ABOUT DESIGN THINKING TEACHING AND LEARNING PACKAGE (TLP)

This package is designed as a structured guide for teachers to deliver the Design Thinking lesson aiming to achieve the following intended learning outcomes (ILOs):

1. Describe the concepts and process of Design Thinking
2. Explain the three core essentials and application of five steps process

It contains comprehensive, practical and updated materials which serve the following purposes:

- **Lesson plan**: It aims to provide the teacher with a guide for running the lesson of Design Thinking. It is a detailed description of the course of instruction for the lesson. Apart from introducing the central core or concept of the lesson, it also describes how to stimulate and maintain the students’ interest in learning what you plan on teaching.
- **Teaching and learning materials**: Presentation PowerPoint and printable worksheets are designed and selected to facilitate students’ learning towards the ILOs. However, teachers should have to exercise professional judgment when using these materials accordingly.
- **Teaching instructions**: This section presents the teaching methods that the teacher should take to achieve the learning outcomes for the lesson.
- **Learning Cases**: Cases are included as Appendices to demonstrate how Design Thinking could be used to lead student projects in different disciplines.
- **Conceptualisation of Design Thinking**: This section provides teacher with a glossary of the important definitions of Design Thinking concepts.
- **TLP Creation/Revision**: The TLP should be regularly reviewed by teachers of this lesson. Students’ feedback should be taken into consideration when reviewing the TLP.

All materials included in the TLP should comply with the VTC policy and guidelines on copyright and intellectual property.
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1 LESSON PLAN
## Lesson Plan of Design Thinking (DT) Implementation for VTC Higher Diploma Programme

Prepared by Edwin WONG and Ken CHEUNG, Hong Kong Design Institute

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<tr>
<th>Time (Duration)</th>
<th>Section / Topic</th>
<th>Contents</th>
<th>PPT page</th>
<th>Learning and Teaching Activities</th>
<th>Remarks/Notes Materials/Worksheets</th>
<th>Learning and Teaching Objectives</th>
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</thead>
</table>
| 10 mins.        | Section 1 / Opening | Welcome students and briefing of workshop topic and intended learning outcomes | 1-2 | Introduction and forming groups  
- Self-introduction  
- Form 5 groups containing students from different disciplines | Teacher may refer to the Preparation and Arrangement Checklist for the preparation (refer to p. 69) | Inform students about the aims and intended learning outcomes of the lesson  
By forming groups containing students from different disciplines could encourage groups to generate diversified ideas during the Design Thinking process |
| 20 mins.        | Section 2 / Presentation of concepts and process of Design Thinking (DT) | Principles 1-3-5 | 3-18 | Lecture  
- Teacher explains the benefits of DT, the T-shaped team, 3 core essentials and 5 steps process | Equip students with the basic concepts of Design Thinking |
| 5 mins.         | Section 3 / Formative Assessment (FA1) | Assessment of concepts and process of Design Thinking | 19 | Questioning  
Teacher randomly selects students to answer the following questions:  
- What is the meaning of T-shaped team?  
- What are the three core essentials? | Assess students’ understanding of the core principles of Design Thinking |

### Intended Learning Outcomes
1. Describe the concepts and process of Design Thinking
2. Explain the three core essentials and application of five steps process

### Topic
Design Thinking Concepts and Process Workshop

### Duration
3 Hours
<table>
<thead>
<tr>
<th>Time (Duration)</th>
<th>Section / Topic</th>
<th>Contents</th>
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</table>
| 10 mins.       | Section 4 / Formative Assessment (FA2) | Assessment of concepts and process of Design Thinking | 20 | **Matching exercise: DT Topics and Definition**  
- Teacher distributes DT’s 5 steps topics and definitions to students  
- Students have to match the names of DT 5 steps topics with the correct definitions  
- Teacher checks students’ answer and presents the key | 5 sets of Design Thinking Topics and Definition Worksheets (refers to p.71)  
- Key for the matching exercise | Assess students’ understanding on the core principles of Design Thinking |
| 20 mins.       | Section 5 / Empathy | Explanation of ‘Empathy’ | 21-25 | **Lecture (5 mins)**  
- Teacher explains Empathy definition and its tools (Observation and immersion)  
**Group discussions (12 mins)**  
- Teacher shows a video about ‘a visually impaired student is going to purchase a drink from a vending machine in campus’  
- Teacher asks each group to discuss and list 3 challenges for a visually impaired student that will encounter in the scenario (7 mins)  
- Teacher invites each group to present one challenge from the discussion (5 mins)  
**Debriefing (3 mins)**  
- Teacher categories the challenges from groups (3 mins) | A 2-min video clip on ‘Using the vending machine’  
- Each group is to be provided with an A3 paper and markers for writing the 3 challenges | Lecture could convey the basic concepts to students  
Group discussion could enable students to learn how to immerse in the situation and identify users’ needs, i.e. the ‘empathy’ of DT |
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>10 mins.</td>
<td>Section 6 / Define</td>
<td>Explanation of ‘Define’, brief on the problem statement</td>
<td>29-30</td>
<td><em>Lecture (5 mins)</em>&lt;br&gt;● Teacher explains Define definition and its tool (Categories of concern)&lt;br&gt;&lt;br&gt;<em>Problem statement exercise (5 mins)</em>&lt;br&gt;● Teacher asks students in groups to come up with a problem statement for the scenario ‘a visually impaired student is going to purchase a drink from a vending machine in campus’ during the break.</td>
<td>• Lecture could convey the basic concepts to students&lt;br&gt;• Problem statement exercise could enable students to have a deeper understanding in defining a problem, and learn how to derive a problem statement based on the identified users’ needs from observation and immersion</td>
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<tr>
<td>10 mins.</td>
<td>Break</td>
<td></td>
<td>32</td>
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<tr>
<td>5 mins.</td>
<td>Section 7 / Define</td>
<td>Answer of the problem statement</td>
<td>33</td>
<td><em>Debriefing</em>&lt;br&gt;● Teacher asks groups to voice out their problem statement&lt;br&gt;● Teacher then suggests a problem statement ‘Create a vending service experience for the visually impaired concerning machine functions, locations, and related facilities’ with brief explanation</td>
<td>• By means of debriefing, students could clearly understand how to reframe a problem</td>
<td></td>
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<tr>
<td>20 mins.</td>
<td>Section 8 / Ideate</td>
<td>Explanation of ‘ideate’</td>
<td>34-38</td>
<td><em>Lecture (5 mins)</em>&lt;br&gt;● Teacher explains Ideate definition and its tool (Mindmap)&lt;br&gt;&lt;br&gt;<em>Mind map activity (10 mins)</em>&lt;br&gt;● Teacher provides each group of students with a mind map worksheet</td>
<td>• 5 mindmap worksheets – one for each group (refers to p. 73 &amp; 74)&lt;br&gt;• Lecture could convey the basic concepts to students&lt;br&gt;• Mind map activity enables students to experience the ideate process and explore ideas</td>
<td></td>
</tr>
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<td>Time (Duration)</td>
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|                 |                 |         | 40       | • Based on the same scenario, asks each group to list out ideas for the vending service experience under the categories of ‘Machine Functions’, ‘Locations’ and ‘Related Facilities’  
• Briefs the 3 rules for the mindmap activity: ‘suspend judgement’, ‘free wheel’ and ‘quantity’  
• Asks each group to present their mindmap and explains their ideas  

Debriefing (5 mins)  
• Teacher provides ideas of mindmap  
1. Machine functions  
(a) Voice control, (b) Tactile signage, (c) Method of payment, (d) Ergonomics design  
2. Locations  
(a) Access free location, (b) Safety concerns, e.g. no stairs, no slope, no obstruction, (c) Less crowded, e.g. less traffic and (d) Away from sports ground.  
3. Related facilities  
(a) Floor guidance tracks, (b) Sound-signal device, (c) Tactile signage and map, (d) Facilities briefing.  

