



# Technology meets art: An experimental joint course between HKUST and CAA

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**H**ong Kong University of Science and Technology (HKUST) (Fig. 1) is a public research university with an engineering school that is consistently ranked among the top 30 in the world by Times Higher Education World University Rankings and QS World University Rankings. Despite having such strong engineering capabilities, HKUST does not have an art school.

The curriculum for the engineering students focuses on knowledge and problem-solving skills from a technological point of view. However, as demonstrated by the successes of the MIT Media Lab and the Stanford University d.school, great ideas often come from a team consisting of students from different backgrounds and skill sets. Thus, HKUST actively seeks partners who can make up for our weaknesses in the current curriculum and complement our strengths.

China Academy of Arts (CAA) (Fig. 2) is one of the top two art institutions in mainland China. The school is transitioning from traditional artistic principles to modern design concepts with more technical components. It also is looking to strengthen its technological influence. When a delegate of HKUST



visited CAA, both sides showed strong interest in collaboration. As the first step, they planned to start with an experimental summer course.

### Designing the course

After multiple rounds of discussions, the course was designed to be a three-credit, one-month summer joint course between HKUST and CAA. There was 40 students: 20 from HKUST and the other 20 from CAA. The goal is radical collaborations by students of very different backgrounds throughout the different stages of the course. Thus, the course was offered to both undergraduate and postgraduate students as well as students from different majors. We wanted the students to be exposed to different environments. It was decided that the course would be held at HKUST for two weeks, while CAA would host the other two weeks. The two universities have contrasting study/research environments that are beneficial for students to engage in and learn new things.

From the HKUST side, four course instructors came from two different departments: Prof. Ravindra Goonetilleke and Prof. Emily Au from the Department of Industrial Engineering and Logistics Management (IELM) and Prof. Huamin Qu and Prof. Pedro Sander from the Department of Computer Science and Engineering (CSE). The first offering of the course was during June 2013. To attract students, the university provided funding to cover the travel and accommodation costs. The IELM led the efforts by providing all the logistics.

On the CAA side, the instructors also came from two different colleges: Prof. Wang Yun and Prof. Liu Zheng from the School of Design and Prof. Jing Tian, Prof. Fan Li, and Prof. Zheng Bo from the School of Inter-media Arts. As a result, the course had a diverse pool of 11 instructors from very different backgrounds. The course description was as follows:

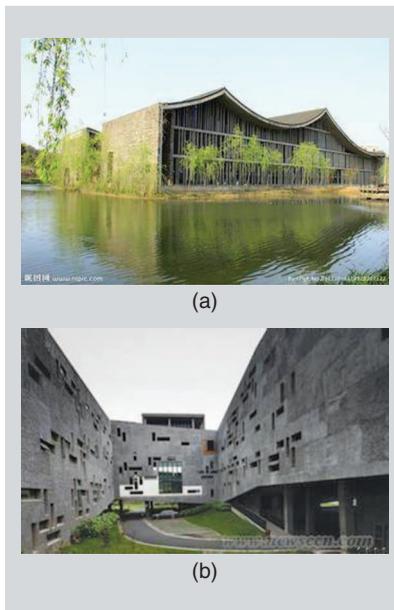
This course is aimed at providing the foundations of designing a successful product.



**FIG1** The HKUST campus.

Students will learn how to think like a designer and resolve constraints arising from technical, aesthetic, human factors and business concerns through hands-on exercises, presentations and case studies. This course offers a student an opportunity to work in a multi-disciplinary team comprising designers and engineers to design and develop a real product or media.

We released advertisements for the course in March at HKUST, and the response from students was very enthusiastic. There were more than 60 students applying for the course, and we conducted interviews to choose the 20 who were accepted. During the interview, students were asked about their background, motivations, and past projects. Some students even brought in their design portfolios.



**FIG2** The CAA campus. (a) and (b) show lecture halls that feature very different styles.

The students who were selected came from five different majors: civil and environmental engineering, computer science and engineering, electronic and computer engineering, industrial engineering and logistics management, and business administration (BBA). They were all either sophomore students or year-one Ph.D. students. From CAA, the students came from four different majors: industrial design, fashion design, integrated design, and inter-media arts. The course was unprecedented in both universities with 11 instructors from four different departments and 40 students from nine different majors. The instructors were very impressed by the quality of the students and their passion for the course.

### Let's get to work

The curriculum was quite challenging to design. After multiple rounds of discussion among 11 instructors, we came to the conclusion that the first two weeks would be mainly lectures and the last two weeks would consist of time for team projects. Finally, we came up with the following lectures, which cover a broad range of topics and expose students to many engineering and art concepts in modern design:

- Social innovation (CAA-Media)
- Principles of design: What design means for each discipline
- Techniques for idea generation
- Semantic design
- User-centric design
- How to design toys
- Basic prototyping
- Data capture, mining, and visualization
- Design for children
- Hands-on prototyping
- Processing, Arduino
- Media interface



**FIG3** The opening ceremony of the course.



**FIG4** A speed-dating-style activity allows CAA and HKUST students to get to know one another.



**FIG6** A CAA student teaches an HKUST student how to sketch.

- Three-dimensional (3-D) printing
- 3-D modeling and rendering.

