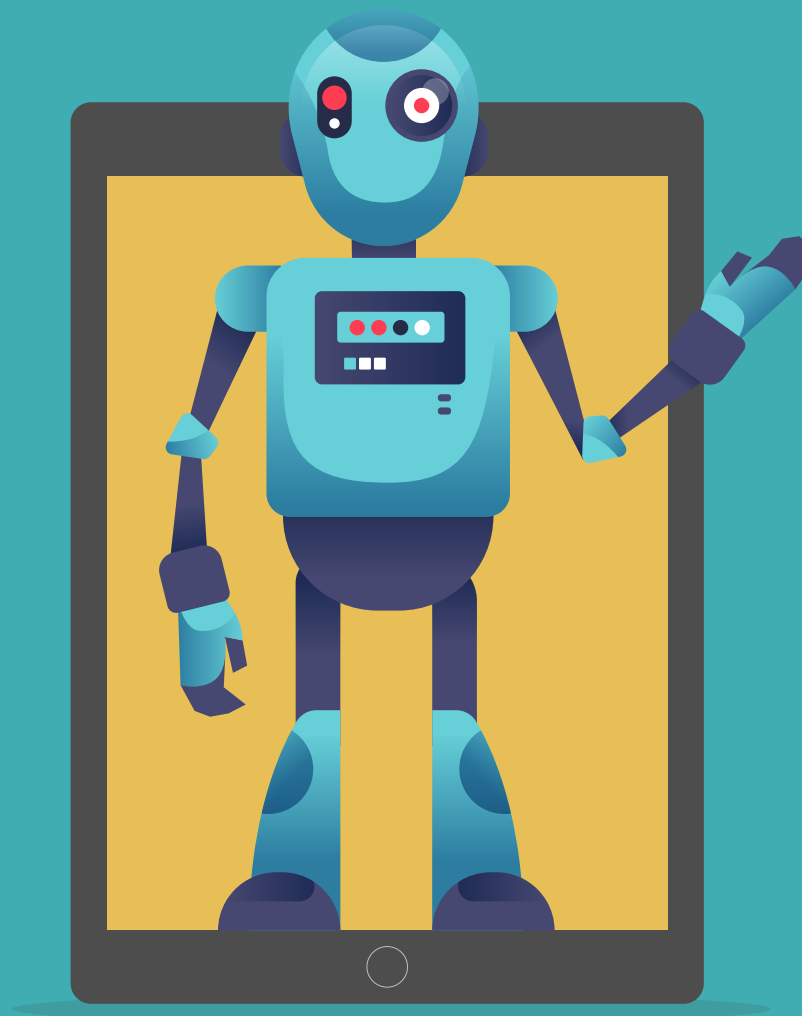# HOW TO EASILY BOOST STUDENT ACHIEVEMENT USING AI

FIRST STEP: UNDERSTANDING ADAPTIVE LEARNING

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NEO
BY CYPHER LEARNING

Introduction

Artificial Intelligence has been around for quite a while now, but it only recently got on the fast track to change the world. This could be seen as a positive thing. For example, AI breakthroughs in medicine promise to save more lives, AI powered industries are more productive and damage the environment less, AI technologies have the potential to revolutionize the education system. However, a coin always has two sides, so AI can also be considered a threat.
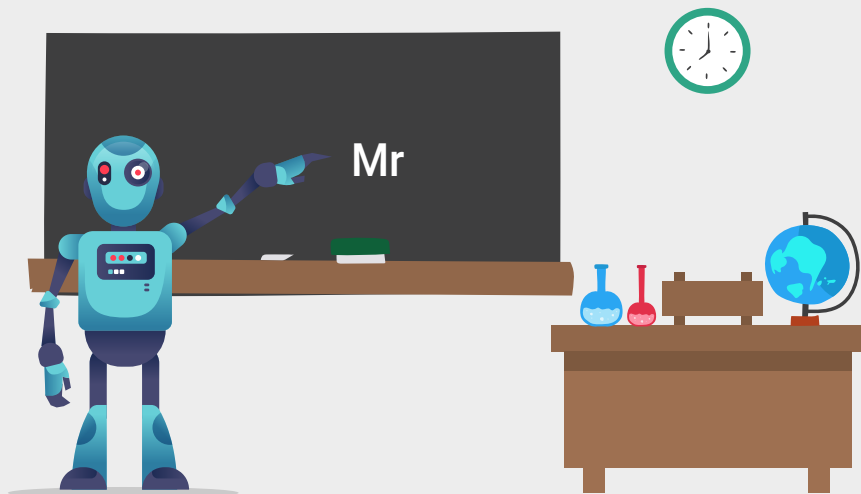
The thing is, we all have a fear monster. Artificial Intelligence means algorithms created by people on computers used by people. What if people create something that is better and smarter than us? The thought of a machine capable of learning is indeed scary. That's probably the core of humanity's fear monster.

