A BRIEF ANALYSIS OF THE PROS AND CONS OF ONLINE ADAPTIVE LEARNING AND EDUCATION

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ABSTRACT. Ever since ancient times, education has been a topic of interest for many civilizations. Seen as a means of progress, education was the main focus for some countries like Finland, and almost ignored by others.

In the last decade, a new term has appeared in regard to education: adaptive learning. Used almost ubiquitous, the term has gained fame due to its presence in a 2013 program launched by the Gates Foundation, abbreviated ALMAP (Adaptive Learning Market Acceleration Program). This program changed into a grant that funded 14 higher education organizations to implement 9 adaptive learning products into 23 courses. The aim was to test and gather data on the impact of these programs of student outcomes. Almost instantly, the term became famous and used by many in their marketing and promotional strategies. In this brief analysis, we discuss the definitions, terminology, use, and pros and cons of adaptive learning in online education.

Keywords: adaptive learning, teaching, education, online, classical, students, teachers, schools, universities

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Introduction

Adaptive learning refers to a non-linear approach to online education that adapts to the needs of the students, as they advance in the courseware. This leads to a specific and personalized educational experience for the students, based on previous information and knowledge. Classical education, on the other hand, is mode linear and does not include any personalized educational means. To achieve this goal, adaptive learning is based on algorithms, course analytics, assessment information taken from knowledge and personality tests, students' feedback, teachers' feedback and information presented in different formats such as video, photo, text, animations (Educause, 2017). This allows for new learning information for those that have achieved mastery or for those that are still struggling to achieve a certain level of expertise (Educause, 2017).

Among the first researchers to study adaptive learning is Bloom (1971), who proved that the differences in performance among students can be solved through personalized and differentiated learning. For this, Bloom implemented a teaching strategy called learning mastery, where content and learning skills are organized in individual units, presented to the students at the beginning of teaching and followed by a formative evaluation (Murray & Pérez, 2015). The feedback achieved from this evaluation identifies if and what sort of remedy teaching is necessary. This way, activities and lessons that correct students' lacks are implemented and the "evaluation - feedback - correction" cycle is done over and over again, until mastery is achieved. Testing this method, Bloom (1984) managed to prove that the expertise achieved in a one to one teaching has higher benefits than conventional teaching. These learning benefits have been assigned to the constant adjustments and personalization done by teachers, based on the progress achieved by students. Bloom was a strong believer in the idea that all students can achieve superior results if given the proper learning conditions, meaning teaching adapted to their rhythm, learning rate and style (Murray & Pérez, 2015).

Bloom started this idea based on his taxonomy of educational objectives (Bloom, 1956) and divided the cognitive processes from the simplest such as knowledge remembering to the more complex, like making judgements about the value of an idea. Later on, in 1999, Lorin

Anderson wrote an updated version of Bloom's taxonomy, which accounts for a larger number of factors that have an impact on learning and teaching. Unlike the former version, this new taxonomy makes the difference between knowing what and knowing how.

Technical implementation

In terms of technical implementation, although different, these adaptive systems have three things in common:

A student model, which involves student characteristics, such as personal data, learning habits, level of knowledge and learning styles (Huong, 2016). In this model, there are two options - a static model, that uses the students' attributes just once and a dynamic model, that constantly and continuously updates students' attributes. These characteristics can be explicitly achieved through scales and assessment tools or implicitly, by watching students' interaction with the system (Murray & Pérez, 2015).

A domain model, which aims at organizing knowledge in an area, by mapping learning resources such as content, exercises, evaluations and other learning objectives (Murray & Pérez, 2015). In other words, this model shows what needs to adapt and the most important aspect of this model is represented by breaking knowledge into learning elements. This model is implemented as a set of resources described as meta-data, that includes traits, knowledge, instructor role. A proper model is built from a collection of materials that are diverse in terms of format, type and teaching method.

An adaptation model, that represents the teaching strategy that defines how and where adaptation takes place, by analysing students' characteristics and adding learning resources (Murray & Pérez, 2015).

Types of adaptive systems

In terms of teaching systems, there are three types, and some of those are adaptive: closed, open and hybrid systems. Closed systems have predefined content and courses, for a fast implementation. Open systems

allow students to control all configurations of a teaching and learning platform, as well as to take decisions regarding the content. Hybrid systems allow a limited configuration, such as selecting the lessons to include or importing parts of courses. Presently, there is a preference for hybrid systems, because they combine the time necessary for developing adaptive courses with the flexibility of platforms to control content and evaluations.

Within the adaptive learning systems, learning content, concepts sequence and evaluations are configured in such a manner to reflect the learning objectives of the course. The systems show the content based on a series of factors such as students' performance, demographics or similar skills or use some predetermined learning paths based on the information gained from evaluations. As students progress based on their evaluations, they can see the information presented in diverse ways, personalized according to their learning needs. From the interactions with the students, the systems learn and adjust their learning rhythm. This personalization means adapting the learning environment to the students' needs (Monova-Zheleva, 2005). Most of those personalized learning systems are done for e-learning or m-learning (mobile learning) and only few are built for cloud-based learning (Nedungadi & Raman, 2012).

