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Keep Online Design Thinking Alive: a Case Study in Indonesia

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Abstract: COVID-19 pandemic has disrupted the way teaching and learning have been conducted at the university in Indonesia. None of us have experienced tackling this extraordinary situation. Prior to the pandemic, face-to-face learning mode has been the primary preference in university education. Some universities in Indonesia have used online mode as a support for the main offline teaching and learning, but the focus was more on administrative activities, such as: submitting assignments, sharing resources, and sending announcements. However, the COVID-19 pandemic has left the universities with no choice, but to switch their education from offline to fully online. However, in the case of Design Thinking courses, offline interaction might not be the best as intense interaction is required to achieve the goals. This study investigates the challenges and potentials of conducting online Design Thinking courses, which is in this case, the Design Research course. Using the Design Thinking 2.0 framework, we have analyzed and identified several interventions that we propose in this paper to leverage and transform the current course.

Keywords: COVID-19, Design Thinking, Design Research, Creativity, Indonesia, online learning, face-to-face learning

1. Introduction

COVID-19 pandemic has changed the way teaching and learning are conducted at most universities in the world, from offline to fully online mode. However, online learning is not always easy to implement and brings satisfaction for educators and learners, especially when the subject requires intense physical presence and face-to-face interaction, like the Design Thinking course.

Design Thinking is an iterative design process that belongs to every level in the organizations (Brown) to solve a wicked problem (Rittel, H. W., & Webber, M. M., 1973). The results of the final stage of the initial work help to inform the next design process until new alternative solutions are developed. Design Thinking is a non-linear iterative human-centred design process to solve wicked problems.

Design Thinking 2.0 (see Figure 1) introduced by the second author, is an advanced version of the Design Thinking framework (Sari, 2020; Tedjasaputra and Sari 2020). In this framework, the design and development process is entwined with each other. The flexibility of iteration in each stage is an additional advantage in Design Thinking 2.0. Furthermore, time-boxing is another built-in property of Design Thinking 2.0 that supports creativity and people's time to be involved in the process. The time-boxing is also the disadvantage of Design Thinking 2.0, in which a complex product that requires longer time to develop will not fit into this framework. In this paper, we will use Design Thinking 2.0 as a framework to analyse the online Design Thinking course.

Learning about Design Thinking at the university needs to provide an authentic experience and ensure students master the key skills that they can apply when they are at the workplace one day.

This study describes an education project done by the first author, who is the lecturer of the Industrial Design Department in a public university in Indonesia. She and her team teach two Design Thinking courses under the names of Design Research and Creativity for the 6th and 7th-semester bachelor students. The Design Research course is a prerequisite introductory course that final design students must take before they do a final project, whereas the Creativity course was an enrichment course intended for non-design students who are interested to learn about Design Thinking and Creativity. In this paper, we will discuss one of the courses, which is Design Research.

