

# Marking Learning Happen: Experiential Learning Courses at HKUST

From Robotics, Community Projects to  
experiential learning platform

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# Co-curricular and Co-curriculum Development @HKUST

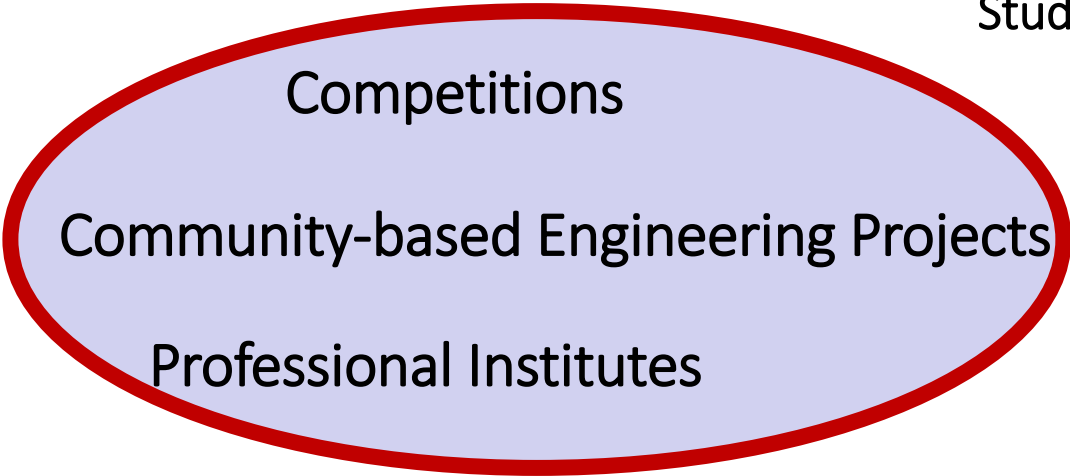


HKUST Connect

Clans @SENG

Internship

Living Learning Communities Program



Student Societies

UROP

Hall Life

Exchange Program

# Today, we share the experience on the experiential learning on .....

Non-credit bearing



HKUST Robotics Team

Community-based Engineering Projects

Credit bearing

HKUST Robotics Team  
X  
Community-based Engineering Projects  
X  
other units in HKUST

# Engineering Education

- Technical Competence and professional skills
  - Collaborative Problem Solving

Team work

Multi-culture

Multidisciplinary

Communication

Leadership

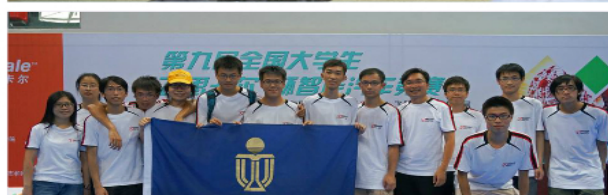
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# Robotics Team @ HKUST

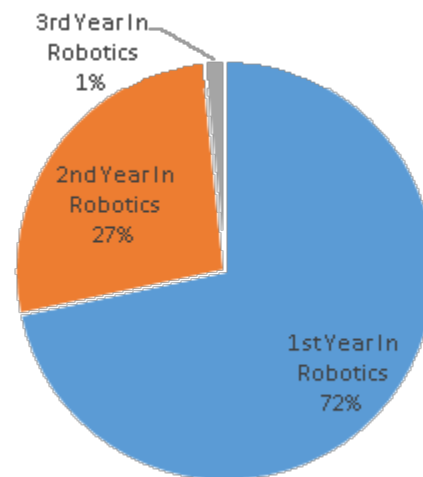
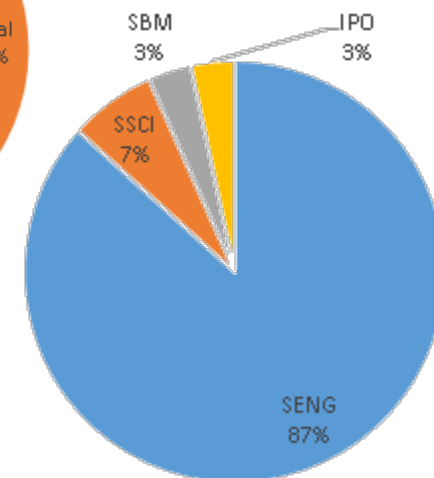
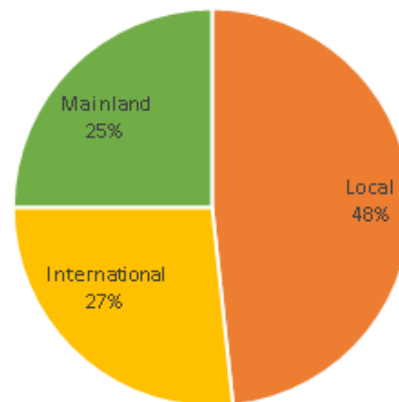
10-year history with several Robot competitions:  
Robocon, ROV & Smart Car