• Debriefing helps students summarise and build on what they have learned and move on to enquiring about new issues |
<table>
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</tr>
</thead>
</table>
| 10 mins.        | Section 9 / Prototype and Test | Explanation of ‘Prototype’ and ‘Test’ | 41-48 | Lecture (5 mins)  
- Teacher explains Prototype and Test definitions and their tools (Paper Prototype and User Feedback)  
Video (5 mins)  
- Teacher shows a video clip to explain how to do a test by a paper prototype (5 mins) |  
- A 5-min video clip on ‘Paper Prototype’ |  
- Lecture equips students with the basic concept  
- Video clip could further enhances students’ understanding by illustrating the process with an authentic case of prototyping and testing |
| 40 mins.        | Section 10 / Formative Assessment (FA3) | Reflect on the use of DT concepts and process; and their application in projects | 50-51 | Case study – video (10 mins)  
- Teacher shows the video clip ‘MIT - All Terrain Wheelchair’ (10 mins) to conclude the 5-step process  
Case study – group discussion (15 mins)  
- Teacher assigns Groups A and B to discuss and work out the answers for the section of T-shaped team and 3 core essentials of Design Thinking in the Case  
- Teacher assigns Groups C, D, E to discuss and work out the answers for the section of 5 steps process of Design Thinking in the Case  
Case study – presentation (10 mins)  
- Teacher asks each group to present their ideas of the assigned topic |  
- A 10-min video clip on the Case Study ‘MIT - All Terrain Wheelchair’  
- 30 copies of ‘Case Study Worksheets’ for individual students in 5 groups (refers to p. 76 & 77) |  
- Case study and group discussion could provide students with an opportunity to reflect on the concepts as a whole and its possible usage in projects  
- Worksheet could assess students’ attainment of the intended learning outcomes of this lesson |
<table>
<thead>
<tr>
<th>Time (Duration)</th>
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<th>Learning and Teaching Objectives</th>
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</thead>
<tbody>
<tr>
<td>10 mins.</td>
<td>Section 11 / Formative Assessment (FA4)</td>
<td>A recap of main concepts of Design Thinking</td>
<td>53</td>
<td><strong>Debriefing (5 min)</strong>&lt;br&gt;● Teacher provides answers of the topic</td>
<td></td>
<td>It could help students review their final year project and plan future projects in applying the 5 steps process</td>
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<td><strong>Assessment Matrix Worksheet</strong>&lt;br&gt;● Teacher introduces Assessment Matrix Worksheet&lt;br&gt;● Asks students to check the 5 steps of DT Process used in the project&lt;br&gt;● Asks students to reflect on the project according to the score</td>
<td>30 copies of ‘Assessment Matrix Worksheets’ (refers to p. 79)</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td><strong>Debriefing (5 mins)</strong>&lt;br&gt;● Selects one/two students to share their results of assessment&lt;br&gt;● Discuss how DT Process could improve the project</td>
<td></td>
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<tr>
<td>5 mins.</td>
<td>Section 12 / Conclusion</td>
<td>A recap of main concepts of Design Thinking</td>
<td>55</td>
<td><strong>Wrap up</strong>&lt;br&gt;● Teacher gives a brief conclusion on the main concepts covered in the lesson</td>
<td></td>
<td>It could help students recap the concepts and process of Design Thinking introduced in the lesson</td>
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<tr>
<td>5 mins.</td>
<td>Section 13 / Questionnaire</td>
<td>Feedback from students</td>
<td></td>
<td><strong>Student Feedback</strong>&lt;br&gt;● Teacher distributes questionnaires to students to collect feedback on the lesson</td>
<td>30 questionnaires (refers to p. 80)</td>
<td>Students feedback are collected for lesson improvement and enrichment</td>
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</table>
2. TEACHING AND LEARNING MATERIALS
2.1 PRESENTATION POWERPOINT
Design Thinking

Concepts and Process

A user-centred, divergent thinking and prototype driven approach to innovation

Wallace Lam, Edwin Wong, Ken Cheung
Welcome!
Topic: Design Thinking Concepts and Process

Intended Learning Outcomes:
- **Describe** the concepts and process of Design Thinking
- **Explain** the three core essentials and application of five steps process
Why
Design Thinking?
Referring to d.school* (Institute of Design at Stanford), it transforms learning experiences from problem solving to innovation.

* "The d.school is a hub for innovators at Stanford. Students and faculty in engineering, medicine, business, law, the humanities, sciences, and education find their way here to take on the world’s messy problems together. Human values are at the heart of our collaborative approach. We focus on creating spectacularly transformative learning experiences." (d.school)

Source: http://dschool.stanford.edu/
Benefits to implement Design Thinking

✓ It inspires user-centred innovation.
✓ It provides a strategy to creative problem solving.
✓ It encourages collaboration.
✓ It ensures the outcomes meet users’ needs.
✓ It enables learner to engage with the community.
Project that can be implemented with Design Thinking

- For innovative project
- For problem-solving project
- For business and management plan
- For product and service development
- For marketing and promotion
- For teaching and learning planning
What is Design Thinking?
What is Design Thinking?

Design thinking empowers innovative project with outcomes of user-centred, practicability and sustainability.

Among all problem solving skills initiated by different professions and disciplines, Design Thinking is one of the approaches with essentials of interdisciplinary, divergent thinking and prototype driven to generate solutions to problems.

It engages with stakeholders’ participation from the beginning till the end of the innovation process in which a cyclical process of Empathy, Define, Ideate, Prototype and Test is emphasised.
Principles & Process
Principles 1 - 3 - 5
1 T-shaped Team

Networks

3 Essentials

User-centred
Practicability
Sustainability

5 Steps Process

Empathy
Define
Ideate
Prototype
Test
1 T-shaped Team
An old saying goes: “Two heads are better than one.”
3 Essentials
User-centred

The solution provides a **desirable experience** based on user’s context

- **Innovation**
  - The solution involves strategies, services, and products
- **Practical**
- **Sustainable**
  - The solution sustains values in economic, social and environmental dimensions
User-centred means the Design Thinking process starts by understanding the context and the users’ needs and stakeholders’ concerns ahead of reviewing resources or solutions. It provides information of the problem identification in a more well thought manner.
Example of User-centered Innovation

Embrace
https://www.youtube.com/watch?v=PyY94ssSww
5 Steps Process

Empathy
To identify the deep and meaningful needs through observing and engaging with users and stakeholders

Define
To reframe needs and insights into an actionable problem statement

Ideate
To generate volume and variety of ideas

Prototype
To visualise possible solutions by creating quick models

Test
To communicate with users and stakeholders to gain feedback and refining solutions
Questions

1. What is the meaning of T-shaped team?
2. What are the three core essentials?
# Matching Exercise

<table>
<thead>
<tr>
<th>Topics</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMPATHY</strong></td>
<td>Understand the deep and meaningful needs through observing and engaging with user and stakeholders</td>
</tr>
<tr>
<td><strong>DEFINE</strong></td>
<td>Reframe needs and insights into actionable problem statements</td>
</tr>
<tr>
<td><strong>IDEATE</strong></td>
<td>Generate volume and variety of ideas in using divergent thinking techniques in maximising as much as possibilities of solutions</td>
</tr>
<tr>
<td><strong>PROTOTYP</strong></td>
<td>Visualise possible solutions by creating quick models in trying out and revisiting the solutions towards the identified problem</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td>Communicate with users and stakeholders to gain feedback and refining solutions</td>
</tr>
</tbody>
</table>
Problem finding

Problem testing

Generate Solutions

empathy
define
ideate
prototype
test

Problem solving
Empathy

When to use this method
Know users
Identify users’ intent
Understand context
Frame insights

To understand the deep and meaningful needs through observing and engaging with users and stakeholders
Empathy (Understand Users)

‘This process starts when we step into the shoes of real users and immerse in the situation that provide insights of deep-lying motives and emotions in users in order to discover unmet needs and desires’ (Cupps, 2014).

The range of stakeholders around the users provide wealthy source of information. thus, It is a must to engage with stakeholders to gain comprehensive data.

Cupps, E. J. (2014). Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation. Iowa State University
Example of Empathy

MRI Adventure Series

https://www.youtube.com/watch?v=LMGoKDA0UXw
Empathy

To understand the deep and meaningful needs through observing and engaging with users and stakeholders

Tools:
Observation / Immersion
Group Discussions

Scenario:
‘A visually impaired student is going to purchase a drink from a vending machine in campus’

Each group lists 3 challenges of this visually impaired student. (7 mins.)
Experiencing with the Vending Machine
Video on Using the Vending Machine
Define

Reframe needs and insights into an actionable problem statement

When to use this method
Recognise the needs of users and stakeholders
Synthesise collected data
Identify approach towards a problem
Prioritise objectives
Frame strategy
Define (Synthesise)

In order to recognize the actual needs of users and the problem, defining the problem by processing collected information and evolve with an objective for the challenge is prioritised at the commencement of the Design Thinking process.
Define

Reframe needs and insights into an actionable problem statement

Tool: Categories of Concern
Break!
Actionable Problem Statement:

Create a vending service experience for the visually impaired concerning Machine Functions, Locations and Related Facilities.'
Ideate

Generate volume and variety of ideas

When to use this method
Understand context
Generate ideas
Keep track of creative ideas
Propose solutions to problem
Ideate (solutions)

A clearly defined objective sets the platform to create ideas and explore possible solutions to the problems. Numerous divergent thinking tools could be used to facilitate ideas generation.