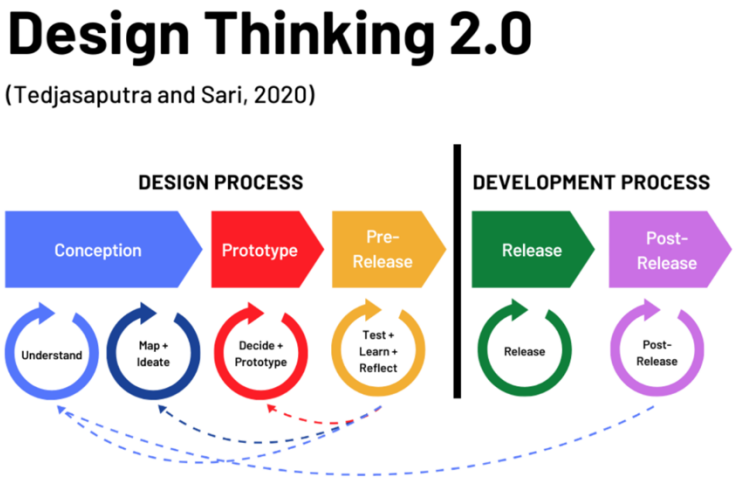

Figure 1. Design Thinking Process

The Design Research course is an introductory course to prepare students for their final project. The topics discussed in this course include Design Thinking, Design Methodology, Design Ethnography, Creativity, Primary and Secondary Data Collection Techniques, Business Analysis, User or Customer Analysis, and many more. By doing this course, some of the key skills expected to master include implementation design concepts into design alternatives, visualization of design alternatives using manual and digital media, application of design thinking principles in data collection, determining design methods, and applying UX research theories to understand target markets and inspire design (UX Design, Ethnography, Persona, Customer Journey Mapping), prototyping and development. Before the pandemic, it was run in classrooms, studios, and labs with industry stakeholders.

Table 1 and 2 show learning outcomes, contents, and classwork from the Design Research course.

Table 1. *Learning Outcomes of Design Research Course*

1. Able to implement design concepts into design alternatives.
2. Able to visualise design alternatives using manual and digital media.
3. Able to apply design thinking principles in data collection, determination of design methods, and analyses required in formulating design concepts.
4. Able to present design projects through academic writing, posters, and verbal presentations.
5. Able to apply user-related theories to design projects, such as user experience design, personas, consumer journey mapping.
6. Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.
7. Able to collaborate with various parties in managing design research.

Table 2. *Weekly Learning Content and Class works*

Weeks	**Titles**	**Contents**	**Class works**

1	Exploring Research Topics	Design Research Secondary Data Research Skills Scope of Work and Possibilities	Mind Mapping
2	Understanding Context	Identify stakeholders - socio-economic issues - who are the users and their needs - product design opportunities	Visualization of Context: Product Transformation and Stakeholder Relationship
3	Product Innovation Ideas	Basic Knowledge: Principles, Regulation, History, Evolution, Trends, Notable/Best Design Product Comparison Analysis	Presentation: Basic Knowledge and Product Comparison Analysis
4	Design Methodology	Designing flow of research Steps and Sources of Information Data Collection Plan & Detail Validity and Reliability of Data Research Ethics of Primary Data Data Collection Procedures	Scheme of Design Method and Data Collection Plan
5	Primary Data Collection	Design Experience: Visceral, Behavioural, Reflective Data Collection Plan and Challenges	Collecting Primary Data
6	Market Analysis	Market Segmentation, Targeting and Positioning	Conducting Market Analysis
7	User Analysis	Methods to build user empathy Introduction to Persona Introduction Scenario, Storyboard and Customer Journey Mapping Predicting User Experience	Develop Persona
8	Design Requirement and Objectives	Affinity Diagramming or Objective Tree	Making Affinity Diagramming
9	Idea Generation	Idea generation techniques: Brainstorming, SCAMPER, Mind Mapping, Mind Mapping, Random Input/ Connection, Analogy	Making 100 thumbnail sketches
10	Preliminary Design	Selecting Prospective Design Turn Prospective Design to Design Alternatives	Proposing Three Design Alternatives
11	Design Selection	Preliminary Design Comparison	Design Presentation
12	Design Resume	Abstract, introduction, design problems, design goals, methods and solutions	Write one page abstract (200 – 400 words)

13	Academic Publication	Criteria of academic publication Writing method Examples of Design Journals/Conferences	Writing a draft for Design Publication
14	Presentation Practice	Flow of Story, Common Pitfall, Time Management, Visualization, Voice Intonation	Presentation Draft
15	Eligibility for Colloquium	Check the checklist of the work Check eligibility for the Colloquium	
16	Research Colloquium	Attendant and Dressing code Preparation: Assignment, Technology Reporting and Supervisory	

The Design Research course requires intensive interaction amongst students, lecturers, external stakeholders, and target users. All the activities are designed using problem and project-based learning, and design thinking as a framework of thinking to solve the problems. When the COVID-19 pandemic happens, face-to-face classrooms could not happen anymore. These hands-on Design Thinking courses must be done online. This paper will discuss a case study on how the first author and her team experienced the challenging transition process, tackled and navigated during the transition from offline to online.