Robot Design Contest at Atrium



# About the Robotics team



# How does the experiential learning platform look like?

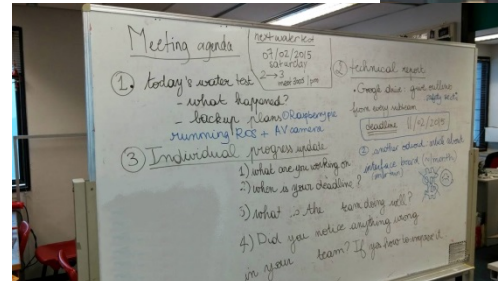
- Fall Semester: Non-credit bearing
  - Driven by the senior members (peer mentors)
  - Supervisor and support staff provide the guidance and facilities booking.

## [HKUST Robot Design Contest 2014 Footage](#)

From recruitment to an internal competition at Atrium

# How does the experiential learning platform look like?

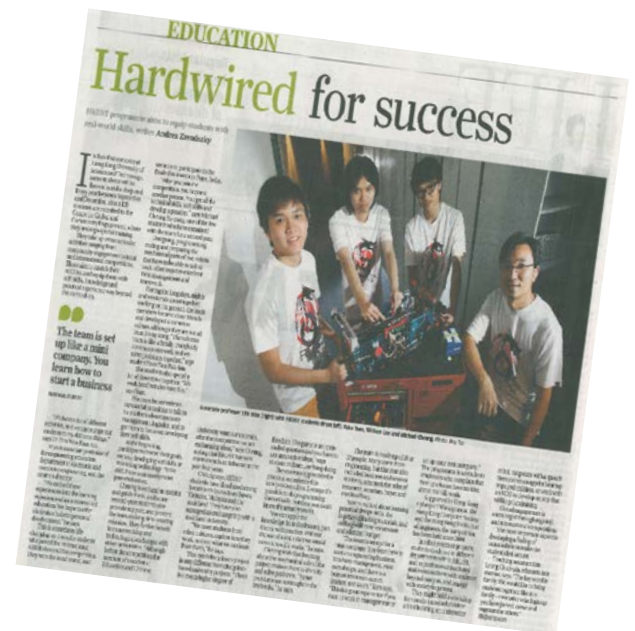
- Winter Semester: Non-credit bearing



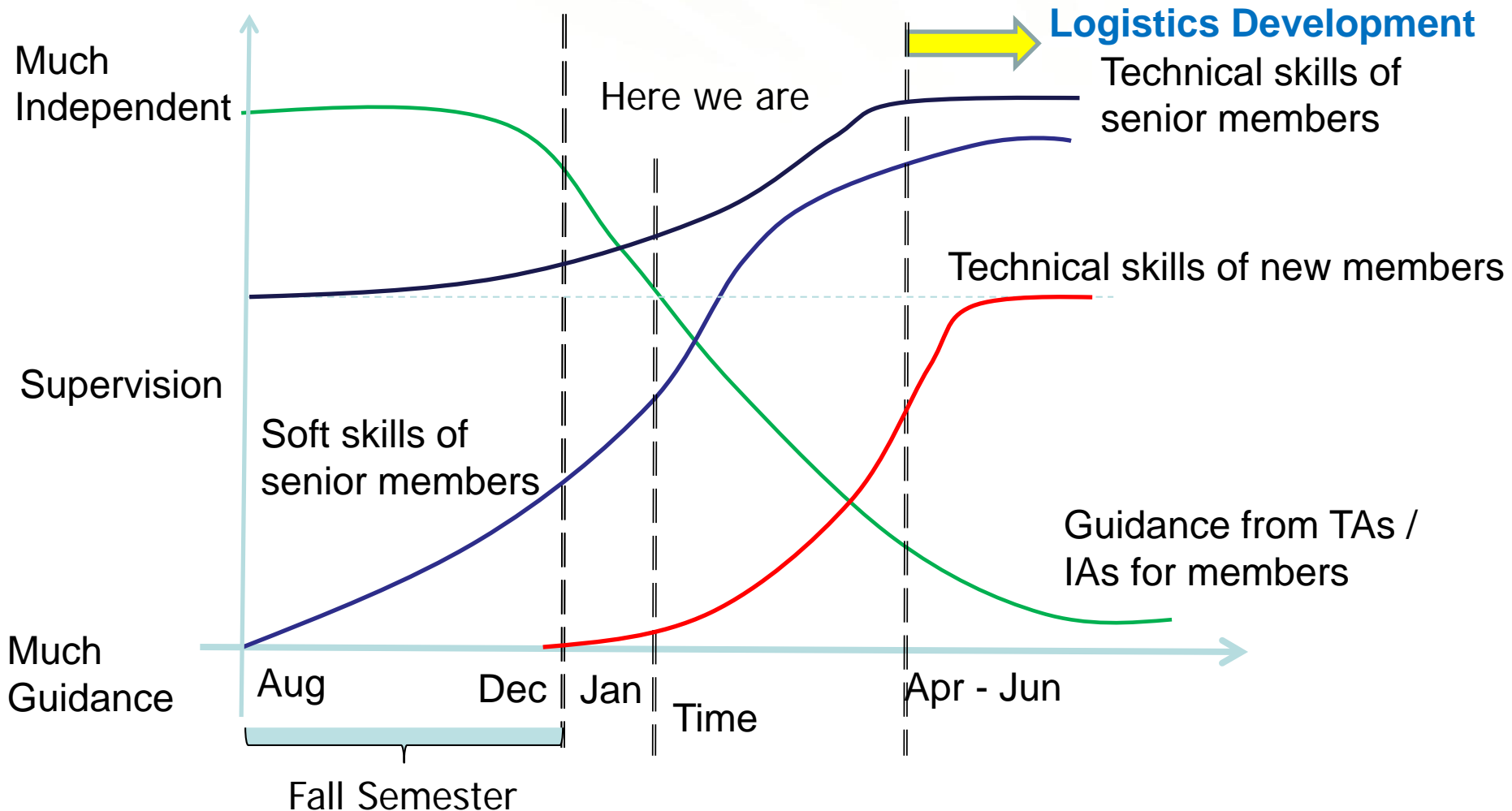


# How does the experiential learning platform look like?

- Spring and Summer Semesters: 4-Credit bearing in total
- We aim to equip student with real-world skills as a company with structure:
  - Leader, Vice Leader, Treasurer, Secretary, Tool Manager, Procurement Officer, Media Officer
  - Technical sub-groups
  - Soft-skills



# How do the students learn from the team?



# How to facilitate and measure their learning impact?

- 4 peer evaluations with Rubrics from Jan to Aug
  - Goal setting and reflection report
  - Final report
  - TA evaluation
  - Supervisors evaluation
- 
- In this course structure, this helps us in evaluating the technical competence and professional skills of students.