Cupps, E. J. (2014). Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation. Iowa State University
Ideate
Generate volume and variety of ideas

Tool: Brain Strom List & Mindmap
Brain Strom List

Service

Channel

Brand

Customer Engagement

Suspend judgment

Free wheel

Quantity
Mind Map

Suspend judgment
Free wheel
Quantity
Mind-map
Mind-map

**Machine Functions**
- (a) Voice Control
- (b) Tactile Signage
- (c) Method of Payment

**Vending Service Experience for the Visually Impaired**

**Related Facilities**
- (a) Guidance Tracks
- (b) Sound-signal Device
- (c) Tactile Signage Map

**Locations**
- (a) Access Free Location
- b) Safety Concerns
- (c) Area of Less Crowded/Less traffic
- No Stairs, No Slope, No Obstruction, Away from sports ground

**Facilities Briefing**
Prototype

Visualise possible solutions by creating quick models

When to use this method
Visualise possibility
Prototype solution
Simulate solution
Engage with users and stakeholders
Prototype (Experimentation)

Convert ideas into reality by building quick prototypes. Extend written to visual and then to physical prototypes allow inspecting ideas through engagement and interaction. Prototypes visualise whether the proposes are met and test whether solutions are practicable. By simulating its function, different ideas are generated to compare and facilitate decision making.
Test

Communicate with users and stakeholders to gain feedback and refining solutions

When to use this method
Provide user experience to users and stakeholders
Practice the solution
Measure the degree of solutions
Collect feedbacks
Collect pitfalls
Test (Feedback)

Engaging real users to test and interact with the prototypes to justify ideas and measure its degree of success (Cupps, 2014) is the final step in actualising the innovative idea. Feedbacks are then collected to iterate the solutions. By continually refining and iterating with real users, the quality and practicality of the solution is guaranteed.

Cupps, E. J. (2014). Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation. Iowa State University
Prototype
Visualise possible solutions by creating quick models
Tool: Paper Prototype

Test
Communicate with users and stakeholders to gain feedback and refining solutions
Tool: User Feedbacks
**Sketch**

**Clear zoning**
- **Private space**
- **Public space**

The building has very clearly defined areas for users. Some areas are shared for all people, while others are only for lodgers to use.

**Clear circulation definition**
- **Visitors**
- **Lodger**
- **Staff**

Each type of user will have their own different route and experience. At the same time, some programs will share and have a relationship. Also, the experience hall will have a bridge to connect the main area.

**Perfectly free access**
- **Ramp**

For some visitors who have walking problems, the whole building route will use accessible paths.

**Merge with landscape**
- **Sea view vs Farm view**
  - **Sea view**
    - All visitors can see very beautiful sea views in their hotel rooms.
  - **Interior farming view**
    - The building interior is created with an interior farm for visitors to catch their attention, making the area feel like an outdoor space.

**Roof landscape**
- The building roof and some plants make the whole building look like part of the landscape.

**Cover by the site**
- The part of the building will hide into the landscape.

**Source:** VTC
Video on Paper Prototype

https://www.youtube.com/watch?v=_g4GGJ8NCY
Example of Practical and Sustainable Innovation

All Terrain Wheel Chair

https://www.youtube.com/watch?v=k6qTwqiHnAM&t=12s
Video on Case Study – MIT All Terrain Wheelchair

One of 1,000+
TED Talks

New ideas every weekday
TED.com

Source: https://www.youtube.com/watch?v=k8qTwJHiAM&t=12s
## Case Study

<table>
<thead>
<tr>
<th>A. T-shaped Team</th>
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<tbody>
<tr>
<td>1. Who are the users?</td>
<td></td>
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<tr>
<td>2. What are the user’s needs?</td>
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<tr>
<td>3. Who are the Stakeholders?</td>
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<thead>
<tr>
<th>B. 3 Core Essentials</th>
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<tbody>
<tr>
<td>4. What is the Design Thinking essential of User-centred?</td>
<td></td>
</tr>
<tr>
<td>5. What are the Design Thinking essentials of Practicability?</td>
<td></td>
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<tr>
<td>6. What are the Design Thinking essentials of Sustainability?</td>
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<tr>
<th>C. 5 Steps Process</th>
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<tbody>
<tr>
<td>7. How did the Engineer exercise “Empathy”?</td>
<td></td>
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<tr>
<td>8. How did the Engineer exercise “Define”?</td>
<td></td>
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<tr>
<td>9. How did the Engineer exercise “Ideate”?</td>
<td></td>
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<tr>
<td>10. How did the Engineer exercise “Prototype”?</td>
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<tr>
<td>11. How did the Engineer exercise “Test”?</td>
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### Case Study

<table>
<thead>
<tr>
<th>A. T-shaped Team</th>
<th></th>
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<tbody>
<tr>
<td>1. Who are the users?</td>
<td>Wheelchair users</td>
</tr>
<tr>
<td>2. What are the user's needs?</td>
<td>Mobility (e.g. Travel on rural area)</td>
</tr>
<tr>
<td>3. Who are the Stakeholders?</td>
<td>Engineer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. 3 Core Essentials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. What is the Design Thinking essential of User-centred?</td>
<td>It focuses on the needs of the third world country’s wheelchair users</td>
</tr>
<tr>
<td>5. What are the Design Thinking essentials of Practicability?</td>
<td>It considers the mobility, accessibility, maintenance, and affordability concerns</td>
</tr>
<tr>
<td>6. What is the Design Thinking essential of Sustainability?</td>
<td>It considers the maintenance of the Wheelchair which bicycle parts are easily to be obtained</td>
</tr>
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<thead>
<tr>
<th>C. 5 Steps Process</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. How did the Engineer exercise ‘Empathy’?</td>
<td>Engineer visited different countries</td>
</tr>
<tr>
<td>8. How did the Engineer exercise ‘Define’?</td>
<td>Mobility (e.g. Travel on rural area)</td>
</tr>
<tr>
<td>9. How did the Engineer exercise ‘Ideate’?</td>
<td>User’s daily living habits</td>
</tr>
<tr>
<td>10. How did the Engineer exercise ‘Prototype’?</td>
<td>Tried different types of prototype</td>
</tr>
<tr>
<td>11. How did the Engineer exercise ‘Test’?</td>
<td>Tested different prototypes with real users for its effectiveness and usability</td>
</tr>
</tbody>
</table>
# Assessment Matrix Worksheet

<table>
<thead>
<tr>
<th>5 Steps of Design Thinking Process</th>
<th>Score/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMAPTHY</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No interview conducted</td>
<td>Interview 1 user</td>
</tr>
<tr>
<td></td>
<td>Interview 1 user and 1 stakeholder</td>
</tr>
<tr>
<td></td>
<td>Interview more than 1 user and more than 1 stakeholder</td>
</tr>
<tr>
<td><strong>DEFINE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No problem statement provided</td>
<td>Provide a problem statement</td>
</tr>
<tr>
<td></td>
<td>Provide a problem statement with at least 3 categories of concern</td>
</tr>
<tr>
<td></td>
<td>Provide a problem statement with at least 5 categories of concern</td>
</tr>
<tr>
<td><strong>IDEATE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No solution provided</td>
<td>Provide 1 solution from 101 ideas</td>
</tr>
<tr>
<td></td>
<td>Provide at least 3 solutions from 101 ideas</td>
</tr>
<tr>
<td></td>
<td>Provide at least 5 solutions from 101 ideas</td>
</tr>
<tr>
<td><strong>PROTOTYPE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No prototype provided</td>
<td>Develop 1 sketch</td>
</tr>
<tr>
<td></td>
<td>Develop 1 sketch and 1 paper prototype</td>
</tr>
<tr>
<td></td>
<td>Develop sketches, 1 paper prototype, and 1 refined prototype</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No test exercised</td>
<td>Exercise 1 self-test</td>
</tr>
<tr>
<td></td>
<td>Exercised 1 self-test and 1 test by 1 user</td>
</tr>
<tr>
<td></td>
<td>Exercised 1 self-test and tests by more than 1 users</td>
</tr>
</tbody>
</table>
1 T-shaped Team