2. Case Study

This section discusses an example of how a design student at the Design Research course experienced offline to online transition during the Design Thinking process.

This student has a project to design an interactive planting media to educate primary to university students about Urban Farming. As the class started just before the lockdown, the student still had a chance to experience a few offline classes. The student could have a face-to-face interaction with the target users to build empathy. The project ideally requires him/her to work closely with students, parents, and teachers through shadowing, observation, contextual inquiry, and other ethnographic activities to understand their perspective, habits, and experience in planting at school, home, and other places. Amongst many of the activities planned were to conduct an observation when students watched a video about planting and started to create their own garden at school.

Below are the activities that are done online after the pandemic lockdown (see Table 3).

Table 3. *A Case Study of Design Thinking Online Experience*

DT Stages	Online Experience
Empathize	Empathy building activities cannot be done in person. Students and teachers have no access to the school garden during the lockdown, except the gardeners. This situation has disadvantaged the design student to be able to observe authentic situations and build empathy for the users and stakeholders as he/she planned before. Working with children (students) with no/a lack of prior experience in planting or farming can be challenging.

	To build empathy, the design students ended up with a literature study about children psychology, interviewed parents, and observed their own nieces/nephews who study at primary schools.
Map and Define	The students map the data from secondary research and limited primary research with somehow similar target users and stakeholders to define the problems during the course.
Ideate and Decide	With the online guidance from the lecturers, the design student could come up with several design concepts using various idea generation techniques like mind mapping and 100 thumbnail sketches and decide to build interactive and realistic learning props, where: - Students can observe the growth of the roots of the plants through a glass container. - Students can receive responses when they touch the plants, so they can be motivated to check the plants more frequently.
Prototype	The design student was unable to develop a prototype. They were only in the phase of reverse engineering on how the existing props work.
Test	The design student has not been able to test the prototypes because the prototypes require tangible interaction.
Release	These processes are not relevant because of the scope of the course, but the school requires students to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.
Post-Release	

3. Discussion and Reflection

3.1 Empathize

The case study shows only one example of the challenges faced by students in building empathy. Their design projects aim to develop tangible products. Thus, it requires the design of students to conduct a series of ethnographic studies before the process of Ideate and Decide to build empathy for their target users and stakeholders. Some of their users are not accessible with the online medium, for example, workers in remote areas or little children who have no access to personal digital devices.

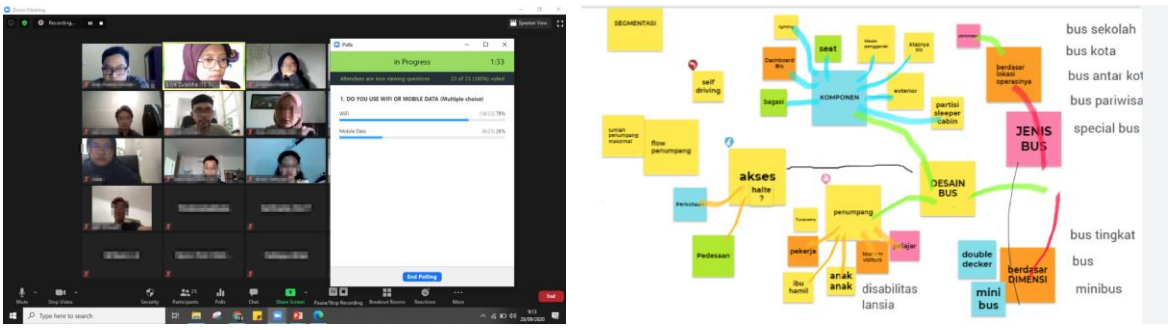

Figure 2. *Online Design Thinking Activities*

The current experience shows that the design students chose to change the building empathy plan with alternative activities, such as learning from the relevant literature, interviewing parents and children they know in their environment. The results of these activities may or may not be relevant and sufficient to get insights for the study. If this pandemic situation continues, the students will lose the learning opportunity to conduct proper empathy-building activities.

