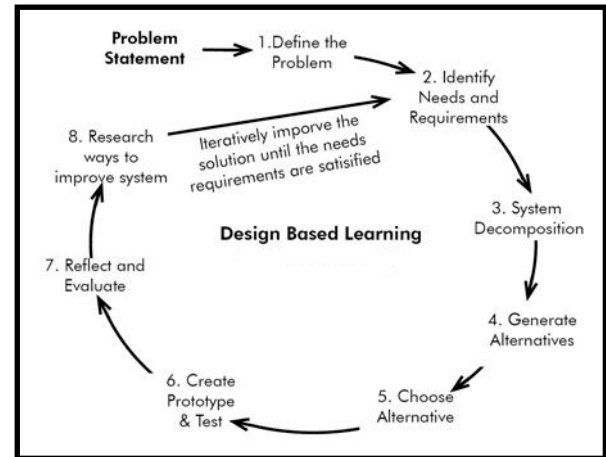


DESIGN-BASED LEARNING

1. What is Design-Based Learning?

Design-based learning (DBL), also known as design-based instruction, is a method of teaching and learning in which students learn by designing, prototyping and developing creative and practical solutions to complex, realistic problems. Design-based learning is often multi or inter-disciplinary and project-based. DBL can be found across many disciplines, including those traditionally associated with design (e.g. art, architecture, engineering, interior design, graphic design), as well as others not normally considered to be design-related (science, technology, business, humanities).



2. Why Design-Based Learning?

- Suitable for inter and multi-disciplinary curriculum –it requires students to draw upon their knowledge across various discipline domains to solve problems.
- Engages students in complex, real-world projects through which they can develop and apply relevant knowledge and skills.
- Promotes creative and innovative thinking- Problems are presented without a predetermined solution.
- Encourages student decision making -students design the process for reaching a solution and they are in charge of accessing and managing the information needed to solve the problem.
- Promotes reflection, evaluation and continuous learning.
- Learning environment has an atmosphere that tolerates failures and mistakes.

3. How to implement Design-Based Learning?

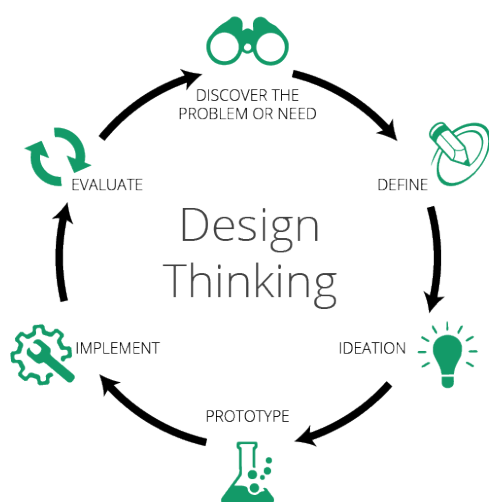
In SUTD context

Several SUTD courses uses Designettes, which are creative design challenges that enable educators to integrate design learning in a single class, across courses, across terms, and across disciplines. When two or more courses join together in a designette, a multidisciplinary learning activity occurs; multiple subjects are integrated and applied to open-ended problems and grand challenges. This practice helps foster a culture of design, and enables the introduction of multidisciplinary design challenges.

Singapore University of Technology and Design (SUTD) has used several designette to teach engineering subject matter over the years. Some examples



include bio-inspired robotics designette (MechAnimal), an interactive musical circuit designette, and an automated milk delivery (AutoMilk) designette. Each challenge combines problem clarification, concept generation, and prototyping with subject content such as circuits, biology, thermodynamics, differential equations, or software with controls. Studies conducted at SUTD found that designettes increase students' understanding of engineering concepts (Telenko *et.al*, 2016).



Students gain knowledge while designing a solution (object or artifact or report) to a given problem/context/task. It involves collecting information, identifying the “real” problem, suggesting ideas to solve it and evaluating the solutions given. Once students have chosen the design problem to focus on, they design a solution to solve it. Finally, the students receive feedback on the effectiveness of their design both

from the facilitator and from other participants. Design-based learning is especially used in scientific and engineering disciplines. One of the key characteristics of DBL is that students incorporate design thinking process in solving the problems.

4. Roles

Lecturer	<ul style="list-style-type: none"> • Facilitator • Jury • Mentor • Assessor • Evaluator
Students	<ul style="list-style-type: none"> • Participants • Presenter • Creators • Thinkers • Collaborators • Problem Solvers

7. References

- Telenko C, Wood K, Otto K, et al. Designettes: An Approach to Multidisciplinary Engineering Design Education. ASME. J. Mech. Des. 2015;138(2):022001-022001-11. doi:10.1115/1.4031638.
- Chandrasekaran, S., Stojcevski, A., & Littlefair, G. (2015). The Role of the Facilitator in a Project/Design Based Learning Environment. Proceedings of 2015 International Conference on Interactive Collaborative Learning (ICL) (pp. 21-24).

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5. Instructional Materials

- Designettes
- Case-studies
- Scenario
- Learning resources
- Application problems
- Pre-reading materials
- Prototype/Artefact briefs

6. Assessment

- Draft proposals
- Peers evaluation
- Prototype presentations
- Rubrics
- Reflective writing
- Quiz
- Artefacts



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