# Beyond credit-bearing course,

## Robotics Competitions



Presentation competitions

- Technical
- Business
- Entrepreneur



Capstone Design Projects

- Final Year Projects
- Hobbies / Makers
- Research projects



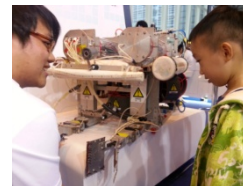
Teaching and learning

- Junior Mentoring scheme
- Robotics x Community



Reaching out

- Friendship exchange programs
- Public exhibition



# Service learning and engineering

“An understanding of professional and ethical responsibility”



**Future engineers**

“The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context”

# Community Engagement Engineering-based Community Projects

Rehab tools



Braille Printer



Apps for Hearing Impaired children



## 助心光生首出戰 初嘗亞軍 科大四度贏水底機械人賽

水底機械人製作講求視覺、觸覺組裝，可謂視障生不可能完成的任務。心光學校十二名視障生卻將不可能變成可能，在科技大學協助下，首戰「IET/MATE香港水底機械人挑戰賽」，利用魚缸水泵抽水推箭的物理學原理，毋須安裝擊打的機械人，勇奪初級組亞軍及特別嘉許獎；參加同一賽事專組的科大則四度奪冠，自行研發推進器，且部分機械臂藏於機械人內，令體積縮細一半，更有利按賽事要求搜索沉船。

科大去年十一月到心光學校舉行科學講座，集中展示水底機械人製作，激發視障學生對科學的興趣。十二名小學至中三年級在科大協助下，利用電腦、斷面水箱的厚度及魚缸水泵等器材製作機械人。以具專精IET/MATE香港水底機械人挑戰賽，在水底挑戰物件，最終兩隊參賽學生在初級組勇奪亞軍及特別嘉許獎。

視障學生的失明程度不一，部分學生僅能視物，部分則完全失明。在科技大學協助下，視障學生利用電腦、斷面水箱的厚度及魚缸水泵等器材製作機械人。以具專精IET/MATE香港水底機械人挑戰賽，在水底挑戰物件，最終兩隊參賽學生在初級組勇奪亞軍及特別嘉許獎。

科大在另一賽事專組中亦不遑多讓，十四名參賽學生在「IET/MATE香港水底機械人挑戰賽」中勇奪初級組亞軍及特別嘉許獎。科大在另一賽事專組中亦不遑多讓，十四名參賽學生在「IET/MATE香港水底機械人挑戰賽」中勇奪初級組亞軍及特別嘉許獎。



