 完成度 | | | |
| | | Present the project skilfully 匯報技巧及表達能力 | | | |
| | | Product an object that is practical and suitable for the user 對用家有用和適合用家 | | | |
| | | | | | |
| | | | | | |
| General learning capacity 整體學習能力 | Engagement 主動性 | | | | |
| | Flexibility 靈活性 | | | | |
| | Cooperation 合作性 | | | | |
| | Leadership 領導力 | | | | |
| | Resilience 抗逆力 | | | | |
| | Communication 溝通 | | | | |
| Overall Grade 整體評級 | | | | | |

Appendix 附錄

MAKER+ planning and assessment guideline for S1, S2 and S3
中一、中二和中三 MAKER+ 籌劃與評核準則



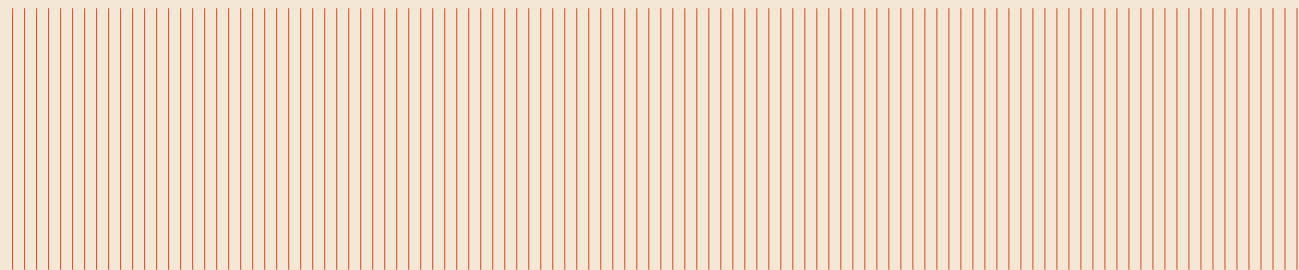
MAKER+ assessment guideline for S3
中三 MAKER+ 評估指引

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|--|--|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Understand users (community needs and impact) 了解用家（回應社區需要及影響） | Make observations from different but relevant perspectives 能夠以不同的角度觀察 | | | |
| | | Make an orderly record and description of the findings/ observations from real scenarios and an on-site observation 在真實情境及實地考察後，有系統地整理及描述觀察所得 | | | |
| | | Demonstrate interview skills and raise relevant questions 訪問技巧及能夠提出相關問題 | | | |
| | | Understand users’ perspectives 以用家角度理解 | | | |
| | | Learn from interview data (organise and analyse) 從訪問獲得資料（整理和分析） | | | |
| | | Find and organise relevant information from a variety of sources (e.g. latest trends, new technologies) 從不同途徑尋找及整理相關資料（例：最新現況、新科技…） | | | |
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| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|---|---|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 1: Understand the issues 了解議題 | Identify problem and make a problem statement 界定及仔細陳述問題 | Organise and build on the collected data 整理及發展收集到的資料 | | | |
| | | Set an appropriate scope for the issue 為議題設定合適範圍 | | | |
| | | Make a relevant and precise problem statement 相關及準確地陳述問題 | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) 構思方案（小組討論 / 訪問 / 製作模型） | Demonstrate fluency of ideas (sketch/imagination/ assumptions) 多「橋」（手繪、想像、假定） | | | |
| | | Find and organise relevant information from a variety of sources (e.g. latest trends, new technologies) 從不同途徑尋找及整理相關資料（例：最新現況、新科技…） | | | |
| | | Understand users’ perspectives and the user experience 以用家角度理解 | | | |
| | | Synthesise and filter feedback to inspire new or better ideas (from real clients, teammates and teachers) 整合和過濾收集到的意見，從而啟發新 / 更好的意念（用家、組員和老師的意見） | | | |
| | | Visualise ideas by sketching 有能力把意念呈現出來 | | | |
| | | Mostly evaluate data intellectually rather than emotionally 經常理性並具體地分析所得資料 | | | |
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| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|--|---|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 2: Idea Generation 構思方案 | Develop ideas (group discussion/ interview/ model-making) | Be decisive and proceed appropriately with the information obtained and ideas generated 善用已有資料及構思，果斷及適當地推進項目 | | | |
| | | Produce a working model (form development/experimentation and measurement) 製作模型（構思 / 探索形式和考慮尺寸） | | | |
| | Learn maker skills (e.g. carpentry, electrical works) | Use tools effectively and appropriately 掌握正確使用工具的方法 | | | |
| | | Complete class exercise using the skills learnt 能運用所學的技巧完成堂課 | | | |
| | 學習技巧（例如：木工、電工） | | | | |
| | | | | | |
| KLA 3: Idea Implementation 實踐方案 | Implement final design ideas in the process of making 動手造：製作品和製作過程 | Demonstrate clarity and accuracy in the design sketch (details and measurement) 清晰和準確的設計圖（細節和尺寸） | | | |
| | | Be decisive and efficient in implementing an idea 果斷及適當地推進項目、實踐構思 | | | |
| | | Set an appropriate project timeline with milestones 有能力為項目設定合適的進度時間表 | | | |
| | | Modify design through an understanding of the user’s views 理解用家意見後改善設計 | | | |
| | | Apply the skills learnt in making a final product 製作品時能運用所學的技巧 | | | |
| | | | | | |