Networks

3 Essentials

User-centred
Practicability
Sustainability

5 Steps Process

Empathy
Define
Ideate
Prototype
Test
End
Reference


4. Cupps, E. J. (2014). Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation. Iowa State University


2.2 WORKSHEETS
## 2.2.1 Preparation and Arrangement Checklist for Teachers

**Preparation and Arrangement Check List For Teacher**

**Instruction:** Teacher could check the following items when preparing the facilities, equipment, and materials for the workshop.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong></td>
<td>Familiarise with the Design Thinking concepts and process</td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Prepare a lecture room for 30 students</td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td>Arrange [ ] 5 tables and [ ] 30 chairs (Each table can accommodate 6 students)</td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td>Arrange [ ] computer, [ ] projector, [ ] projector screen, [ ] audio system, [ ] micro-phone, and [ ] speakers</td>
<td></td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td>5 sets of DT Topics and Definitions Worksheets for Formative Assessment 2 in A3 size</td>
<td></td>
</tr>
<tr>
<td><strong>6.</strong></td>
<td>10 sheets of A3 size papers</td>
<td></td>
</tr>
<tr>
<td><strong>7.</strong></td>
<td>10 black or blue markers</td>
<td></td>
</tr>
<tr>
<td><strong>8.</strong></td>
<td>5 packs of blu-tack</td>
<td></td>
</tr>
<tr>
<td><strong>9.</strong></td>
<td>5 sheets of Mindmap Worksheets in A3 size</td>
<td></td>
</tr>
<tr>
<td><strong>10.</strong></td>
<td>30 sheets of Case Study Worksheets for Section 10 in A3 size</td>
<td></td>
</tr>
<tr>
<td><strong>11.</strong></td>
<td>30 Assessment Matrix Worksheets in A4 size</td>
<td></td>
</tr>
<tr>
<td><strong>12.</strong></td>
<td>30 Questionnaires in A4 size</td>
<td></td>
</tr>
</tbody>
</table>
2.2.2 Design Thinking Process Definitions Worksheet

Instructions
This activity aims to assess students’ understanding of the important components of DT introduced at the early stage of the lecture. The flow of this matching activity is outlined below:

Preparation
1. Prepare sufficient sheets of A3 size papers, blu-tack
2. Cut the topics and definition pieces by the dotted lines
3. Mix up the topics and definition pieces

Matching Activity (Group)
1. Divide students into five groups
2. Distribute the topics and definition pieces to each group of students
3. Ask students to match the names of DT 5 steps process with the correct definitions and stick on to an A3 paper
4. Ask students to adhere the A3 paper on the wall.

After Task
1. Teacher checks students’ answer
2. Teacher presents the key and explain

Remarks: Teachers may adapt the activity and the use of materials where appropriate
<table>
<thead>
<tr>
<th>Topics</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPATHY</td>
<td>Understand the deep and meaningful needs through observing and engaging with user and stakeholders</td>
</tr>
<tr>
<td>DEFINE</td>
<td>Reframe needs and insights into actionable problem statements</td>
</tr>
<tr>
<td>IDEATE</td>
<td>Generate volume and variety of ideas in using divergent thinking techniques in maximizing as much as possibilities of solutions</td>
</tr>
<tr>
<td>PROTOTYPE</td>
<td>Visualise possible solutions by creating quick models in trying out and revisiting the solutions towards the identified problem</td>
</tr>
<tr>
<td>TEST</td>
<td>Communicate with users and stakeholders to gain feedback and refining solutions</td>
</tr>
</tbody>
</table>
2.2.3 Ideate Mind Map Worksheet

**Instructions:**
Referring to the video in which “a visually impaired student is going to purchase a drink from a vending machine in campus”, teacher provides a mindmap worksheet to facilitate students to list out the main concerns for the visually impaired student in terms of machine functions, locations and related facilities. This activity enables students to explore the ideation process and explain the ideas.

**Preparation**
1. Prepare sufficient black or blue markers, blu-tack
2. Prepare sufficient mindmap worksheets

**Mind Map Activity (Group)**
1. Divide students into five groups
2. Explain to students about the simulated scenario in which they have to design a vending machine for a visually impaired student
3. Present the mindmap worksheet and brief the 3 rules - Suspend judgement, Free wheel and Quantity
4. Based on the scenario provided, ask students to list out the main concerns for the visually impaired student in terms of machine functions, locations, and related facilities
5. Ask them to write down their ideas in the boxes provided
6. Assign each group to present and explain their ideas

**After Task**
Teacher explains the following ideas of the mindmap:

- **Machine functions**
  (a) Voice control
  (b) Tactile signage
  (c) Method of payment; and (d) Ergonomics design

- **Locations**
  (a) Access free location
  (b) Safety concerns, e.g. no stairs, no slope, no obstruction
  (c) Less crowded, e.g. less traffic; and (d) Away from sports ground.

- **Related facilities**
  (a) Floor guidance tracks
  (b) Sound-signal device
  (c) Tactile signage and map; and (d) Facilities briefing
Mind Map Worksheet (For Teacher)

**Machine Functions**

(a) Voice Control

(b) Tactile Signage

(c) Method of Payment

**Vending Service Experience for the Visually Impaired**

(a) Access Free Location

(b) Safety Concerns

(c) Area of Less Crowded/ Less traffic

No Stairs, No Slope, No Obstruction, Away from sports ground

(a) Guidance Tracks

(b) Sound-signal Device

(c) Tactile Signage/ Map

Facilities Briefing
Instructions:
Based on the scenario provided, generate ideas under the concerning categories of ‘Machine Functions’, ‘Locations’ and ‘Related Facilities’ by filling in the boxes.

Rules:
1. Suspend judgement
2. Free wheel
3. Quantity
2.2.4 Case Study: ‘MIT – All Terrain Wheelchair’ Worksheet

Case Study Worksheet (For Teacher)

Instructions
This activity helps students reflect on the concepts covered in the lesson as a whole and the usage of Design Thinking in problem-solving. Students viewed a video clip about ‘MIT – All terrain Wheelchair’ and are provided with a worksheet to identify the T-shaped team, 3 core essentials and 5 steps process of Design Thinking in the case.

Preparation
1. Prepare a video clip about ‘MIT – All terrain Wheelchair’
2. Prepare sufficient black or blue markers, blu-tack
3. Prepare sufficient copies of Case Study Worksheets

Case Study (Group)
1. Divide students into five groups
2. Distribute and explain the worksheets to students
3. Asks students to watch the video ‘MIT - All Terrain Wheelchair’
4. Assign Groups A and B to discuss and work out the answers for the section of T-shaped team and 3 core essentials of Design Thinking in the Case
5. Assign Groups C, D, E to discuss and work out the answers for the section of 5 steps process of Design Thinking in the Case
6. Ask each group of students to present their ideas of the assigned sections

After Task
1. Present the answers with explanations
## Case Study Worksheet (For Teacher)

### A. T-shaped Team

<table>
<thead>
<tr>
<th>1. Who are the users?</th>
<th>Wheelchair users</th>
<th>Third world country users</th>
<th>Who can afford around US$200 for a wheelchair</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. What are the user’s needs?</td>
<td>Mobility (e.g. Travel on rural area)</td>
<td>Accessibility (e.g. washroom)</td>
<td>Maintenance (e.g. easily repair)</td>
</tr>
<tr>
<td>3. Who are the Stakeholders?</td>
<td>Engineer</td>
<td>Bicycle mechanic</td>
<td>Designer</td>
</tr>
</tbody>
</table>

### B. 3 Core Essentials

<table>
<thead>
<tr>
<th>4. What is the Design Thinking essential of User-centred?</th>
<th>It focuses on the needs of the third world country’s wheelchair users</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. What are the Design Thinking essentials of Practicability?</td>
<td>It considers the mobility, accessibility, maintenance, and affordability concerns</td>
</tr>
<tr>
<td>6. What is the Design Thinking essential of Sustainability?</td>
<td>It considers the maintenance of the Wheelchair which bicycle parts are easily to be obtained</td>
</tr>
</tbody>
</table>

### C. 5 Steps Process

<table>
<thead>
<tr>
<th>7. How did the Engineer exercise ‘Empathy’?</th>
<th>Engineer visited different countries</th>
<th>Engineer interviewed different wheelchair users</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. How did the Engineer exercise ‘Define’?</td>
<td>Mobility (e.g. Travel on rural area)</td>
<td>Accessibility (e.g. washroom)</td>
</tr>
<tr>
<td>9. How did the Engineer exercise ‘Ideate’?</td>
<td>User’s daily living habits</td>
<td>User’s physical needs</td>
</tr>
<tr>
<td>10. How did the Engineer exercise ‘Prototype’?</td>
<td>Tried different types of prototype</td>
<td>Tried many prototypes for years</td>
</tr>
<tr>
<td>11. How did the Engineer exercise ‘Test’?</td>
<td>Tested different prototypes with real users for its effectiveness and usability.</td>
<td></td>
</tr>
</tbody>
</table>
**Case Study Worksheet (For Student)**