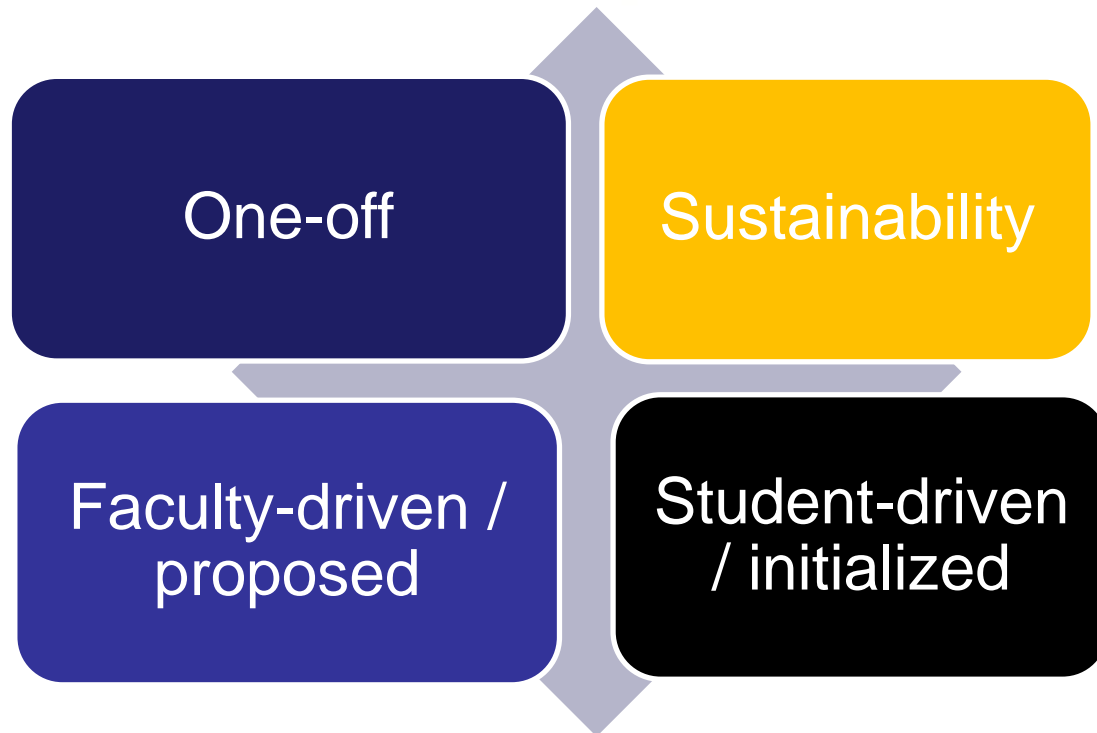
無國界醫生 MSF for Android  
<http://www.msf.org.hk/android>

「安視儀」(MyEyezP)