| Stages of Learning & Assessment Criteria | | Intended Learning Outcomes 預期學習成果 | Assignment 相對應的作業 | Grades 評級 | Comments 其他意見 |
|--|---|---|----------------------|--------------|------------------|
| 學習階段 評核準則 | | Students are able to ... 學生能夠…… | | | |
| KLA 3: Idea Implementation 實踐方案 | Present a final design outcome 最終設計成果及匯報 | Take appropriate form/structure into consideration 是否有考慮合適的形式 / 結構 | | | |
| | | Exhibit a degree of quality/ craftsmanship in a finished product 質量 / 手工 | | | |
| | | Take concept implementation into consideration 是否能實踐構思及考慮其可行性 | | | |
| | | Bring a project to completion 完成度 | | | |
| | | Present the project skilfully 匯報技巧及表達能力 | | | |
| | | | | | |
| General learning capacity 整體學習能力 | Engagement 主動性 | | | | |
| | Flexibility 靈活性 | | | | |
| | Cooperation 合作性 | | | | |
| | Leadership 領導力 | | | | |
| | Resilience 抗逆力 | | | | |
| | Communication 溝通 | | | | |
| Overall Grade 整體評級 | | | | | |



About PolyU Jockey Club “Operation Solnno”

Organised by the Jockey Club Design Institute for Social Innovation (JCDISI) at The Hong Kong Polytechnic University (PolyU) and funded by The Hong Kong Jockey Club Charities Trust, the 3-year social innovation project commenced in 2018 aims to innovate solutions, in collaboration with a wide spectrum of stakeholders, to respond to social challenges with a view to improving life in Hong Kong. JCDISI puts its strategic focus on tackling the combined impact of “Double Ageing” (ageing of people and building) in Hong Kong, the programme would engage the trans-disciplinary forces of academia, nongovernmental organisations, professional bodies, members of the public, corporations and the Government to generate innovative ideas and practical actions.

