Elements of an Adaptive Learning System

A fully adaptive learning program should be designed with one primary goal: to cause learning. Adaptivity is not the goal; it is a necessary means to cause learning. You cannot have a true learning platform unless it adapts in meaningful ways.

Adaptivity is required for students to learn because students need to revise and improve their thinking. Therefore, an adaptive learning program needs to engage students in critical thinking that can be revised and improved.

—Tim Hudson, senior director of curriculum design, DreamBox Learning

By now, the American public is familiar with classrooms where students use computers every day. Regularly, broadcast news reports focus on education in America. They often show a teacher circulating through a classroom full of students using computers, pointing out something on a student's screen or engaging with students in a project displayed on an interactive whiteboard.

However, these short reports do not delve into the nuts and bolts of such a learning environment. They do not discuss what actually goes into delivering successful adaptive learning. Let's look inside that puzzle box.

Learning Management Systems

The basis for effective adaptive learning is a comprehensive, flexible learning management system (LMS) that can interact on a variety of levels with different audiences. Primarily, of course, it has to act as a personal tutor to individual students. To do this, it incorporates cognitive modeling to analyze student data and give intelligent feedback so the system can adapt sequencing, navigation, pace, and presentation for each user. This "philosophy of learning" programmed into the LMS takes into account the processes that the human brain uses to accomplish complex tasks, such

as learning, remembering, predicting, inferring, problem solving, and decision making, as well as how these processes interact (Busemeyer, 2009).

Creating this sort of artificial intelligence requires massive amounts of programming as well as extensive databases and a nimble feedback capacity. In addition to cognitive modeling, the system must encompass the following segments:
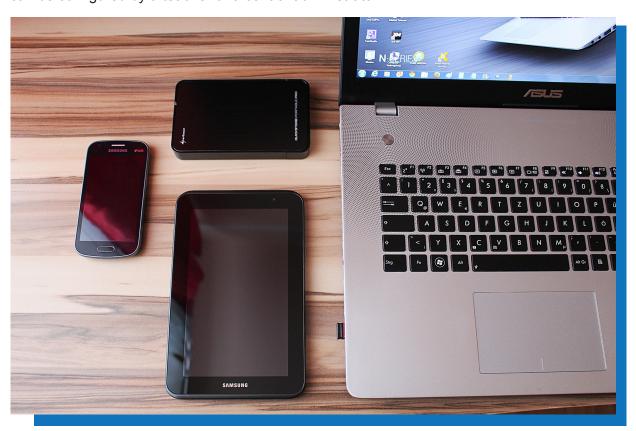
- Curriculum: the material to be learned, broken out into interconnected modules
- Learning activities: tactics to engage students, hold their interest, and propel them to be active learners
- Continuous assessment: assessment embedded throughout the curriculum that creates data points about students, gives them feedback on their work, and points them toward new understanding
- Database of student information: continuous capture of students' interactions with the system

The LMS must also incorporate students' prior knowledge—either through pre-lesson assessment, or assumptions about learning in earlier grades—to create individualized sequencing of the curriculum. This enables the system to (1) identify and correct students' misconceptions, and (2) present learning activities in ways that access and build upon students' knowledge and interests.

The purpose of such complexity in the LMS is that, although all students must meet certain learning objectives, different students use different pathways to mastery. The system itself outlines the individual path based on what the student is ready for, taking into consideration the range and diversity of learning experiences needed to ensure coherent connections and deep understanding.

Interacting with the LMS

Although the popular idea of educational technology involves students sitting in front of banks of computer screens, schools are increasingly making use of a range of devices. For example, Google has made inroads selling its Chromebooks to school districts. These relatively inexpensive, instant-on devices are: connected to storage, apps, and other programs running in the cloud; can be used by individual students or shared by groups; and can be configured by a teacher or a central administrator.

Schools are not limited to using a particular type of device. Because the percentage of students who have smartphones or tablets grows each year, some schools employ BYOD—bring your own device—to add technology to their classrooms. (The school still has to supply devices for students who do not have their own.) The educational apps and resources available online are generally scalable and can run on any size device. And because the devices are not tethered to the classroom, students and teachers can access their learning at home, as well.

Making Adaptive Learning Part of Total Learning

Ultimately, skilled teachers—not artificial intelligence machines—are responsible for the mastery attained by their students. Adaptive learning works best as a supplement to personal direction and mentoring. Teachers still determine class flow so that students have optimal opportunities for individual work, group activities, online research, and contact with outside experts.

Effective adaptive learning also allows for time to step away from the system by including segments for independent research. Some of this research is done in sources that are linked to the LMS, but students are also encouraged to find and incorporate into their experience text, audio, and video sources from experts in their fields of study.

There are many other digital tools that can help promote learning beyond the pathways laid out by the LMS. Schools may opt to use collaborative software from vendors such as Google, Blackboard, or Moodle. These software suites and websites allow users to create and jointly edit documents, slide presentations, databases, and drawings. Other advantages include (Pappas, 2015):

- user-friendly interface
- ability to upload, manage, and store files and folders
- ability to share documents, images, files, and collections
- ability to transmit messages to individuals, groups, or the whole class
- collaboration on documents in real time
- chat functionality for collaborators to use while working on projects
- option to expand the learning experience by searching other online sources

These suites also provide tools to track student engagement and progress through the course. Teachers can include their own formative and summative assessments or borrow ideas from other teachers in community forums. Data about student performance can be stored and displayed to better plan individuals' learning paths; it can be accessed by students so they can see how far they have advanced and

what they still need to accomplish. Teachers can also connect with other staff to get professional feedback on best practices they can use to craft learning opportunities for their students.

Conclusion

Adaptive learning tools have proliferated in recent years, and technology companies have been striving to make the tools as user-friendly and comprehensive as they can. Teachers benefit through more flexible

delivery of learning experiences as well as the opportunity to gather useful data about their students that can inform their classroom plans. Students benefit from these tools through access to a wider range of learning experiences, collaboration with classmates and students in remote areas, and individualized learning and assessment.

References

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