# Engineering-based community projects

- Challenges

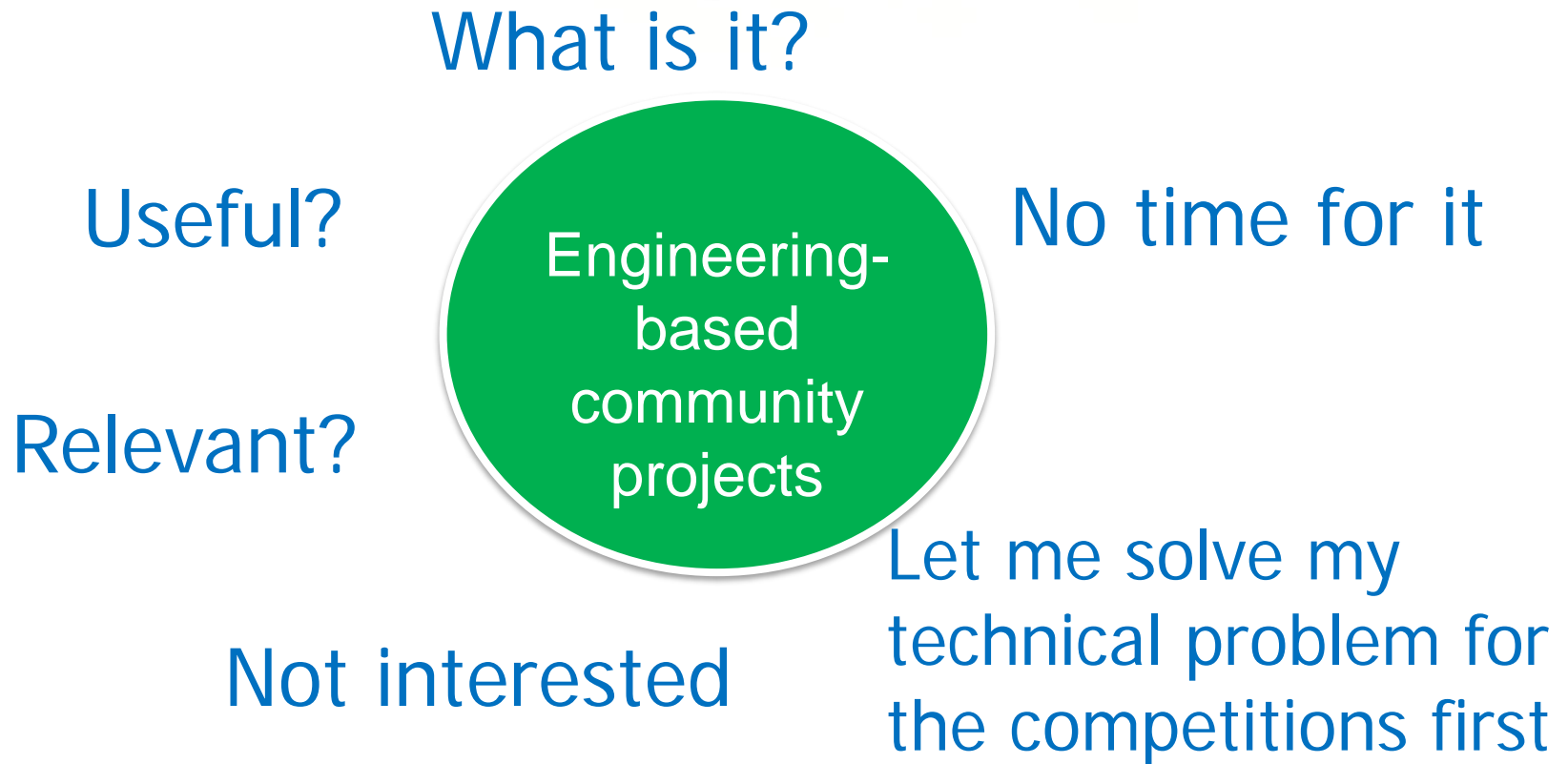


# Service learning and engineering

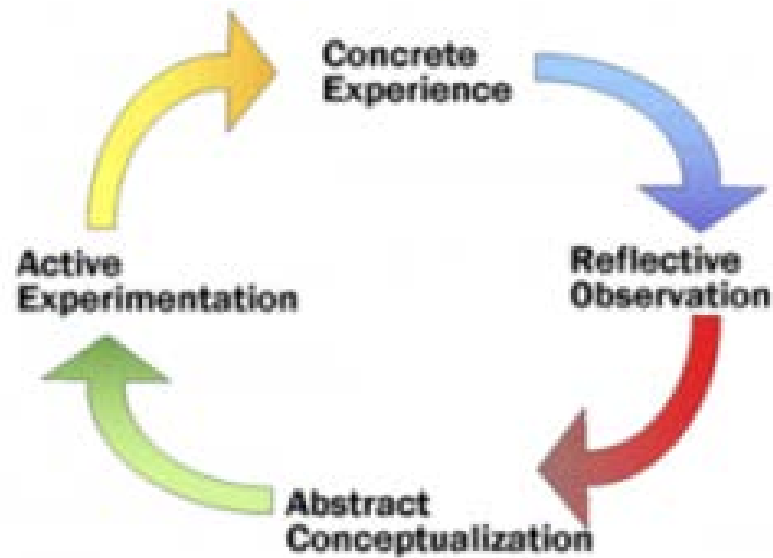
- Mentality of many engineering students
  - Technical oriented problem-solvers (Lucena & Schneider, 2008)
  - A technical sense of professional identity (Huff, Zoltowski, Oakes, & Jesiek, 2013)



# Similar mentalities were found in the Robotics Team



# How to facilitate student learning?



the Kolb's learning cycle

# After the projects

## After the projects

“I used to think that designing robots **was just for fun** and for the competitions. Now I can see that engineering was not only (for) boosting machine performance but could also really **make a difference** in society...”

- from a student who have participated in the projects

## After the projects

“I enjoy doing something that we like. It is where **our passion lies**. Working with a bunch of kids who share the same interest in robotics design is quite fun.”

- from a focus group with students who have participated in the project

## After the projects

- “One or two workshops cannot do much to the community. Something in a **long-term** will be needed. GCE can foster interest in learning robotics design in the community.”
- “If time allows, I will be willing to **take more responsibilities in designing materials and organizing workshops**. It will be **more fun**.”
  - from a focus group with students who have participated in the projects

# A new perspective was found among some students

Engineers can  
really make a  
difference.

