

A model to design, develop, and evaluate online adaptive learning

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In a previous publication, we have described three design approaches (pragmatic, instrumental and communicative) to involve and guide teachers in designing digital adaptive learning (see Lucero, 2022b). While a **design approach** reveals your way of thinking, a **design model** tells you the specific sequence of steps to follow in the design process. In this article, we introduce the design model we follow to create adaptive learning materials and paths in the context of higher education.

Adaptive learning materials and paths provide students with different content or sequences of activities depending on their preferences, knowledge, behavior, etc. Online adaptive learning refers to tailored learning supported by a digital system. See more in Lucero (2022a).

Training the teachers in adaptive learning and instructional design

Since May 2022, we have been training teachers in the design, development, and evaluation of two adaptive learning materials (an adaptive video and adaptive questions) and two adaptive learning paths (one in the Blackboard Ultra and one in our eCourses-platform). These are four [pilot projects](#) in the framework of the project “[Adaptive Building Blocks for Blended and Distance Learning](#)” at Odisee University of Applied Sciences.

Our training consists of general sessions, individual sessions, workshops, and self-study materials. We started with a general session to get to know each other and to reflect on adaptive learning. This was especially important to clarify some concepts and create a sense of togetherness. From then on, weekly sessions have been arranged with each teacher apart. We train teachers in the use of audiovisual equipment, educational programs (e.g., H5P, Camtasia, Stornaway.io), and learning platforms (e.g., Blackboard Ultra and Odisee eCourses). Moreover, our teachers have learnt by themselves programs like Miro, Möbius, Visio, and others.

To keep the teachers engaged in the project, we follow the communicative approach (Kessels, 2000), which includes project management and relationship building strategies; but primarily, we follow the **pragmatic approach** (Visscher-Voerman & Plomp, 1996, Visscher-Voerman, Gustafson, & Plomp, 2000) when designing adaptive learning. In the pragmatic approach, several preliminary versions of a product are being evaluated by experts and users before reaching a definitive version. See more in Lucero (2022b).

The design model

The design model tells what activities to follow in the design process. In our project, we took as basis a generic model of instructional design (Kessels & Plomp, 1999):

1. Preliminary Inquiry
2. Design
3. Construction
4. Test and revision
5. Implementation

Like the popular ADDIE model (Analysis, Design, Development, Implementation and Evaluation), this model raises three fundamental questions: Where are we going? How do we get there? And how do we know when we have arrived? In our case, however, we do not address the detailed formulation of learning objectives as suggested by the ADDIE model (see Mager, 1997, and Smith & Ragan, 2005, for comprehensive guidelines for writing learning objectives). While the ADDIE model is more instrumental (planning by objectives) than pragmatic, our approach is more pragmatic (trial and error) than instrumental.

When we adapt the model of Kessels & Plomp (1999) to our project, we get the model shown in Figure 1. It is a **prototyping model of instructional design**.

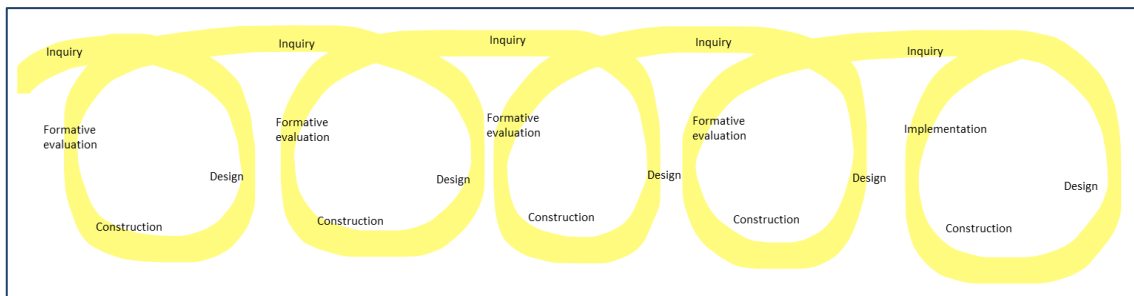


Figure 1: A prototyping model of instructional design. Image by Maria Lucero

As shown in Figure 1, we work with cycles of prototypes in continuous improvement. The evaluations are formative because we have not yet come to a definitive version. The evaluations are not about the performance of the students, but the quality of the product.

As stated by Visscher-Voerman & Plomp (1996), prototyping models provide a "straightforward view of the flow of the design process: the models propose that there is a specific order of steps and that they are carried out several times (cycles) to create a useful end product." (p. 24)

We plan to conduct at least four formative evaluations to improve the prototypes. A first prototype will be evaluated by a professional instructional designer; a second, by an expert in educational technology or a fellow teacher (expert in the content and the students). A third prototype will be evaluated by one or two students using the "read-think-aloud" technique, which means that the student tells aloud what he/she is thinking while interacting with the learning materials. Finally, the fourth version will be tested with some students from the target group. The project will conclude with the development of the definitive version and the corresponding report.

Since the project runs for a limited period, it is up to the teachers to implement the products with a large group of students later in the academic year or during the next one. At that point, a summative evaluation would be recommended to identify factors that facilitate or hinder the implementation.

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