What is adaptive learning?

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Basically, adaptive learning is tailor-made learning (Vlaanderen, 2020). It is a teaching strategy that takes into account what the learner already knows before moving on; it adapts the learning activities or materials to the needs of the learners. Some learners need to repeat some steps, some others need to skip them; some of them need to go slower, some others need to go faster.

In consequence, adaptive learning is particularly helpful when working with heterogenous groups. Beginners, intermediate and advanced learners are offered different learning trajectories, also called adaptive learning paths. This article refers mostly to adaptive learning supported by a digital system. Adaptive learning can also take place in a setting where the teacher adjusts activities or content based on e.g. the responses given to questions or the body language of students in the class.

The government of Flanders states that students learn more efficiently in an adaptive learning environment. High motivation and targeted feedback during adaptive learning might be the reasons for learning efficiency. Students get motivated with exercises or content challenging enough but not too difficult to give up (Vlaanderen, 2020). It is also motivating to see their progress in visual charts. Targeted feedback focuses on what they did well and how they can improve in relation to specific learning goals (MIT Teaching + Learning Lab, n.d.). According to Kurt (2021), “studies have shown that students are more engaged when they are able to practice frequently. Adaptive learning models also provide immediate feedback, reduce the amount of meaningless tedious work for the instructor themselves” (para.2).

Adaptive learning can be used in the cognitive, affective or psychomotor domain. In the cognitive domain, adaptive learning supported by a digital system seems to be especially useful when the objective is to remember or recall, like in language and mathematics. Remember is, according to Bloom’s taxonomy, at the base of other types of learning, like comprehension, application, analysis, evaluation, and creation. The highest-levels are difficult to assess by a digital system and, consequently, less suitable for digitally-supported adaptability.

Digitally-supported adaptability is certainly not meant to replace the personalized learning experience a teacher can provide. It might depend on the learning objectives but still, when working at the basic level, the involvement of the teacher is necessary. What would be the role of the teacher ? Xerte Online Toolkits (2021), summarizes it as follows:

1. to motivate the students to follow the path, to keep them engaged.
2. to maintain individual contact, feedback, appreciation, and support.
3. to analyze the available data about the students and understand their learning behavior, such as drop out or procrastination.
4. to give meaning to the content; that is, to show the relevance of the content in different contexts, to make a link with the personal experiences and current events.

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Additionally, the role of the teacher is to continuously evaluate the materials and activities proposed and to secure the alignment between learning objectives, learning activities and assessment (i.e., test items). This requires a deep knowledge of instructional design. No matter how far technology goes, the principles of instructional design remain at the core of any educational innovation.

The creation of adaptive learning paths is time-consuming; mostly because it implies the creation of diverse content options. As an alternative, the focus could be on metacognitive learning strategies to help the student learn the already existing content. How do students process the reading material? Do they highlight the main information, make a summary, a concept map? Could we provide them with hints and other types of questions? Does the student take notes when watching a video? The same goes about the idea of creating diverse content to satisfy diverse learning styles. In fact, some scholars doubt that students learn better through a self-reported learning style. Instead, the focus could be on learning to learn. “A broader approach that invites students to reflect on their learning, rather than narrow their style down, has been shown to improve learning outcomes” (Ambrose et. al, 2010, as cited in Yale Poorvu Center for Teaching and Learning, n.d.).

Adaptive learning platforms collect data regarding the interaction of the learner with the digital system. Adaptive learning can be based on artificial intelligence or on rules predefined by the instructor. Depending on this, we talk about **AI-based adaptive learning** or **rule-based adaptive learning** (Aberdour, 2021). The first one adjusts the activities or content to all the data collected from the learner and other learners in the same system and in other systems (performance, demographics, etc.). The more data collected, the better the system can adapt the experience by itself. Rule-based adaptive learning, on the other hand, requires less data and mostly uses if/then conditions or a specific response of the learner to present a certain learning path depending on the fulfillment of those conditions (the learner performance). The learning experience is organized as a set of decision trees.

While the concept of learning paths might be easy to understand (ancestrally and even instinctively, teachers have used them with slow learners, for example, before technology appeared), the concept of adaptive learning materials requires a paragraph apart and some examples. Adaptive learning materials identify where the student gets stuck and offer more practice or clarifications.

> Wrong answers can be analyzed with intelligent machine learning algorithms instead of just determining that the assignment has been done or that the answer is right or wrong. A very simple example: Take the sum “2+3 = …” and the answer categories a) 5, b) -1, c) 6, d) 8. A student who answers (b) is subtracting instead of adding and the student who answers (c) is multiplying. Students who answer (d) aren't just misreading the math sign, there's more to it than that. The feedback and the follow-up assignment can be adjusted based on the error that is made. (van Elk et al., 2021, p. 5).

Other examples provided from the authors are the adaptive practice tests where the student gets a more difficult question or exercise only if he/she answers correctly the previous one; otherwise, the level of difficulty remains the same till the answer is correct.

In conclusion, adaptive learning has several forms. Nowadays, it refers to tailor-made learning supported by a digital system, even though teachers have ancestrally use tailor-made learning in the classroom. It is based on rules previously determined by an instructor or on the artificial intelligence of a machine. Finally, it can be designed as adaptive learning paths or adaptive learning material. Given the many possibilities and advantages adaptive learning offers, the current high interest of

the government, educational institutions, and teachers in this topic is not a surprise. The covid-19 pandemic also gave a boost to the digitalization of education in the last two years. Teachers, who are enthusiastic about online/blended learning, are invited to test out the adaptivity options and identify the most realistic approach in their personal case. Tailor-made learning for the students implies an approach tailor-made for the teacher.

References:

Aberdour, M. (2021, January 19). Understanding rule-based and AI-based adaptive learning. *Open Thoughts blog.* https://www.open-thoughts.com/2021/01/19/rule-based-vs-ai-adaptive-learning/

Kurt, S. (2021, September 12). Adaptive Learning: what is it, what are its benefits and how does it work?. *Educational Technology blog*. https://educationaltechnology.net/adaptive-learning-what-is-it-what-are-its-benefits-and-how-does-it-work/

MIT Teaching + Learning Lab (n.d.). *How to give feedback*. https://tll.mit.edu/teaching-resources/assess-learning/how-to-give-feedback/

Vlaanderen. (2020, May 25). Adaptief leren = leren op maat. *i-Learn blog*. https://www.i-learn.vlaanderen/nieuws/edtech/adaptief-leren-leren-op-maat/

van Elk, W-J.; Voorzanger, J.; Vermaas, K.; Karstens, B., van der West, H.; Vroom, J.; Camp, G.; Baten, D. (2021). Trend adaptief leermateriaal in het hoger onderwijs: kansen en risico's. SURF. https://www.surf.nl/adaptief-leermateriaal-in-het-hoger-onderwijs-wat-zijn-de-kansen-en-uitdagingen

Xerte Online Toolkits. (2021, June 4). *Aan de slag met audio en video in Xerte: presentatie webinar*. [PowerPoint slides]. https://toll-net.be/moodle/xertetoolkits/xapi_launch.php?template_id=51191&group=groupname#page3

Yale Poorvu Center for Teaching and Learning. (n.d.). *Learning Styles as a Myth*. https://poorvucenter.yale.edu/LearningStylesMyth

Other recommended sources:

Designing The Learning Journey

https://elearningindustry.com/strenghts-weaknesses-adaptive-learning-paths-case-study

Adaptive learning
https://en.wikipedia.org/wiki/Adaptive_learning#:~:text=Adaptive%20learning%20systems%20can%20be,incorporating%20aspects%20of%20adaptive%20learning

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