A long-term plan  
to foster the  
learning of  
engineering in  
the community

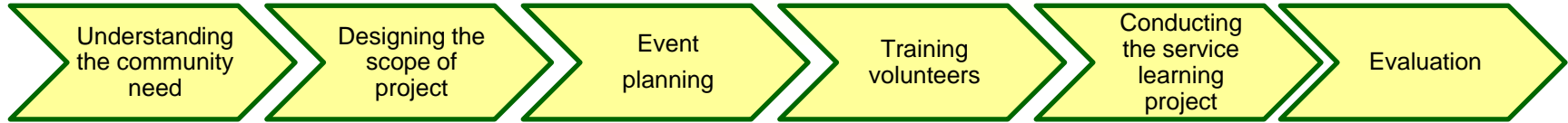


Working with  
others who share  
the same interests

Willing to take more  
responsibilities

# The engineering-based community projects

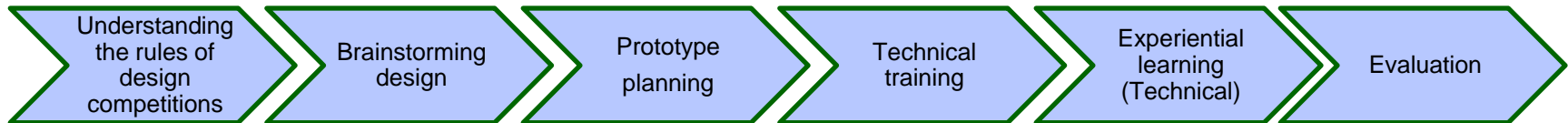
## Service Learning Projects



## Engineering-based Service Learning Projects



## Engineering Design Projects





# The service learning projects



~50 workshops (~1000 children and teenagers) in InnoCarnival 2013 & 2014



Co-organized with IET HK on underwater robotics workshops (~150 teenagers and their teachers) from Nov 2014 to Jan 2015



Seminar and workshop on underwater robotics to ~30 visual impaired children in Jan-Mar 2014.



助心光生首出戰 初嘗亞軍  
**科大四度贏水底機械人賽**

水底機械人製作講求視覺、觸覺回饋，可讓視障生不可能完成的任務，水心光學校十二名視障學生卻將不可能變成可能，在科技大學協助下，首戰「IET/MATE香港水底機械人挑戰賽」，利用奧缸水壓推力的物理學原理，毋須安裝發射的機械人，勇奪初級組亞軍及特別嘉許獎；參加同一賽事大專組的科大則四度奪冠，自行研發產機器，且部分機械藏於機械人內，令體積縮短一半，更有利按賽事要求搜索沉船。

記者 李紹欣

科大學生十一月到心光學校舉行科學講座，當中被水底機械人吸引，希望從視障學生探討科學的興趣。十二名小至中三生早前在科大協助下，利用講堂學習，與深水庫約浮球及射水筆等日常材料製作機械人，即可自製「IET/MATE」香港水底機械人挑戰賽；在水底挑戰物件，越深則得分越多學生在初級組勇奪亞軍及特別嘉許獎。

科大的另一重要大專組中心不設多課，十四名參與學生來自香港、德國及意大利等地，最終獲勝。要獲勝，要機師「聽」住聲音表現，還有有專項冠軍。七月是該代表香港應邀來美，與四十四名國際水底機械人比賽。

**聽話所有專項冠軍**  
由於比賽要求接收沉船，依國際機械人，個人組別，隊員負責接收沉船，今年自行研發機器。

科大的水底機械人挑戰賽四度奪冠，更幫助心光學校的視障生出關一比賽，勇奪亞軍。

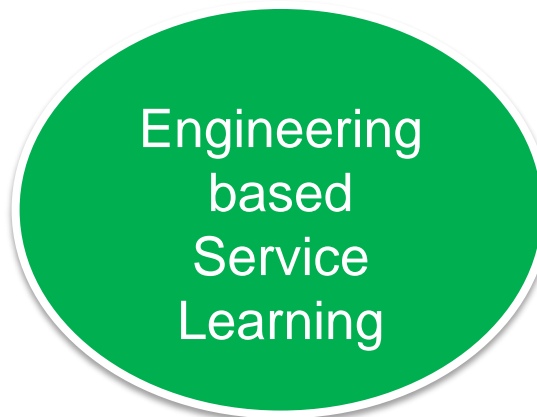
等隊成員，是將大多機械零件藏於機械人內，令機械人重量一半至三分之二，長約六十厘米，重量三十公斤，成本亦要一半至幾萬元，「以低體積卻有大炮」！更特別的是，因為視障，自己研發機械人比多電子專業高，一隊成員機械人本身已在二十米水深的地方試水，有信心應付只有五米水深的國際賽人工地。

We mentored the visual impaired children and they won the 1st-Runner Up in Scout Class in the competition.