**Instruction:** Watch the video ‘MIT – All Terrain Wheelchair’ and answer the following questions:

<table>
<thead>
<tr>
<th>A. T-shaped Team</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Who are the users?</td>
<td></td>
</tr>
<tr>
<td>2. What are the user’s needs?</td>
<td></td>
</tr>
<tr>
<td>3. Who are the Stakeholders?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. 3 Core Essentials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. What is the Design Thinking essential of User-centred?</td>
<td></td>
</tr>
<tr>
<td>5. What are the Design Thinking essentials of Practicability?</td>
<td></td>
</tr>
<tr>
<td>6. What are the Design Thinking essentials of Sustainability?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. 5 Steps Process</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. How did the Engineer exercise ‘Empathy’?</td>
<td></td>
</tr>
<tr>
<td>8. How did the Engineer exercise ‘Define’?</td>
<td></td>
</tr>
<tr>
<td>9. How did the Engineer exercise ‘Ideate’?</td>
<td></td>
</tr>
<tr>
<td>10. How did the Engineer exercise ‘Prototype’?</td>
<td></td>
</tr>
<tr>
<td>11. How did the Engineer exercise ‘Test’?</td>
<td></td>
</tr>
</tbody>
</table>
2.2.5 Design Thinking Process Assessment Matrix Worksheet

**Instructions**
This activity aims to help students plan their future project in applying the 5 steps process of Design Thinking.

**Preparation**
1. Prepare sufficient black or blue markers, blu-tack
2. Prepare sufficient copies of Assessment Matrix Worksheets

**Assessment Matrix Activity (Individual)**
1. Ask individual students to pick a project for evaluation
2. Check the 5 steps of Design Thinking Process used in the project
3. Circle the score according to the descriptions
4. Reflect on the project according to the score to see how Design Thinking process could improve the project

**After Task**
1. Select one or two students to share their results of assessment and ideas
2. Discuss how Design Thinking process could help improve the project
<table>
<thead>
<tr>
<th>5 Steps of Design Thinking Process</th>
<th>Score/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMAPTHY</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No interview conducted</td>
<td>Interview 1 user</td>
</tr>
<tr>
<td><strong>DEFINE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No problem statement provided</td>
<td>Provide a problem statement</td>
</tr>
<tr>
<td><strong>IDEATE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No solution provided</td>
<td>Provide 1 solution from 101 ideas</td>
</tr>
<tr>
<td><strong>PROTOTYPE</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No prototype provided</td>
<td>Develop 1 sketch</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No test exercised</td>
<td>Exercise 1 self-test</td>
</tr>
</tbody>
</table>
## 2.2.6 Student Feedback Questionnaire

### Design Thinking Concepts and Process Lesson Feedback

| Date: ________________________________ | Programme: ________________________________ |

1. **This lesson:**

   | Strongly agree | Strongly disagree |
   | 1 | 2 | 3 | 4 | 5 |

   (a) has provided me with insight on Design Thinking and its application. 
   [ ] 5  [ ] 4  [ ] 3  [ ] 2  [ ] 1

   (b) was well-facilitated (e.g. good presentation & interaction). 
   [ ] 5  [ ] 4  [ ] 3  [ ] 2  [ ] 1

   (c) was well-organised. 
   [ ] 5  [ ] 4  [ ] 3  [ ] 2  [ ] 1

2. Overall, I am satisfied with the lesson
   [ ] 5  [ ] 4  [ ] 3  [ ] 2  [ ] 1

3. Please tell us which aspect(s) of the lesson you find good/useful.
   __________________________________________________________
   __________________________________________________________

4. Which aspect(s) of the lesson would you want further information?
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

5. Do you have other comments or suggestions?
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
3. TEACHING INSTRUCTIONS
In choosing learning and teaching strategies, teachers should take into account of their students' prior knowledge, learning styles and abilities. Intended learning outcomes can be attained by more than one type of strategies, but the most important guideline for choosing suitable strategies is “fitness for purpose”.

The following pedagogical approaches with different teaching and learning objectives are adopted in this lesson:

**Direct instruction**

Direct instruction (e.g. lecturing) can be an effective means for transmitting knowledge quickly to students. The most common type of direct instructional strategy is lecturing which can help students understand the concepts of Design Thinking (such as T-shaped team, core essentials and 5 steps process) in a short time. It can also be used to arouse interest in a subject, complement and clarify text materials. For example, a video showing how to do a test by a paper prototype can help students understand quickly the Design Thinking process of prototype and test, remember the process more vividly and stimulate them to put theories into practice.

**Indirect Instruction**

In contrast to direct instruction, this strategy is mainly student-centred. The following methods are adopted in the lesson:

**Matching**
Teacher assigns each student group to match between the names and definitions of Design Thinking's 5 steps process in order to assess students' understanding of the important components of DT introduced at the early stage of the lecture.

**Problem Statement Exercise**
To enable students have a deeper understanding in defining a problem during the Design Thinking process, teacher assigns a simulated scenario “a visually impaired student is going to purchase a drink from a vending machine in campus” to stimulate students’ learning to derive a problem statement based on their observation of the user’s needs with the tool ‘categories of concern’.

**Mind Map**
Referring to the video in which ‘a visually impaired student is going to purchase a drink from a vending machine in campus’, teacher provides a Mind Map worksheet to facilitate students to list out the main concerns for the visually impaired student in terms of machine functions, locations and related facilities. This activity enables students to explore the ideation process and explain the ideas.
Case Study
Students viewed a video clip about ‘MIT – All terrain Wheelchair’ and are provided with a worksheet to identify the T-shaped team, 3 core essentials and 5 steps process of DT in the case. This activity helps students reflect on the concepts covered in the lesson as a whole and the usage of DT in problem-solving.

Interactive Instruction
Knowledge is not something out there to be discovered, but rather an understanding to be developed through collaboration and sharing. This approach relies heavily on discussion and sharing among students.

Group discussions
When students are engaged in group discussions, they learn through actively formulating and communicating their opinions among their peers. For example, teacher gives a simulated scenario to student groups to discuss and identify challenges for a visually impaired student to face in the scenario.

Teacher debriefing
Teacher debriefings are arranged when a learning activity is completed in the lesson in order to help students summarise and build on what they have learned through the activity, and move on to enquiring about new issues. For example, teacher categorises and explains the ideas generated in the Mind Map activity in relation to the main concerns for a visually impaired student to use a vending machine.
4 APPENDICES
Appendix A: Why implement Design Thinking in Education?

In education, Design Thinking enhances learners’ capabilities in problem-solving in a number of ways:

(a) **Tackle wicked problem:** By using multiple lenses when examining a problem, learners have to demonstrate apparently unrelated perspectives in searching for applicable solutions. It encourages learners to tackle complex, wicked problems through an interdisciplinary approach.

(b) **Enhance collaboration:** Design Thinking emphasises learners to collaborate with different professionals in the learning process as well as the problem-solving process that a concept that will be valuable to their scholarly, professional and personal lives. Learners can recognise the importance of the collaborations between businesses, institutions and organizations to tackle problems and derive solutions that best serve their interests.

(c) **Master divergent thinking skills:** Design Thinking urges and enables learners to expand their horizon in thinking by both interdisciplinary perspectives as well as by exercising both divergent and convergent thinking methods together to give outside-of-the-box ideas. As mentioned, problem with incomplete or changing requirement tends not to have logical or preset solution. Approaching a problem by innovative and all-rounded alternatives through a systematic progress would be essential in learning.

(d) **Develop user-centred solution:** Design thinking facilitates learners to develop viable and feasible solutions that are user-centred in which users have both the position and contribution to influence and shape the products and services they receive (MISE, 2013).
Appendix B: Design Thinking in Action (Learning Cases)

Design Thinking was implemented into different VTC’s projects in which the 5 steps process was exercised. The following examples demonstrate how this creative problem-solving method can lead a project from initial to final with innovative outcomes.