To improve this process, we suggest that a curriculum design intervention be made to ensure students have the most authentic learning experience. Some of the proposed ideas include: the department provides several dedicated projects that students can choose from.

With the dedicated projects, the schools already decide with the relevant people in the community to become the interviewees for the projects. Instead of working independently, students can work in a group of 2-4 people so they can support each other.

The assessment model needs to be improved so each student can be accessed fairly, for example, various types of assessment for each stage can be introduced, personal reflection, peer assessment, group assessment, differentiated teaching, and assessment (Lockhart, n.d.).

If the school has sufficient resources, the school may build a proper collaboration agreement with the relevant communities or organizations, where they can support with proper resources so communication and collaboration can be nurtured between them, the schools, and the design students.

The proposed activities above are in line with the following learning outcomes (refer to the Table 1 above):

Learning Outcome 5: Able to apply user-related theories to design projects, such as user experience design, personas, consumer journey mapping.

Learning Outcome 7: Able to collaborate with various parties in managing design research.

3.2 Map and Define

The current situation relies heavily on limited and irrelevant data collected by the students due to many restrictions to meet people face-to-face. Reflecting on this situation, if the design students can gather enough data from their stakeholders and target users, they will be empowered to map the users' pains and gains, and define their projects better. The key thing here is the data and the ability of the lecturers to teach the students the concept of mapping and defining problems (see Table 2, Week 7).

The students and lecturers reflected that earlier this year they faced communication problems in the teaching and learning themselves. They still struggle to find the balance between the right tune and rhythm for learning online apart from the core learning itself. However, as time goes by and online learning becomes a norm, access and literacy to the technology should not be a hindrance anymore.

The challenge is how the lecturers can scaffold complex information to the students, such as: building a persona, customer journey mapping, contextual scenario, and storyboard in one 4-hour meeting and 8-hour of independent learning. There are a lot of available templates, however, templates themselves are not enough to ensure the students are able to master these key skills because each case needs personalization and contextualization.

However, having less and dedicated projects as proposed in the Empathy stage would give a better scope for the study. Other proposed solutions to ensure authentic learning is to invite guest mentors or speakers, or previous students who have taken the courses to help in mentoring the students in their independent learning.

During pandemic situations, collaboration is key to strengthening the learning community. The academics need fresh insights to check with the reality from the industry practitioners, while the industry practitioners need to go back to the foundation to ensure they are on the right track, provide a channel to contribute back to the community, and build their professional mentoring portfolio (Sari and Wadhwa, 2015).

The proposed activities above are in line with the following learning outcomes (refer to the Table 1 above):

Learning Outcome 4: Able to present design projects through academic writing, posters, and verbal presentations.
Learning Outcome 6: Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.

3.3 Ideate and Decide

For a design student, being able to generate ideas for the design solutions is an important goal. The lecturers could provide sufficient guidance for the students to generate ideas (Ideate) and select alternative design (Decide) on weeks 3, 8, 9, 10, 11.

The experience of running offline studio-based experience has equipped the lectures with professional tacit knowledge, skills and experience to identify problems when students expressed enthusiasm, confusion or boredom. Being able to engage students in spontaneous conversation helps students to keep on the track, challenge themselves to be accountable with any design decisions they make, and can communicate their problems.

When doing this similar process online, the problems we discovered were more on engaging the students in an ongoing conversation as in the studio-based experience. Loneliness due to a lack of opportunities to exchange ideas and get spontaneous and relevant feedback was the biggest challenge faced by this group of students. Despite the challenges, we observed that students were highly resilient in coping with finishing their projects.