# The engineering-based community projects

Rethink the appropriate engineering knowledge

Engage non-technical people



Motivate more fellows to join new projects

Much understanding in social responsibilities

# The impact to Robotics team members...

## New initiatives

Service learning projects

Engineering knowledge

Community needs

Rethink

HKUST Underwater Robot Mentoring Scheme for high-school students 2015

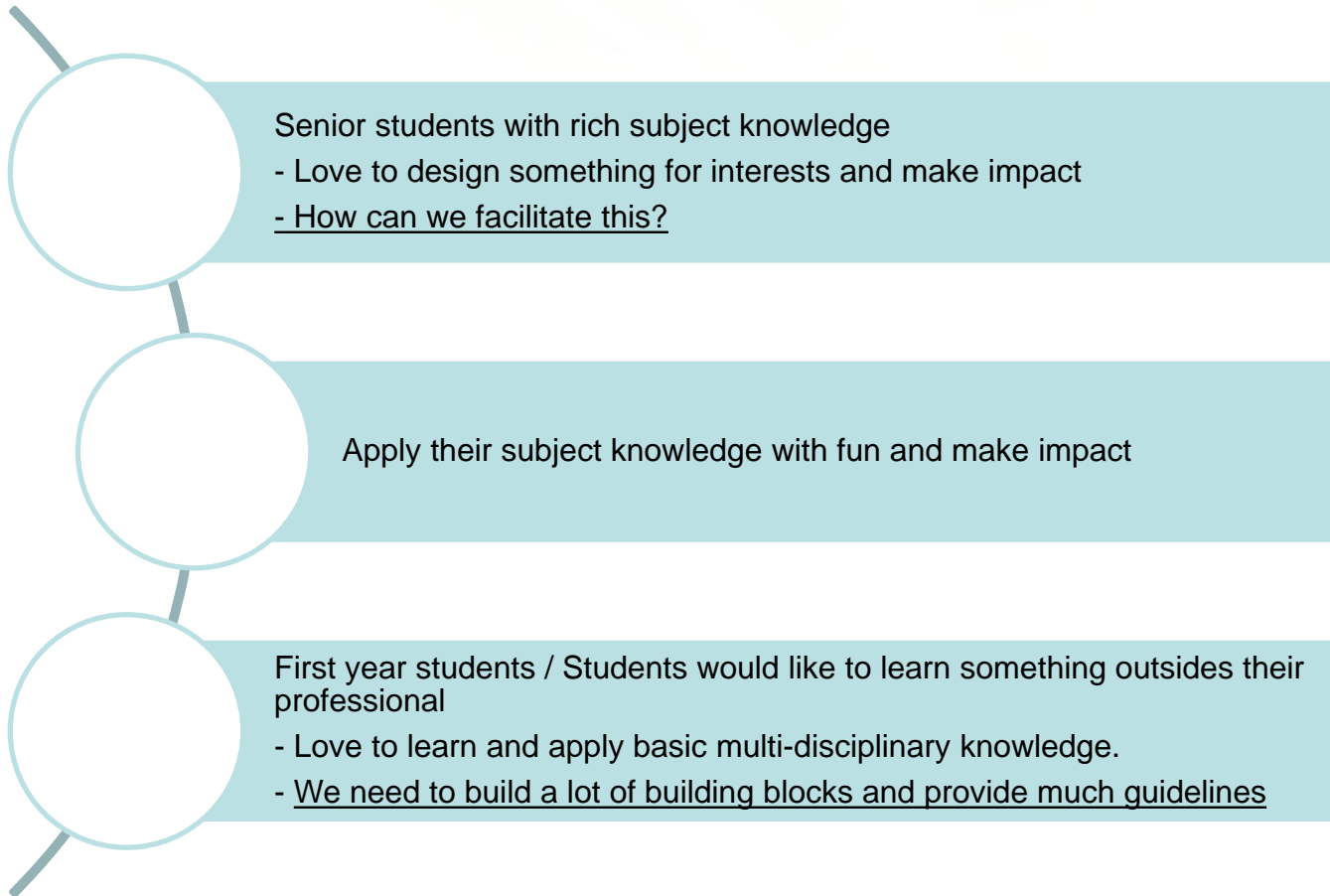
Underwater Robot Community Engagement Projects 2015

Air-ship design project for High-school Summer Camp 2013

Regular Credit-bearing air-ship design course for UG students 2014



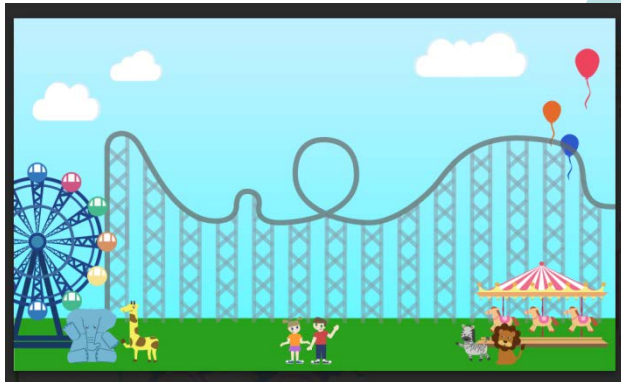
# From these cross-over experience, we find similar observation in community projects



# New initiated Experiential Learning: App Design Project in Spring 2015

## Course ENGG2900C Community Services Project

~ 13 engineering students (enroll)  
~ 5 business students (volunteers)