1. Applied Science (AS)
2. Business Administration (BA)
3. Childcare, Elderly and Community Services (CECS)
4. Design (DE)
5. Engineering (EN)
6. Hotel, Service & Tourism Studies (HoSTS)
7. Information Technology (IT)
8. Hotel and Tourism Institute, Chinese Culinary Institute and International Culinary Institute (HTICCI-ICI)
B.1 Applied Science (AS) - Healthy sea cucumber noodles
HD in Applied Nutritional Studies

Project description
Consumers today are health-conscious. In addressing the nutrition needs and taste of Asians, a sea cucumber noodle was under development. The new creation will be commercialized to provide the industry partner with competitive edge in the market.

1 T-shaped Team
AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials
User-centred: Healthy dining
Practical: Applied nutritional studies
Sustainable: Food manufacturer
### 5 Steps Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1. **Empathy** | Collect opinions from stakeholders through questionnaires with end-users and interview with industry partners.  
Realize the industrial production procedures during factory visit.  
Explore useful knowledge from learnt modules. |
| 2. **Define** | Establish the project rationale as below:  
Develop a unique healthy food product.  
Consider additional nutritive value into common staple food.  
Supply to the local and Asian market. |
| 3. **Ideate** | Explore the food characteristics in terms of type, flavour and nutrient content.  
Formulate ingredient mix and production directions to provide necessary nutrition, appearance and texture.  
Design packaging and plan marketing strategies for promotion. |
| 4. **Prototype** | Determine production directions to achieve proposed food characteristics.  
Make trial productions to refine and adjust the production details.  
Prepare progress report to communicate the development progress. |
| 5. **Test** | Evaluate the noodles through tasting session with industry partners, tutors and students.  
Collect feedback from stakeholders by conducting sensory evaluation survey.  
Refine the ingredients and production directions according to the feedback |
B.2 Business Administration (BA) - Brand development for PizzaStage

HD in Marketing Management

Project description

Based on the real-life business scenario of PizzaStage, a subsidiary of the Café de Coral Group, a marketing campaign was developed to rejuvenate the brand. The fresh yet solid proposal showed great potential for sales growth.

1 T-shaped Team

AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials

User-centred: Dining experience
Practical: Marketing strategies
Sustainable: Business growth
# 5 Steps Process

## 1. Empathy
- Study buyer behaviours through survey, field study and observation.
- Step into the shoes of users and experience dining as a customer.
- Understand company objectives through in-depth interview with the Marketing Manager.

## 2. Define
- Analyse the brand positioning through 7P marketing mix.
- Consolidate findings of the study to identify opportunities in brand awareness, product variety and location.
- Provide recommendations to explore promotion strategies and product line extension.

## 3. Ideate
- Add product variety through adopting Ansoff’s Product Development Strategy.
- Explore marketing strategies such as highlighting the European continent brand image and offering sales promotion.
- Enhance visibility of the brand through promotion kiosks at selected locations.

## 4. Prototype
- Consolidate suitable actions and strategies into a thorough marketing plan.
- Rehearse the presentation to tutors through internal assessment.

## 5. Test
- Collect user feedback on the strategies with customer survey.
- Obtain practical feedback from the corporation through business plan presentation to the Marketing Manager.
B.3  Childcare, Elderly and Community Services (CECS) - Play activities for Dementia
HD in Social Services and Community Education / HD in Elderly Care Services

Project description
Engaging people with dementia in leisure or recreational activities has been found as an effective way to alleviate behavior syndromes. Activities promoting cognitive stimulation have also been found to slow down memory loss in healthy older people. A board game that recalls fond memories of the daily life was created for older adults, which is to be patented and produced for the market.

1 T-shaped Team
AS | BA | CECS | DE | EN | HoSTS | IT | HITCCI-ICI

3 Core Essentials
User-centred: Patient recovery and disease prevention
Practical: Dementia therapy
Sustainable: Elderly community center
### 5 Steps Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| **1. Empathy** | - Discover aspirations of stakeholders (that is elderly, caretakers, social community and students) through needs assessment, observations and field studies.  
- Understand the local community by means of ‘community walk’ and ‘site visit’. |
| **2. Define** | - Determine objectives of the play activity  
- Generate positive emotional experience, respect and dignity in elderly.  
- Create a dementia-friendly generation by building knowledge and awareness.  
- Provide effective interventions that prevent behavioral syndromes. |
| **3. Ideate** | - Explore means of non-pharmacological therapy for people with dementia such as play, music, sensory activities and cognitive training.  
- Generate play activities, such as board games, matching games and motor skills training toys, that maintain cognitive and attention level. |
| **4. Prototype** | - Produce mock up sample of the board game to actualize the idea.  
- Present the board game to tutors through internal review.  
- Justify the effectiveness of the board game in terms of psycho-social factor. |
| **5. Test** | - Collect feedback by engaging stakeholders to play the board game.  
- Evaluate the outcome from a professional perspective through academic assessment.  
- Gather peer opinions through feedback reports and comments. |
B.4  Design (DE) - Farming resort for elderly with Alzheimer’s
HD in Architectural Design

Project description
In offering spatial comfort for healing and medication purpose as well as raising community awareness on Alzheimer’s disease, a farming resort was created for senior patients to spend time and interact with their family. The farming resort, defeating more than 150 other entries, won the Social Innovation Inventor Competition.

1 T-shaped Team
AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials
User-centred: Patient recovery
Practical: Spatial planning
Sustainable: Non-government organizations
### 5 Steps Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Empathy</strong></td>
<td></td>
</tr>
</tbody>
</table>
| - Recognize objectives of the site development at briefing session.  
- Understand needs and aspirations of different users through field study, observation and interviews.  
- Study the environment through site analysis.  
Source: WGO |
| **2. Define** |  |
| - Gather all necessary site and facilities requirement.  
- Formulate a package of strategies for the development with focuses on interaction through farming activities, environmental, site context and building technology.  
Source: WGO |
| **3. Ideate** |  |
| - Perform accessible spatial planning for ease of facility use and user circulation.  
- Explore the use of interior and exterior space according to the package of strategies.  
- Consider farming activities that enable interaction with relatives.  
Source: WGO |
| **4. Prototype** |  |
| - Consolidate ideas from each strategy and integrate in a coherent form.  
- Produce site plan drawings to illustrate the overall proposal.  
- Build masking models and paper study models to actualize the proposal.  
Source: WGO |
| **5. Test** |  |
| - Perform data analysis such as light test to simulate daylight.  
- Gather opinions of architects and tutors at internal review.  
- Collect feedback from stakeholders as the judging panels at the competition.  
Source: WGO |
B.5 Engineering (EN) - Free flight glider
HD in Aircraft Maintenance Engineering

Project description
Applying theory of aerodynamics, scaled gliders are designed and constructed to demonstrate flight stability and endurance. With the same principles being adopted to construct a flying machine with compartment to fit in the pilot, the machine won the champion at the Red Bull Flugtag Contest.

1 T-shaped Team
AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials
User-centred: Aviation safety
Practical: Aerodynamics design
Sustainable: Professional competence
<table>
<thead>
<tr>
<th>5 Steps Process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Empathy</strong></td>
</tr>
<tr>
<td>• Understand the industry competent needs through interviews with government body (Civil Aviation Department), leading aircraft maintenance service provider (such as HAECO) and airlines companies.</td>
</tr>
<tr>
<td><strong>2. Define</strong></td>
</tr>
<tr>
<td>Establish objectives as to develop competence in aviation safety and aircraft design efficiency by constructing a glider that:</td>
</tr>
<tr>
<td>• Demonstrate straight and level flight.</td>
</tr>
<tr>
<td>• Exceed set air flight time.</td>
</tr>
<tr>
<td>• Operate with a single motor.</td>
</tr>
<tr>
<td><strong>3. Ideate</strong></td>
</tr>
<tr>
<td>• Explore aerodynamic design through calculation.</td>
</tr>
<tr>
<td>• Derive the aircraft design in terms of form, structure, aerodynamics and power source to produce stable and enduring flight.</td>
</tr>
<tr>
<td>• Consider material use for structural rigidity and weight efficiency.</td>
</tr>
<tr>
<td><strong>4. Prototype</strong></td>
</tr>
<tr>
<td>• Build scaled models to examine and fine tune the aircraft design.</td>
</tr>
<tr>
<td>• Evaluate material choice in accordance with aerodynamic performance.</td>
</tr>
<tr>
<td><strong>5. Test</strong></td>
</tr>
<tr>
<td>• Perform flight test to evaluate aircraft design.</td>
</tr>
<tr>
<td>• Assess flight performance through observation and flight report.</td>
</tr>
<tr>
<td>• Set off the flying machine with a pilot on board at the competition.</td>
</tr>
</tbody>
</table>
Project description

To put event management theories in practice, a 2-days spring carnival was planned and organized for the amusement of local teenagers. The carnival especially offers a diversity of trending team activities that is much loved by the teenagers.