The design students fall into the category of Gen-Z, who are highly capable of using technology, in a deep desire for work-life balance, in need of constant feedback, and prone to negative feedback as they are often considered as a failure (Stahl, 2019).

To engage this generation, the lecturers need to intentionally design a constant and regular feedback mechanism within the classroom as a part of the learning process. The feedback mechanism is not optional, but it is part of the assessment for those who give and receive feedback. In addition to the students, lecturers also need to design a weekly dedicated session in addition to their official classroom meetings only to give feedback to the students or a session where the design students basically can ask anything related to the topic of the week.

The proposed activities above are in line with the following learning outcomes (refer to the Table 1 above):

Learning Outcome 4: Able to present design projects through academic writing, posters, and verbal presentations.
Learning Outcome 5: Able to apply user-related theories to design projects, such as user experience design, personas, consumer journey mapping.
Learning Outcome 6: Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.
Learning Outcome 7: Able to collaborate with various parties in managing design research.

3.4 Prototype

In a new normal situation, we need to change the way we think and operate our business. One of the learning

outcomes of the course is for the students to be able to implement design concepts into design alternatives. Prototyping is important evidence to show how the students transform user research data into design. Limitations, such as materials or tools to create the products are imminent, however, this situation should not stop the students to be creative in designing out-of-the-box solutions with innovative materials and approaches. Reverse engineering of the current solutions without clear expectations for innovation will only result in copying design solutions.

Our proposed solutions to consider the out-of-the-box solution as one of the aspects to assess. Pushing the students to explore a new area to find a specific solution is recommended. To improve a coffee product, Knapp, Zeratsky, and Kowitz (2016) looked for ideas and inspiration from anything outside of the coffee industry. Teaching methods and best practices of innovative and out-of-the-box prototyping will transform the current practice of prototyping activities.

The proposed activities above are in line with the following learning outcomes (refer to the Table 1 above):

Learning Outcome 1: Able to implement design concepts into design alternatives.
Learning Outcome 2: Able to visualize design alternatives using manual and digital media.
Learning Outcome 3: Able to apply design thinking principles in data collection, determination of design methods, and analyses required in formulating design concepts.
Learning Outcome 6: Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.

3.5 Testing

Currently, many of the design students have not been able to test their prototypes because the testing of the prototypes requires tangible interaction and the students need to physically meet the target users to get their feedback.

However, none of us know how long we will be in the COVID-19 pandemic situation and thus we need to work on how to intervene in this situation, how to hack the process of testing the prototypes, so authentic testing experience can still exist.

One of our proposed activities is creating a 3D or 360 videos of the prototype and organising remote and online Usability Testing (moderated and unmoderated depending on the project). The other thing that we can experiment with is by sending cultural probes that consist of the miniature of the prototype with a pack of video or diary study to the target users so they can still have tangible interaction with the prototype in a unique way.

The proposed activities above are in line with the following learning outcomes (refer to the Table 1 above):

Learning Outcome 4: Able to present design projects through academic writing, posters, and verbal presentations.
Learning Outcome 6: Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.
Learning Outcome 7: Able to collaborate with various parties in managing design research.

3.6 Release and Post Release

The Development Stage that consists of the Release and Post-Release steps of the Design Thinking 2.0 (Sari, 2020; Tedjasaputra and Sari, 2020) has not been explored yet in this course. However, this stage is a key stage when implementing Design Thinking in a real-world environment. This stage gives a sense of urgency and limitation of resources to get a product out of the line, which will financially benefit the stakeholders.

While Design Research courses emphasize a common Design Thinking approach, this course needs to be transformed to meet with the current industrial needs by adding the Development Stage as one of the components. The lecturers need to intentionally develop learning outcomes and activities to ensure students get the appropriate skills and assessed properly.

