So, H. J. et al. (Eds.) (2020). Proceedings of the 28th International Conference on Computers in Education.
Asia-Pacific Society for Computers in Education

# Design Thinking 2.0 for Curriculum Design and Development

**Adi TEDJASAPUTRA[a*] & Eunice SARI[b]**
[a]*Customer Experience Insight Pty Ltd, Australia*
[b]*UX Indonesia and Charles Darwin University, Indonesia and Australia*
*josh@cxinsight.com.au

**Abstract:** This paper describes several identified gaps in Backward Design and how Design Thinking 2.0 may bridge the gaps. Never intended to be a silver bullet, Design Thinking 2.0 is a promising alternative to Backward Design that still requires further validation from more case studies.

**Keywords:** Curriculum Design and Development, Backward Design, Design Thinking 2.0, Design Thinking, Education, Wicked Problems

## 1. Curriculum Design and Development

As a process that requires high-order creative and critical thinking, curriculum design and development can be categorized as a wicked problem (Rittel, H. W., & Webber, M. M., 1973).

While many have tried to solve this wicked problem (Hitchcock, C., Meyer, A., Rose, D., & Jackson, R., 2002, Tomlinson, C. A., Kaplan, S. N., Renzulli, J. S., Purcell, J., Leppien, J., & Burns, D., 2002, Mishra, P., & Koehler, M. J. 2007, Melles, G., Howard, Z., & Thompson-Whiteside, S., 2012), a prominent planning framework that has been used by many for the last fifteen years is Backward Design (Wiggins, G., Wiggins, G. P., & McTighe, J., 2005).

## 2. Backward Design

Since the introduction of Backward Design in the publication of Understanding by Design, many educators around the world have successfully used Backward Design as an integrated assessment, content, resources, and instruction planning framework (Childre, A., Sands, J. R., & Pope, S. T., 2009, Richards, J. C., 2013, Davidovitch, N., 2013, Cooper, K. M., Soneral, P. A., & Brownell, S. E., 2017).

The main advantage of Backward Design is that teachers should be able to focus on teaching more effectively based on defined learning goals, while students should be able to focus on learning more effectively based on expected learning outcomes. In an ideal situation, every piece of instruction, resource, content, and assessment has a cohesive purpose towards the learning goals.

Despite its success in improving the effectiveness of teaching, Backward Design has several drawbacks as follows:

- Teachers communicate the learning goals to students and sometimes parents after the process of Backward Design has ended, and usually at the beginning of a lesson or course. When an extreme or sudden change in a situation that occurs during the lesson, like what we have experienced in the COVID-19 pandemic, there is no evidence or data to help teachers adjust their teaching.
- The premise of any successful Backward Design is the definition or identification of effective learning goals. Although teachers are provided with guiding questions in the three-stage process of Backward Design and guidelines related to the curriculum, such as a national curriculum, a failure in defining or identifying relevant and effective learning goals will catastrophically fail in the whole planning process.

- Backward Design is a teacher-centered framework that has no built-in mechanism to include student participation in the process of planning. In the three-stage process of Backward Design, a teacher is provided with several guiding questions to help them create content, resources, instruction, and assessment for the students, without student participation or feedback.
- There is no built-in litmus test to evaluate the outcome of the Backward Design process against the real needs of students.
- There is no built-in support or mechanism for planning personalised learning activities or differentiated instructional design based on evidence of student needs.

## 3. Design Thinking and Design Thinking 2.0

Design Thinking continues to expand its meaning and connections in contemporary culture (Buchanan, R., 1992). In this paper, we will use the following definition of Design Thinking: A non-linear iterative human-centred design process to solve wicked problems.