1 T-shaped Team

| AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI |

3 Core Essentials

User-centred: Further education
Practical: Event management
Sustainable: Course promotion
### 5 Steps Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1. Empathy</td>
<td></td>
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</tbody>
</table>
- Understand user interest and ability through needs assessment and observation.  
- Familiarize the venue with site visit.  
- Realize the event objectives via interview with organizing body. |
| 2. Define | Establish objectives of the event:  
- Apply theories of event management to plan and implement event.  
- Identify and handle issues encountered at leisure and recreation event.  
- Promote vocation education through leisure activities. |
| 3. Ideate |  
- Generate games and activities that interest users and align with the event theme.  
- Perform resource management on manpower, finance, time and venue.  
- Prepare contingency plan for unexpected issues such as weather condition. |
| 4. Prototype |  
- Consolidate event ideas into a proposal and present to tutors for consultation.  
- Integrate concerning arrangements to create an event rundown.  
- Produce promotional materials such as design and print posters. |
| 5. Test |  
- Obtain user feedback by engaging visiting school students, staff and students on campus to participate in demo games.  
- Check for potential problems and issues through event rehearsal. |
Project description

With the purpose to automate and streamline the workflow for registering events at different scales, an Online Event Registration platform was created. The activity data accumulated on the platform could be used further analyzed to facilitate customer relation management (CRM) functions.

1 T-shaped Team

AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials

User-centred: Social life effectiveness
Practical: System programming
Sustainable: Event organizers, SDO
## 5-Step Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
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</table>
| **1. Empathy** | - Gain insight on needs though interviewing with key users such as event participants and organizers.  
- Visualize current user experience by producing use case diagram. |
| **2. Define** | Determine objectives of the platform:  
- Offer convenience by bringing organizers and participants all on the same platform with a single point of entry.  
- Automate the workflows in event registration.  
- Provide visual activity reports, customer relation management (CRM) and related functions. |
| **3. Ideate** | - Explore useful functions for participants, such as event browsing and search, express registration with form auto-filling, event reminders and schedule clash alert and QR-code check-in.  
- Explore useful functions for organizers such as activity reporting, evaluation, participant recommendation, and CRM functions based on stored data. |
| **4. Prototype** | - Systems functions were coded by development tools such as Visual Studio and Netbeans  
- User interfaces were evaluated through dummy screens and storyboards. |
| **5. Test** | - Perform module test to validate individual system component.  
- Carry out system integration test to evaluate the whole system.  
- Conduct user acceptance test (UAT) to justify system usability. |
B.8  Hotel and Tourism Institute, Chinese Culinary Institute and International Culinary Institute (HTICCI-ICI)-
Standing Cocktail Party for Cuisines of the Americas
HD in Culinary Arts

Project description
To practice culinary production during Cuisines of the Americas course module and kitchen operation of restaurants, a 4 course menu from selected cuisines was developed optimizing student skill, authenticity, and operational constraints. A standing cocktail reception was arranged serving the menu to 80 guests for tasting experience, guest and professional attendee feedback.

1 T-shaped Team
AS | BA | CECS | DE | EN | HoSTS | IT | HTICCI-ICI

3 Core Essentials
User-centred: Standing cocktail reception
Practical: Menu creation and culinary production
Sustainable: Restaurant operation
## 5 Steps Process

1. **Empathy**
   - Understand the characteristics of the cuisine through attending lecture and performing literature research.
   - Collect responses on the cuisine through survey and peer discussion.

2. **Define**
   - Replicate and innovate the style of specific cuisines of the Americas.
   - Frame the event objectives to include cuisine characteristics with authenticity, culinary production, and context of the event.
   - Determine the job distribution and work plan.

3. **Ideate**
   - Explore dishes, recipes, and cooking methods of the cuisine with authenticity.
   - Design the menu for the context of standing cocktail reception.
   - Develop the event production plan.

4. **Prototype**
   - Consolidate and balance the food items on the menu.
   - Create a proposal that explains the event and production plan.
   - Prepare a minimum of 20 portions of each of the 4 dishes within a set time limit.

5. **Test**
   - Arrange a tasting session with chefs and instructors.
   - Gather opinions on the event through guest feedback, self-evaluation and observation.
   - Produce a report that reviews the event and outcome of the dishes.
Appendix C: Conceptualisation of Design Thinking

Design Thinking differentiates from other problem-based thinking methods by involving the following important concepts throughout the problem-solving process:

(a) **User-centred** means the Design Thinking process starts by understanding the context, the users’ needs and stakeholders’ concerns ahead of reviewing resources or solutions. It provides information of the problem identification in a more well thought manner.

(b) **Synthesis** is a process of defining the problem in combining isolated ideas or components in forming a comprehensible whole.

(c) **Divergent Thinking** warrants the process of ideation for the most feasible solutions explored systematically.

(d) **Convergent Thinking** helps narrow down the possibilities of solutions. Both divergent and convergent thinking are complementing one another for the outcome of synthesis to develop upon the process of former analysis.

(e) **Prototype-driven** refers to the cyclical process of verification in which concepts are to be visualised and tested before the solutions to problems. It eliminates the possible errors and reassures the solutions are responding to the users’ needs in a problem.

(f) **Innovation** refers to production or implementation of a value-added creativity in economic and social domains. It could be renewal and expansion of products, services, or markets; development of new methods of production; or establishment of new managing systems.

Pyramid of Design Thinking Practice are providing a reference in distinguishing the implementation of Design Thinking.

i. The first level refers to the rearrangement of artifact’s appearance, form, features, and functions;

ii. the second level refers to the improvement of both artifact and experience of user;

iii. the third level refers to the restructuring of system and behavior of a group of user; and

iv. the forth level refers to the transformation of a large scale system such as culture, economic, or social domain.
Appendix D: The Design Thinking process

In practice, the Design Thinking process puts creativity into action to generate solution to problem and to evolve innovation. The methods involved are Empathy, Define, Ideate, Prototype and Test, in which divergent and convergent thinking skills are implemented in which a cyclical approach of understand, create, and deliver is implemented. It begins with engaging the users and stakeholders and ends with the practical and sustainable implementation of products, services, and/or systems.
Appendix E: Empathy

To understand the deep and meaningful needs through observing and engaging with user
This process starts when we immerse in the situation that provide insights of motives and emotions in users in order to discover unmet needs and desires (Cupps, 2014). It is the process in identifying the user’s perspectives as well as the user’s motive through ways of engagement. Moreover, the range of stakeholders around the users could also provide a rich source of information, thus, it is also necessary to connect with stakeholders to gain comprehensive data.

When to use this method

1. Know user
2. Identify user’s intent
3. Understand context
4. Frame insights
**Empathy Tools (Interview/Fieldwork/Immersion/Persona)**

1. **Interview:**

   Interview is an in-depth conversation in gaining individual and contextual information. It is a good method in knowing the user and collecting user’s stories and insight towards an issue.

   **How:**
   
   1. A contextual inquiry can be structured in a not more than 2-hour section
   2. Permission must be gained from interviewee to document the interview by audio or video
   3. 5W1H (Who, What, Why, When, Where, How) method can be used in understanding the user and user’s experience
   4. Collect stories, opinions, and insights
   5. Do not comment and judge user’s content
2. Fieldwork:

Field Research involves various methods including direct observation and interviewing people. It is useful to know the user, the context, and the happenings which even the user may not be aware of.

How:

1. Prepare research for the studies
2. Develop a schedule of the site visit
3. Create questions or forms for interviewees to respond
4. Collect stories, opinions, and insights
5. Permission must be gained from interviewee to document the interview by audio or video
6. Analyze data
7. Develop insights
8. Make recommendation
3. Immersion:

Involve yourself to the user’s living and working context to gain first-hand experience of their needs, desires, and challenges. It is an effective method in obtaining the details of the user’s experience.

How:

1. Prepare research for the studies
2. Develop a schedule of the experience
3. Permission must be gained to document the interview by audio or video
4. Perform immersion by participating in the user’s living or working environment
5. Record and analyze data
6. Develop insights
7. Make recommendation
4. Persona:
A persona is a representative that is meant to signify a group of users in a role who segment common goals, attitudes and behaviors when interacting with a specific product or service.