There are several platforms and content creators that offer such adaptive learning tools, like Khan Academy, McGraw-Hill or Pearson. Some new platforms appear like Acrobatiq, Cerego or Smart Sparrow, that offer systems with a certain degree of personalization. There are also schools and universities that are using and testing adaptive education: Arizona State University, Arizona North University or Florida University.

Pros and Cons of Online Adaptive Education

In terms of advantages, an adaptive education system allows students to apply the knowledge they accumulated previously and learn faster. Also, students can achieve mastery before moving to a new topic and teachers can avoid teaching for the average students. Also, it was proven that, after being enrolled in an adaptive course, students come back for more similar courses and they consider the time spent as a good investment (Freda, 2016). Teachers can monitor students' needs easier

and also measure their performance (Educause, 2017). Adaptive education can help students remember more information and achieve higher outcomes (Nakic, Granic & Glavinic, 2015). In an adaptive learning system, students have the possibility to personalize their learning, which can increase their competence (Dziuban, Moskal, Johnson & Evans, 2017). Liu & Lim (2020) suggest using AI (Artificial Intelligence) to solve the balance between scalability and quality and propose a model named SEAL (Self-Evolving Adaptive Learning), which is a system that allows personalized learning. This is definitely a plus, since AI is a widely studied concept, with a lot of funds invested in research and development.

Sangineto et al. (2008) noticed significant differences in students' performance before and after using an adaptive learning system, with a sharp progress. Latham et al. (2004) showed that students learning with an adaptive system recorded higher test scores than those learning in a classical approach. Adaptive learning is an excellent way of helping both at risk students and advanced ones (Educause, 2018), especially by measuring the data through analytics, which can predict what will happen with those students and how to make that happen. Other pluses are the scaling of this type of teaching, the lower costs and downsizing fraud attempts due to a personalized content and evaluation (Educause, 2017).

Simply put, the adaptive learning approach transforms the current education paradigm (Elmunsyah, 2020) and allows anyone to learn from anywhere, at any time.

On the negative side, some scientists cautioned that the technological transformations we are now experiencing can enrich and guide the learning experience (Stracke & Tan, 2018), and at the same time they have the potential to neglect students' affective learning (Näykki et al., 2019). It was shown that, at the beginning, students spend more time with an adaptive course compared to a traditional one (Freda, 2016). Implementation costs are higher at first, sometimes the support is inappropriate, the amount of information and training needs are bigger (Freda, 2016). Adaptive teaching requires a considerable amount of time to build a detailed curriculum and a content to support learning objectives (Educause, 2017). Last, these systems are useful in competence based programs, where students learn at their own pace. Although not exactly a minus but rather a myth or a misconception, is the idea that adaptive learning systems will replace the

teachers currently teaching in a classical format (Cavanagh, Chen, Lahcen & Paradiso, 2020). Yet this could not be further from the truth because, though automatized, the process of adaptive learning still needs humans to design, implement, test and continuously adjust the process. Rather, adaptive learning is and will become a complementary approach to classical teaching. Means et al. (2010) proved in a meta-analysis that blended learning (a combination of both traditional teaching and online adaptive learning) yields more positive effects than a simple face to face teaching alone. Karam et al. (2016) studied these issues and mentioned the importance of two main concepts - fidelity and quantity. By fidelity, they measured whether a course was implemented exactly as it was meant, and by quantity, they measured the amount of an intervention needed to achieve an effect. Phillips, Pane, Reumann-Moore & Oluwatosin (2020) consider that one of the challenges in online adaptive learning is to keep the students on task. For this, the technology must be engaging enough to prevent the students from doing something else during teaching. Also, teachers will need constant support to help them understand and integrate the online adaptive learning strategies with the classical approach (Phillips et al., 2020).

Conclusions

Currently, with few researches that have tested these systems, there are a lot of challenges when supporting adaptive learning education (Cavanagh, Chen, Lahcen & Paradiso, 2020), such as finding funds and grants, convincing students and teachers to use these platforms, selecting the right people to teach, collecting and analysing big data and, last but not least, understanding and accepting that adaptive education is not a holy grail with solutions for everyone and everything. There is a growing need to continue to develop apps and programs that implement and test adaptive learning, both in academic and private endeavours. It is clear that the classic - linear education we have used so far can no longer be successfully applied with nowadays students, because their environments and needs have changed, and ultimately, the world has changed. And these changes bring the need for schools and universities to accept a harsh truth: adapt or become obsolete.

All these studies prove that further data and research is needed to clarify how adaptive learning should be implemented in real practice (Miaomiao & Rui, 2020). It is obvious that studying and incorporating adaptive learning is the right path to choose in the current worldwide development. And that, for optimal results, educational best practices should consider implementing adaptive learning, complementary with the classical face to face teaching.

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