While Design Thinking has been around for about five decades (Simon, H. A., 1969), its application in curriculum planning is still in its infancy. Simon N. Leonard, Robert N. Fitzgerald & Geoffrey Riordan (2016) argues for the use of developmental evaluation as a design thinking tool for curriculum innovation in professional higher education. Willness, C., & Bruni-Bossio, V. (2017) introduces a Design Thinking framework of Curriculum Innovation Canvas that promotes a creative and fluid approach to curriculum development. Crites, K., & Rye, E. (2020) reports on the outcome of an exploratory case study based on the implementation of Design Thinking in a language curriculum design process at a Colombian university.

Design Thinking 2.0 (see Figure 1) (Sari, 2020) is an advanced version of the Design Thinking framework. 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.

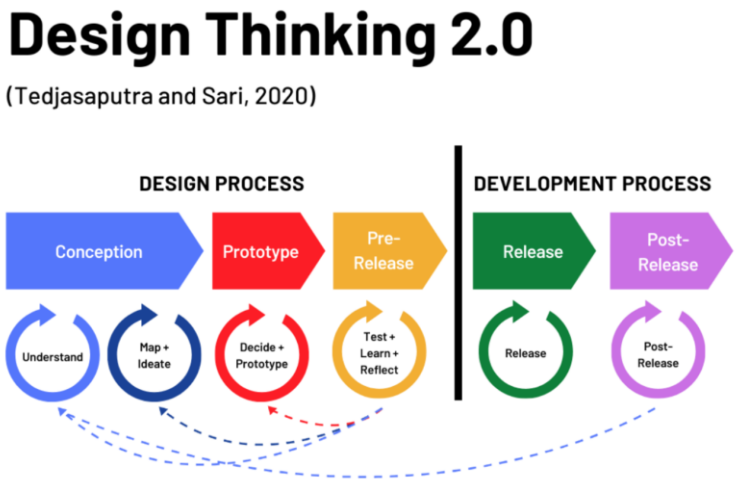


*Figure 1.* Design Thinking 2.0

In relation to the design and development of curriculum, the Design Thinking 2.0 may provide an alternative to Backward Design. Similar to Backward Design, a teacher can use Design Thinking 2.0 as an integrated planning framework for designing assessment, content, resources, and instruction, and also bridge the gap posed by the Backward Design. Providing potential solutions to the gaps identified in the Backward Design, Design Thinking 2.0 has several advantages:

- Teachers communicate the learning goals not only to students but also to parents before a planning process starts in Design Thinking 2.0. This event will provide an opportunity for both students and parents to provide feedback on the learning goals. If an extreme or sudden change in a situation occurs, like what we have experienced in COVID-19 pandemic, the teacher will be in a better position to adjust the learning goals based on prior feedback data and evidence from students and parents.
- Due to the explicit and iterative process of identifying and mapping student needs, behaviour, attitude, pain, and gain in Design Thinking 2.0, the risk of identifying or defining false learning goals can be mitigated.
- Nonetheless, when a failure is identified during a Design Thinking 2.0 process, it naturally occurs during the planning process, and not after the process has completed.
- Once a failure is identified in the learning mechanism of Design Thinking 2.0, the teacher can then identify and rectify the problem based on data and evidence.
- With a philosophy of designing for, with and by the students in a student-centred learning framework, Design Thinking 2.0 includes students in different roles throughout the process.
- In Design Thinking 2.0, there is a built-in litmus test to evaluate the outcome of the Backward Design process against the real needs of students.
- The use of Persona and Student Journey Map in Design Thinking 2.0 facilitates the development of relevant and effective plans for personalised learning activities and differentiated instructional design based on evidence of student needs.

Having outlined the advantages of using Design Thinking 2.0 compared to Backward Design, we have also identified some challenges posed by it:

- At least one facilitator is required in a Design Thinking 2.0 to help teachers in planning.
- The non-linear iterative nature of Design Thinking 2.0 implies that the process is more complex than Backward Design.
- The success of Design Thinking 2.0 relies heavily on the skills and experience of the facilitator.