How:
1. Prepare research for the studies
2. Segment the users
3. Collect data through observation and interviews
4. Create persona according to user’s interaction with a scenario
Appendix F: Define

Reframe needs and insights into actionable problem statements
In order to recognize the actual needs of users and the problem, defining the problem by processing collected information and evolve with an objective for the challenge is prioritised at the commencement of the Design Thinking process. This process is to identify the approach towards a problem in which involves defining the problem statement and to structure the strategy or the framework for the solutions.

When to use this method
1. Recognise the needs of user
2. Synthesise collected data
3. Identify approach towards a problem
4. Prioritise objectives
5. Frame strategy
Define Tools (Reframing the problem/Uncover stakeholder’s stories Operational Brief)

1. Reframing the problem:
Reframe a problem from different point-of-view (POV) such as culture, values, preferences, resources or norms. Changing the statement by shifting perspective from the user can bring new insights to the problem. For example: I am a new student from Mainland who has a hard time finding the right direction to my classroom in this campus.

How:
1. Deconstruct assumptions
2. Change paradigm
3. Use diversified and unusual perspectives
2. Uncover stakeholder’s stories:

Story telling is an effective tool to illustrate the needs of user and to inspire innovative ideas. By telling a story based on the data collected through the Empathy stage, present the user’s point of view which the deeper desire or needs of the user can be uncovered.

How:
1. Collect information for the story
2. Establish the norm, and then contrast that with how an event didn’t go as expected
3. Once the norm of the story is established, describe the turning point
4. Add dialogue
5. Always have a least one character (although you'll probably end up with two)
6. Always have a setting no matter how minimal
7. Always have at least one problem to solve
8. Always have a solution or resolution.
3. Operational Brief:
Writing up a short brief is a practice in clarifying a challenge’s Situation, Mission, Execution, Communications, Support (SMECS) which provide information for possible strategies, measures of success, foreseeable constrains, and a plan to move forward.

How:

Operational Briefing FORMAT (SMECS)

SITUATION
Here is what is going on around us.
Here is what we need to watch out for.

MISSION
Here is why this is important.
Here is how we should do it.

EXECUTION
Here is what we need to make it work.
Here is how we’re organized.
Here is how it should look when we’re done.
COMMUNICATIONS
Here is what we need to talk about.
Here is who we need to talk to.
Here is how we’re going to talk.

SUPPORT
How do you see your role in this?
What are your concerns?
Here is who is working with us.
What are their concerns?
Appendix G: Ideate

**Generate volume and variety of ideas in using divergent thinking techniques in maximizing as much as possibilities of solutions**

A clearly defined objective sets the platform to create ideas and explores possible solutions to the problems. Numerous divergent thinking tools could be used to facilitate ideas generation.

**When to use this method**

1. Understand context
2. Generate ideas
3. Keep track of creative ideas
4. Propose solutions to problem
Ideate Tools (Brainstorming 101/Mind-map/ SCAMPER)

1. Brainstorming 101:

Brainstorming is a structured process to explore possibilities and collect insights by a diverse team through divergent and convergent thinking. There are rules to be followed in order to generate volume of ideas and useful alternatives for the problem.

How:
1. Form a diverse team of 4-5 people who have basic knowledge of the problem
2. Propose a facilitator to lead the section for time management, invite contribution, and write ideas on the white board
3. Determine one clear goal per a 45 minutes’ brainstorming section
4. Use a white board and prepare Post-it-notes
5. Prepare refreshment and allow break
6. Quantity based and 101 ideas per section
7. Defer judgement
8. Suspend critique
9. Encourage wild ideas
10. Give each participant 3 Post-it-notes to vote for their favorite ideas
11. Cluster the favorite ideas
12. Select 3 ideas to be further discussed for their viability
2. Mind-map:

Mind map is a technique to encourage a diverse team to contribute concepts by building on existing ideas. It provides a structured method for a team to follow the idea development path and to evolve diversified ideas for a topic and understand its connections.

How:
1. Form a diverse team of 4-5 people who have basic knowledge of the problem
2. Propose a facilitator to lead the section for time management, invite contribution, and write ideas on a large sheet of paper
3. Determine one clear goal per a 45 minutes’ mind-map section
4. Prepare refreshment and allow break
5. Determine one clear goal per a 45 minutes’ mindmap section
6. Use a large sheet of paper and start in the centre with a key word
7. New idea should be built on the previous idea and connect by lines
8. Defer judgement
9. Suspend critique
10. Give each participant 3 Post-it-notes to vote for their favorite ideas
11. Cluster the favorite ideas
12. Select 3 ideas to be further discussed for their viability
3. SCAMPER:

SCAMPER is a method that uses below words/concepts as prompts.

1. Substitute
2. Combine
3. Adapt
4. Modify
5. Put to another use
6. Eliminate
7. Reverse

How:
Take an existing product or service for improvement or further development, using the prompt to guide you in coming up with new ideas.

Substitute
- What materials, resources, process, or rules can you substitute to improve the product?
- Can you use this product somewhere else, or as a substitute for something else?

Combine
- What would happen if you combined this product, purposes or resources with another and to create something new?
- What could you combine to maximize the uses of this product?

Adapt
- How could you adapt or readjust just this product to serve another purpose or use?
- What other context could you put your product into?
Modify

- How could you change the shape, look, or feel of your product?
- What element of this product could you strengthen to create more value?

Put to Another Use

- Can you use this product somewhere else, perhaps in another industry?
- How would this product behave differently in another setting?

Eliminate

- What features, parts, or rules of this product could you eliminate?
- How could you make it smaller, faster, lighter, or more fun?

Reverse

- What would happen if you reversed this process or sequenced things differently?
- What if you try to do the exact opposite of what you're trying to do now?
Appendix H: Prototype

Visualise possible solutions by creating quick models in trying out and revisiting the solutions towards the identified problem
Convert ideas into reality by building quick prototypes. Extend written to visual and then to physical prototypes allow inspecting ideas through engagement and interaction. Prototypes visualise whether the objectives are met and test whether solutions are practicable. By simulating its function, different ideas are generated to compare and facilitate decision-making.

When to use this method
1. Visualise possibility
2. Prototype solution
3. Simulate solution
4. Engage with user
Prototype Tools (2-D and 3-D Mock-up/Pitch WOW)

1. Mock-up:
Mock-up is a quick way to gain insight and modify decision. It simulates function of solutions without the concerns of aesthetics or the details of proposed solutions. It can help to compare alternatives with interactions of experiences.

   a. Sketching
   b. Flow chart
   c. Paper Prototype
   d. Scaled mock-up
   e. Full size mock-up

How:
1. Illustrate 2-D sketching or flow chart in a way users and stakeholders can be understood easily and comments
2. Make quick 3-D mock-up models with instructions for testing
2. Pitch WOW:

Every good idea needed to be amplified.

How:

1. Know your audience
2. Prepare a 5 minutes brief
3. Capture the essentials in three insights
4. Provide ideas for execution but not hypothesize
5. Pitch with passion
Appendix I: Test

Communicate with users to gain feedback and refining solutions
Engaging real users to test and interact with the prototypes to justify ideas and measure its degree of success is the final step in actualising the innovative idea. Feedbacks are then collected to reiterate the solutions. Continually refining and reiterating with real users guarantee the quality and practicality of the solution.

When to use this method
1. Provide user experience
2. Practice solution
3. Measure the degree of solutions
4. Collect feedbacks
5. Collect pitfalls
Test Tools (Usability test)

1. Usability test

Engaging real users to test and interact with the prototypes help to justify solution and measure its degree of success. It uncovers user’s favours and struggles in engaging with the solutions’ features and process. It gives a much cleaner picture of what should be improved and even how the solutions could be revisited for its original objectives.

How:
1. Randomly invite users form the segment for the solution
2. Seek their agreement for video recording
3. Explain the test to users
4. Ask users to think aloud to encourage participants to keep a running stream of consciousness as they work
5. Ask users to test or exercise the solutions
6. Do concurrent probing to understand participants’ thoughts when they attempt to work through tasks
7. Observe and video record the process
8. At the end of test, collect insights from the users
9. Categorise and analyse the insights
10. Make recommendations for the solution
5 REFERENCES
References


3. Cupps, E. J. (2014). Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation. Iowa State University


6 TLP CREATION/REVISION RECORD
<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Purpose</th>
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<td>New</td>
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<td>Wallace LAM (Vice-Principal)</td>
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<td>Edwin WONG (Lecturer)</td>
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<td></td>
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<td>Ken CHEUNG (Teaching Associate)</td>
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