We also decided that each course project team would consist of two students from HKUST and two students from CAA. The students could suggest and develop their own projects. The course attracted the attention of DJI, a Chinese technology company which manufactures commercial and recreational unmanned aerial vehicles (UAVs). It offered to

organize a competition for designing new models of UAVs for their company and award cash prizes and UAV products for the top three winners.

The students from HKUST arrived at the CAA campus in Xiangshan on 2 June 2013. The opening ceremony (Fig. 3) was in a fancy design studio and was attended by Jianping Song, the vice president of CAA, and Fugee Tsueng, the department head of IELM at HKUST.

Along with lectures, we arranged a wide range of activities for students. As students came from diverse backgrounds and did not know each other, we provided multiple icebreaking activities for them to form teams voluntarily. A speed-dating-style activity (Fig. 4) took place where each CAA student would have an opportunity to talk to each HKUST student for 3 min. After 1 h, they all had some basic information about the students from the other university.

We then asked students to write down the skills they have and the potential projects they want to do. These pieces of paper acted as name cards as the students proceeded to walk around to talk to one another with them pinned to their clothes (Fig. 5).

We then asked each CAA student to teach an HKUST student how to sketch (Fig. 6). After these activities, the students knew each other pretty well and most of them successfully formed project teams. Some of them were attracted by similar project interests, while others simply liked each other but had no idea on what project they were going to work. For the remaining students, the instructors assigned them into different teams.

After the students formed their project teams, with each team including students from both CAA and HKUST, the instructors and students worked together on project topics. We used a bottom-up approach where the students began brainstorming to suggest different topics, and then presented their ideas to the instructors and other students (Figs. 7 and 8).



**FIG5** Students walk around to find team members.



**FIG7** A student presents his project idea in front of the course instructors.



**FIG8** A project team presents their idea in front of other students and course instructors.



**FIG9** Group photo with Provost Wei Shyy after the project exhibition at HKUST.

Some project teams quickly came up with an interesting topic and started to work on development, while other teams struggled with project ideas. One reason for this was the course had 11 instructors, and it was hard to reach a general consensus regarding each team's finalized topic. Students were sometimes confused by different opinions given by different instructors. All course instructors wanted each project to have both a strong engineering flavor and prominent artistic flair. However, the industrial design instructors and inter-media art instructors often disagreed on whether practicality should be a deciding factor in project design.

Another problem we encountered was how the students did not take

feasibility of the project into account, despite the demanding deadline of having only ten days to complete the project. Some students preferred their own flawed ideas over the more feasible ideas from instructors. Eventually, we resolved these disagreements by simply letting students choose and plan projects that really excited them. After all, their ideas are a product of their own creativity, and creativity is what we strive to promote through this course.

### Course projects and exhibition

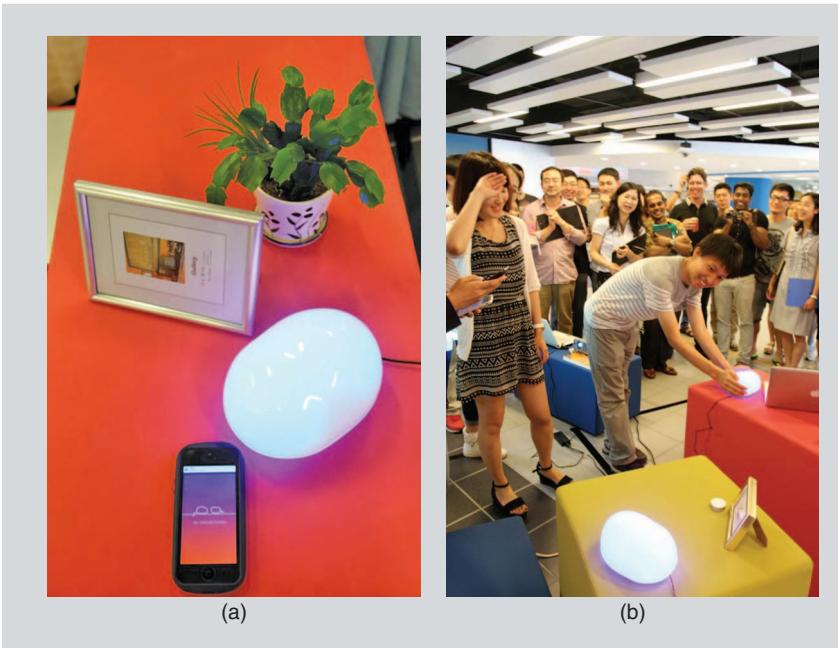
The last two weeks of the course was at HKUST. During this time, students had a very limited amount of time to transform their ideas into either a real product or a media piece.