The proposed activities above are in line with the following learning outcomes (see Table 1):

Learning Outcome 6: Able to construct design concepts based on considerations of needs, technological feasibility, and environmental and responsible business considerations.
Learning Outcome 7: Able to collaborate with various parties in managing design research.

4. Conclusions and Future Works

The study has opened new ideas on how to run Design Thinking courses in a university during the global pandemic situation. The pandemic and its impact were unknown to all. Most of us have endeavored to find ways to make things work and give better results. This includes the education field as well.

This online Design Research course has a set of learning outcomes to equip students with key skills to run user experience design projects using the Design Thinking framework. During the first cohort, there were a lot of hiccups, which were mainly due to technology literacy, access, motivation, and external factors like access to target users, etc.

However, as the times progressed and learning online has become a norm in a new normal, the course needs to be leveraged and transformed. Using Design Thinking 2.0, which is an advanced Design Thinking framework developed by the second author, we conclude the following plans for the transformation of the Design Thinking courses (see Table 4).

These plans will be discussed further with other stakeholders who are part of the education system, but not part of this project to get approval for trials in the upcoming semesters.

Table 4. *Transformation Plan for the Design Thinking Course – Design Research*

Stages	**Proposed Interventions**	**Learning Outcomes**
Emphasize	● Dedicated projects, contacts, and interviewees ● Group Project instead of Individual Project ● Various Assessment Models: Differentiation, Individual, Peer and Group Assessments	LO5, LO7
Map and Define	● Comprehensive scaffolding teaching and learning ● Personalized Mentoring Scheme: Industry Practitioners, and Peers	LO4, LO6
Ideate and Decide	● Comprehensive scaffolding teaching and learning ● Personalized Mentoring Scheme: Industry Practitioners, and Peers ● Intentional Feedback Mechanism: Practitioners,	LO4, LO5, LO6, LO7

	Lecturers, and Peers	
Prototype	● Out-of-the-box Prototyping Methods and Process	LO1, LO2, LO3, LO6
Test	● Remote, Online Usability Testing using Authentic Video ● Sending Culture Probes with Prototype Miniature	LO4, LO6, LO7
Release	● Introducing the Development Stage of Design Thinking 2.0 that consists of Release and Post-Release in the Curriculum	LO6, LO7
Post-Release		LO6, LO7

References

Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation Introduction*. New York, NY: HarperCollins.

Knapp, J., Zeratsky, J. & Kowitz, B. (2016). *Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days*. New York, NY: Simon and Schuster.

Lockhart, S. (n.d). High Impact Teaching Strategies in Action: Differentiated Teaching. Retrieved from https://www.education.vic.gov.au/school/Pages/default.aspx on September 30, 2020.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences*, *4*(2), 155-169.

Sari, E. (2020). Design Sprint for Digital Transformation. A recording from the 2nd Thai SIGCHI Symposium: HCI and UX for Digital Transformation. Retrieved from https://www.facebook.com/watch/?v=573896596627642 on September 30, 2020.

Sari, E. & Wadhwa, B. (2015). Understanding HCI education across Asia-Pacific. In *Proceedings of the International HCI and UX Conference in Indonesia (CHIuXiD '15)*. Association for Computing Machinery, New York, NY, USA, 65–68. DOI: https://doi.org/10.1145/2742032.2742042.

Tedjasaputra, A. & Sari, E. (2020). Design Thinking 2.0 for Curriculum Design and Development. A position paper at ICCE 2020 Workshop: Design Thinking: Hacking Education During and Post Covid-19 in So, H. J. et al. (Eds.) (2020). *Proceedings of the 28th International Conference on Computers in Education. Asia-Pacific Society for Computers in Education*.

Stahl, A. (2019). How Generation-Z Will Revolutionize the Workplace. Retrieve from https://www.forbes.com/sites/ashleystahl/2019/09/10/how-generation-z-will-revolutionize-the-workplace/#1689b6564f53 on September 30, 2020.