## 4. Future Works

While Design Thinking and Design Thinking 2.0 applications in solving wicked problems in education are still emerging, in this paper we have presented the potential advantages of applying Design Thinking 2.0 in curriculum design and development. Nonetheless, as we need more data and evidence to support our thesis on the application of Design Thinking 2.0, we actively encourage and collaborate with the educational community to start identifying how Design Thinking 2.0 may benefit to solving wicked problems in education.

### References


Buchanan, R. (1992). Wicked problems in design thinking. *Design issues*, *8*(2), 5-21.

Childre, A., Sands, J. R., & Pope, S. T. (2009). Backward design: Targeting depth of understanding for all learners. *Teaching Exceptional Children*, *41*(5), 6-14.

Cooper, K. M., Soneral, P. A., & Brownell, S. E. (2017). Define your goals before you design a CURE: a call to use backward design in planning course-based undergraduate research experiences. *Journal of microbiology & biology education*, *18*(2).

Crites, K., & Rye, E. (2020). Innovating language curriculum design through design thinking: A case study of a blended learning course at a Colombian university. *System*, *94*, 102334.

Davidovitch, N. (2013). Learning-centered teaching and backward course design from transferring knowledge to teaching skills. *Journal of International Education Research (JIER)*, *9*(4), 329-338.

Hitchcock, C., Meyer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum: Universal design for learning. *Teaching exceptional children*, *35*(2), 8-17.

Melles, G., Howard, Z., & Thompson-Whiteside, S. (2012). Teaching design thinking: Expanding horizons in design education. *Procedia: Social and Behavioral Sciences*, *31*, 162-166.

Mishra, P., & Koehler, M. J. (2007, March). Technological pedagogical content knowledge (TPCK): Confronting the wicked problems of teaching with technology. In *Society for Information Technology & Teacher Education International Conference* (pp. 2214-2226). Association for the Advancement of Computing in Education (AACE).

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

Simon, H. A. (1969). The sciences of the artificial. *Cambridge, MA*.

Simon N. Leonard, Robert N. Fitzgerald & Geoffrey Riordan (2016) Using developmental evaluation as a design thinking tool for curriculum innovation in professional higher education, Higher Education Research & Development, 35:2, 309-321, DOI: 10.1080/07294360.2015.1087386

Richards, J. C. (2013). Curriculum approaches in language teaching: Forward, central, and backward design. *Relc Journal*, *44*(1), 5-33.

Tomlinson, C. A., Kaplan, S. N., Renzulli, J. S., Purcell, J., Leppien, J., & Burns, D. (2002). *The parallel curriculum: A design to develop high potential and challenge high-ability learners*. Corwin Press.

Wiggins, G., Wiggins, G. P., & McTighe, J. (2005). *Understanding by design*. Ascd.

Willness, C., & Bruni-Bossio, V. (2017). The curriculum innovation canvas: A design thinking framework for the engaged educational entrepreneur. *Journal of Higher Education Outreach and Engagement*, *21*(1), 134-164.

Anderson, R. E. (1992). Social impacts of computing: Codes of professional ethics. *Social Science Computing Review*, *10*(2), 453-469.

Chan, T. W., Roschelle, J., Hsi, S., Kinshuk, Sharples, M., Brown, T. et al. (2006). One-to-one technology-enhanced learning: An opportunity for global research collaboration. *Research and Practice in Technology-Enhanced Learning*, *1*(1), 3-29.

Conger, S., & Loch, K. D. (1995). Ethics and computer use. *Communications of the ACM*, *38*(12), 30-32.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning to Solve Problems with Technology: A Constructivist Perspective (2nd Edition)*. Columbus, OH: Prentice Hall.

Mackay, W. E. (1995). Ethics, lies and videotape. In I. R. Katz, R. Mark, L. Marks, M. B. Rosson, & J. Nielsen (Eds), *Proceedings of CHI'95* (pp. 138-145). Denver, Colorado: ACM Press.

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.

Schwartz, M., & Task Force on Bias-Free Language of the Association of American University Press (1995). *Guidelines of Bias-Free Writing*. Bloomington, IN: Indiana University Press.