關於理大賽馬會社創「騷・In・廬」

由香港理工大學（理大）賽馬會社會創新設計院主辦及香港賽馬會慈善信託基金捐助，於 2018 年開展，計劃為期三年，以期匯集社會各方，以創新理念和務實可行的社會創新方案，應對多項社會挑戰，共同改善香港的生活。以應對香港「雙老化」（即人口老化及住屋老化）的複合效應為工作的策略焦點，聯合學術界、非政府組織、專業團體、熱心的社會人士、企業和政府，攜手構建創新方案，並按此制訂建議的實際行動。

The Four Pillars of the project 項目四大範疇



ONE FROM HUNDRED THOUSAND
「十萬分之一」社創研討會

“One from Hundred Thousand” - to organise a series of participatory symposia and workshops open to the public to collect views on social issues, facilitate discussion and co-create solutions. JCDISI names the platform based on the belief that if one person from every 100,000 people (i.e. 70+ persons from the 7 million+ population of Hong Kong) can sit together and contribute their time, passion, knowledge and creativity, they can innovate solutions for a specific problem.

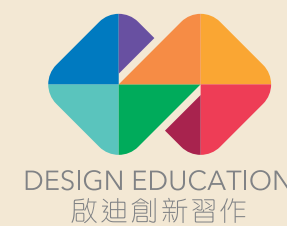
「十萬分之一」社創研討會 - JCDISI 相信，假若每十萬人之中有一人，即香港七百多萬人口當中的七十多名市民，能貢獻時間、熱誠、知識與創意，攜手合作，定能為特定的社會議題帶來創新的解決方案。透過一系列的參與式研討會及工作坊，收集市民對社會議題的意見、促進討論，並共同設計務實和創新的方案。



ACTION PROJECTS
社創行動項目

“Solnno Action Projects” - to collaborate with non-government organisations, professional bodies and academia for developing innovative ideas generated at “One from Hundred Thousand” into designs or prototypes.

社創行動項目 - 聯合非政府組織、專業團體和學術界，把「十萬分之一」社創研討會上衍生出來的創新理念，轉化成可以執行的設計及專案原型。



DESIGN EDUCATION
啟迪創新習作

“Solnno Design Education” - to introduce social innovation and design thinking into the curriculum of secondary school education to nurture students as social innovators. Social innovation workshops will be organised for students and teachers and multi-media interactive teaching kits will be developed in this regard.

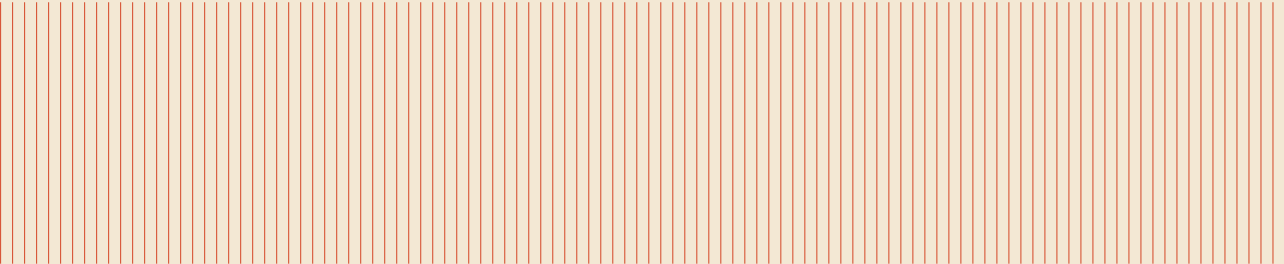
啟迪創新習作 - 將社會創新和設計思維引入中學課程，培育青年成為社會創新推動者，內容包括為中學師生開設社會創新工作坊、製作多媒體互動教材等等。



KNOWLEDGE PLATFORM
社創知識平台

“Solnno Knowledge Platform” - to document and disseminate for public use the social innovation experience and knowledge generated from the programme through various formats, including academic papers, videos, design and practice guidelines, case study reports, workshops, regional and international conferences and exhibitions.

社創知識平台 - 以不同形式（如學術論文、短片、設計與指引、個案報告、工作坊、地區及國際會議、展覽等），記錄是項計劃的各環節，包括社會創新過程、創造的方案與知識等等，並公開予公眾參考應用。



Publication Details 出版資料

| | | |
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