We arranged a one-day exhibition for all the project teams. Each team was assigned a space and it was their job to decide on how to best showcase their final pieces. We asked each team to display a poster and provide a short presentation and a live demonstration during the course of the exhibition day. Together, the instructors graded each team separately and agreed upon final grades through a series of group meetings.

The exhibition was attended by Wei Shyy (Fig. 9), provost of HKUST, and industrial partners. The projects were highly creative and could not have been completed without teamwork and the collaboration of different skills provided by HKUST and CAA students. As a result of these varying skills, the event was very successful.

We believe that the "technology meets art" concept was fulfilled through this course by the completion of fascinating end products. The following two projects are examples that show what students achieved in this course and how "technology meets art" is a concept with significant future potential.

The first project, "Mr. and Ms. Potato" (Fig. 10), was produced by a team that consisted of one HKUST student from the Electrical and Computer Engineering (ECE) Department, one HKUST student from the IELM Department, and two CAA students from the Industrial Design School. This product was designed for those people who are in a relationship but live in different locations, with each person having a "potato" that can connect to some social media account of the other person. It looked transparent with light-emitting diode light built in the core. The color of the light was controlled by a mobile phone, which was connected to some social media platform (like Facebook or Twitter) of the other person. For example, if a person feels depressed, the light of the "potato" becomes blue. If you want to cheer up your partner, you can touch the potato and the light will then turn pink. The structural and visual designs were completed by the CAA



**FIG10** "Mr. and Ms. Potato." (a) A "potato" that can be controlled by a mobile phone. (b) The students demonstrated the project in front of instructors and classmates.

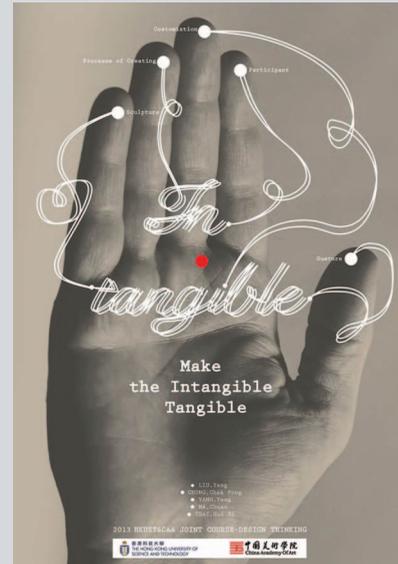
students, the pressure sensor and its coding was done by the IELM student, and the mobile phone linking system was accomplished by the ECE student. This proved to be a truly multidisciplinary project.

Another project was “Make the Intangible Tangible” (Fig. 11). The basic idea was to make the movement of hands tangible and to use it for designing consumer products such as lamps. The project team consisted of one HKUST student from CSE, one HKUST student from mathematics, and two CAA students from the inter-media arts. The Microsoft Kinect was used to capture the gesture and trajectory of human hands, and a software system was developed to show the curves of the hand and its movements. Users could customize the curves to make them more beautiful and personal. After that, the design of the curves were sent to a 3-D printer and a tangible 3-D curve was produced. The printed real 3-D curve was then turned into a lamp. The project idea came from the CAA student but the coding was done by the HKUST students. Once again, this was a multidisciplinary project, and we began to see how these multidisciplinary projects really acquire the skills and the collaboration between students with engineering backgrounds and those with art backgrounds. Both of these projects proved to be the start of very interesting ideas that involve elements of artistic creativity and technological finesse, which, we believe, could lead to future research and development.

### Feedback and future development

This course was an eye-opening experience for the instructors. However, more importantly, it received some very positive feedback from the students. One student wrote,

Design thinking is a course that provides a platform for students from different backgrounds to work together. The project we have done was more successful than we had imagined before taking the course. All the students enjoyed the memorable and fruit-



(a)



(b)



(c)

**FIG11** “Make the intangible tangible.” (a) The poster of the project, (b) a tangible 3-D curve produced by 3-D printing, and (c) the setting of the demonstration.

ful moments in the course. By accomplishing the project together with the classmates, I took a chance on collaborating with students having mixed background, experienced the collisions between technology and art, and learned lessons about how to build an efficient team.

The course was offered a second time in June 2014 and it was also very successful. These projects have been showcased in high-profile exhibitions in Hangzhou. This is the only the beginning and, with the success of this course, both sides want to continue

deepening their collaboration through exploring the possibility of establishing a dual-degree postgraduate program.

### About the author

**Huamin Gu** (huamin@cse.ust.hk) earned a B.S. degree in mathematics from Xi’an Jiaotong University, China, and M.S. and Ph.D. degrees in computer science from Stony Brook University. He is a professor and postgraduate programs coordinator in the Department of Computer Science and Engineering at the Hong Kong University of Science and Technology. **P**