2 ECE faculty, 1 CSE faculty



香港聾人福利促進會  
THE HONG KONG SOCIETY  
FOR THE DEAF



Office of the Government Chief Information Officer  
The Government of the Hong Kong Special Administrative Region

Speech Recognition Algorithm

Server / Mobile Data Transfer

Database / Speech Record

Research Work

Research students

Apps developers for system and design

Senior Engineering students

UI design

Apps developers for voice recording

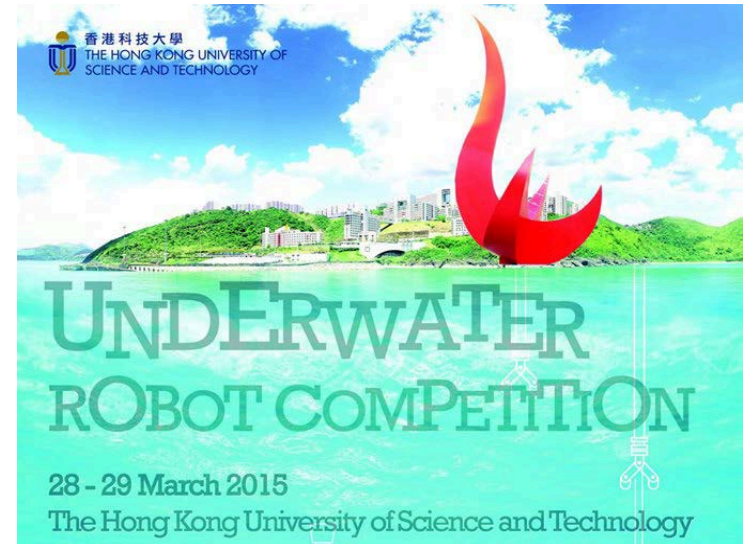
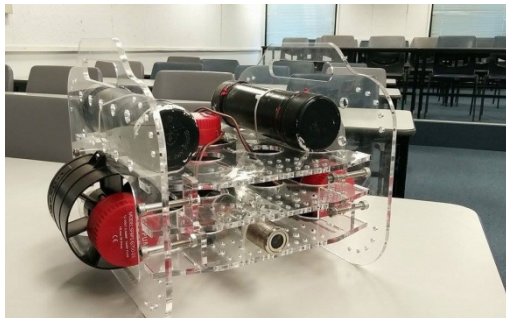
Junior Engineering students

Speech collection

Non-Engineering students

# New initiated Experiential learning: Community Engagement Project in Spring 2015

- Course: ENGG 2900D Community Services Project
  - Co-listed courses with SBM, SSCI, and a faculty from SHSS
- Working groups: ~27 UST students,
- Served groups: 6 special need groups, 12 groups from ordinary schools



- ~ 13 engineering students
- ~ 9 business students
- ~ 5 science students

# Community Engagement Engineering Community Projects

One of our goals:

Link a bridge between students, faculty and the community. The students can tackle the challenges by applying their subject knowledge

Strong liaison with



Faculty and students

In mid-March (11 March), we plan to organize a seminar / briefing session for you in understanding their challenges.



They have their challenges and wish needs.

You are welcome to offer any Community Based FYPs / experiential learning projects in addressing their needs.

# Upcoming event: Engineering Engagement Exhibition on mid-late Apr 2015 (Engineering Common)

- Introduce GCE
  - Design Competitions,
  - Community Based Engineering Projects
  - Display boards for Student Chapters
  - Shanghai study tour



Photo taken in early Oct 2014



Photo taken in early Oct 2014



# Innovation is everywhere in School

INITIATE **Innovation**  
To  
POWERFUL  
**Collaboration**



# Visit us and learn more

<https://www.facebook.com/HKUST.SENG.GCE>



<https://www.facebook.com/ustrobotics>



Thank you

Q & A

New initiative:  
Undergraduate Innovation Laboratory (UIL)

Objective:

A new open environment to cultivate UG students' creativity and innovation across all disciplines at HKUST.

Initiated by 3 units:

- Student Innovation for Global Health Technology (SIGHT)
- Global & Community Engagement (GCE), and
- International Genetically Engineered Machine (iGEM),



# Appendix - Responses of the workshop participants (N=34)

Statement	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
1) This underwater robot workshop was fun.	0	0	5.9	58.8	35.3
2) I have learned some engineering skills from the workshop.	0	0	2.9	52.9	44.1
3) I have learned teamwork skills from the workshop.	0	0	23.5	47.1	29.4
4) I have learned about what engineering is during the workshop.	0	2.9	5.9	61.8	29.4
5) The workshop increased or confirmed my interest in studying engineering.	0	0	17.6	55.9	26.5
6) I have enjoyed learning from/ with students from HKUST.	0	0	8.8	55.9	35.3
7) I would recommend the workshop to others in my school.	0	0	29.4	29.4	41.2
8) I believe that engineering is fun.	0	0	0	52.9	47.1