Turning our attention to education, what if a machine that runs an artificially intelligent software would teach our children how to read, count and write? What if such a machine would assess the learning progress of students and then be able to decide what one student or another should learn next? Will teachers be made redundant by AI technology? That's probably the core of teachers' fear monster and the reason why the question "Will AI replace teachers?" is thrown in so many conversations.

Some people say that fear does not really exist, that it's the only feeling we people can choose not to feel. We don't feel fear when we search something on Google (Google's algorithm is probably the most ubiquitous example of AI) and we don't feel fear when we use AI technology in the classroom.

Reading Trainer[1] improves the reading speed and retention rates of students using it. **iWriteWords**[2] teaches kids to write. **PhotoMath**[3] helps students understand mathematics and solves even handwritten math problems. These three are educational apps. Then, there are learning management systems and other cloud-hosted teaching tools.

All these are examples of AI technology and plenty of teachers already use them in their educational activities. The degree of Artificial Intelligence varies in all of them, but it exists nonetheless.

Are teachers redundant in any of these cases? No, they're absolutely not. They're the masterminds that know how and when to use these AI tools in the learning process of their students. The tool can't replace the mastermind.

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[1] www.itunes.apple.com/us/app/reading-trainer/id406388984?mt=8

[2] www.itunes.apple.com/us/app/iwritewords-handwriting-game/id307025309?mt=8

[3] www.itunes.apple.com/ro/app/photomath-camera-calculator/id919087726?mt=8

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The incredible AI potential in education

If people didn't overcome their fear of interacting with an intelligent machine to get some money out of the bank we would still stand in line for who knows how long (during public hours, of course) to be handed some cash from our own bank accounts. It's almost incredible how natural an action it is for us to use an ATM to get our money nowadays.
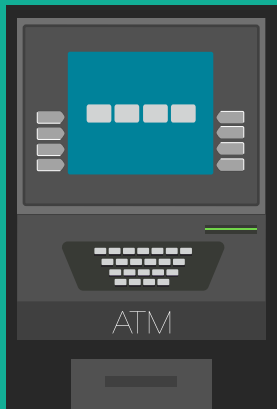
Well, an ATM (Automatic Teller Machine) is an artificially intelligent machine which revolutionized the banking system. Thanks to it there are now more bank branches and more tellers than there were before and in the early days of ATMs. People working in a bank now do more complex jobs than handing out some cash. Automation actually expanded and embettered the financial market.

AI has the potential to do the same in education.

One of the recurrent requirements of online education is that it should reach a great mass of students while also providing a personalized learning experience. While this is currently done by including various teaching methods and trying to accommodate every learning style, AI could prove to be the answer for the truly individual experience.

If teachers could delegate the most repetitive and time-consuming tasks to AI they would get more time to actually teach! There are many ways and many ideas on how to improve our education system but teachers are caught in their day to day activities and they hardly have any time to be innovative on a large scale.

If an artificially intelligent machine or software could help them with that, then why shouldn't it? It's not like we have to automate everything a teacher does in the classroom. And it's not like the teacher will completely disappear from an educational setting and not oversee what AI does.

Here are some ways AI could support the work of teachers:

Lesson planning. This is one of the most time-consuming thing teachers have to do. By using AI technology they will be able to input all the learning materials they have on their subject matter — old lesson plans, text documents, PDFs, videos, audio files, images, animations, presentations, etc. The software will parse, analyze and sort this input and automatically create lesson outlines. Teachers will have to review and add changes to the plans but they won't have to create them from scratch every time.
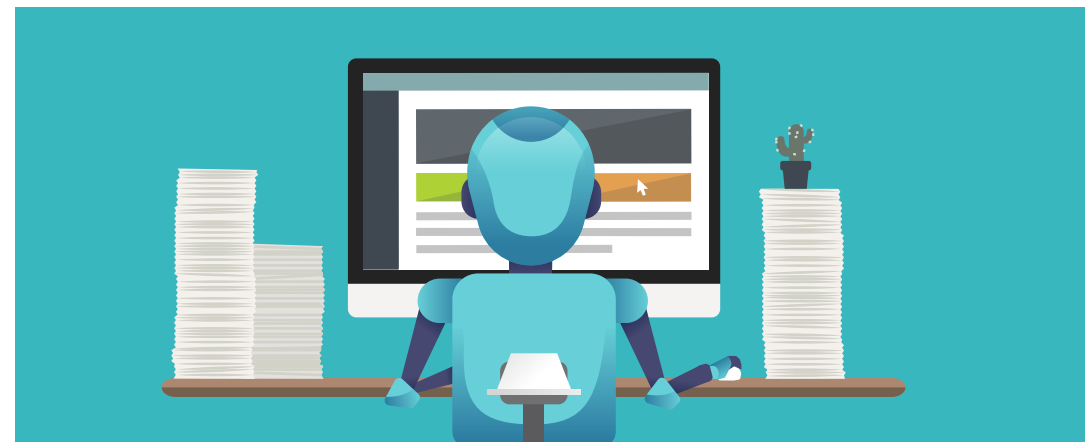
Student support. This is already happening and the best example is Jill Watson[4]. Jill is a teaching assistant at Georgia Tech University. She is also an AI software. One of the most famous case studies. Jill answered many of the 10,000 online messages from 300 or so students enrolled in the same course about Artificial Intelligence. And she (it?) did that with 97% accuracy, becoming the most efficient TA for that course. If one AI software eliminated a lot of tedious work for the actual professor and his teaching assistants, allowing them to tackle more complex and technical issues, it's easy to assume such software could do the same for more teachers, in more schools.
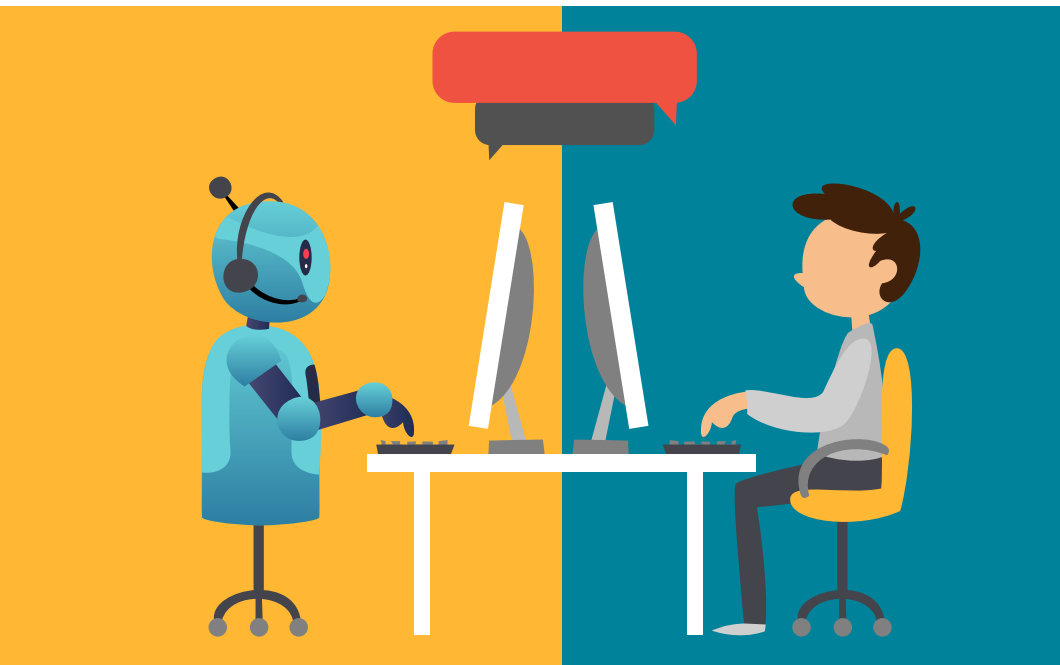
Assessing papers. This is another time-consuming task that educators have to do, no matter if their students are in the first grade or in the senior year of college, and Artificial Intelligence can make things easier for them. All STEM subjects assessments are rather easy to automate, and even creative ones — like literature or foreign language learning — can be graded by intelligent mechanisms. Of course, more work is needed to reach 100% accuracy to automated student assessment, but AI technology is constantly evolving, and soon this downsize won't exist anymore.

Adaptive learning. This takes personalized learning to a deeper level. An adaptive learning system learns about the student while the student learns. And it does so with every student in the classroom, no matter if it's a 15-student primary group or a 300-student college class. Based on all the learning data it gathers in real time, such a system can adapt to each student's needs and suggest personalized next steps in each of their learning processes. AI will therefore assist teachers in adapting their instruction for meeting all their students' needs, thus educating everyone in a unique manner.

These are just a few examples of how useful AI can be for the average teacher. If educators are able to delegate their repetitive and most time-consuming tasks to intelligent technology, they'll focus more on other more complex or creative problems and build better interpersonal relationships with their students.

But let's go back to adaptive learning. This concept deserves so much more than a paragraph. Educators can use adaptive learning in order to harness the power of Artificial Intelligence in their instruction and be able to focus more on each student.

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[4] www.news.gatech.edu/2016/05/09/artificial-intelligence-course-creates-ai-teaching-assistant

What exactly is adaptive learning and how does it work?

Adaptive learning has been called several names – such as intelligent tutoring or adaptive instruction. Regardless of what we call it, adaptive learning is mainly seeking to employ modern day technology to better the education process by ensuring that students are enrolled in individualized learning paths built around data that is gathered both before and during the entire learning process.

Teachers are currently attempting to address the need for personalized experience by constantly gathering feedback and periodically updating the content and delivery methods. Having an adaptive learning solution means that content transformation would happen right away and with a lot less effort.

An intelligent platform could pick the best learning method for each person. For example, it could turn a portion of written coursework into video delivery or even an immersive, reality-mimicking module in response to learner preferences or needs.
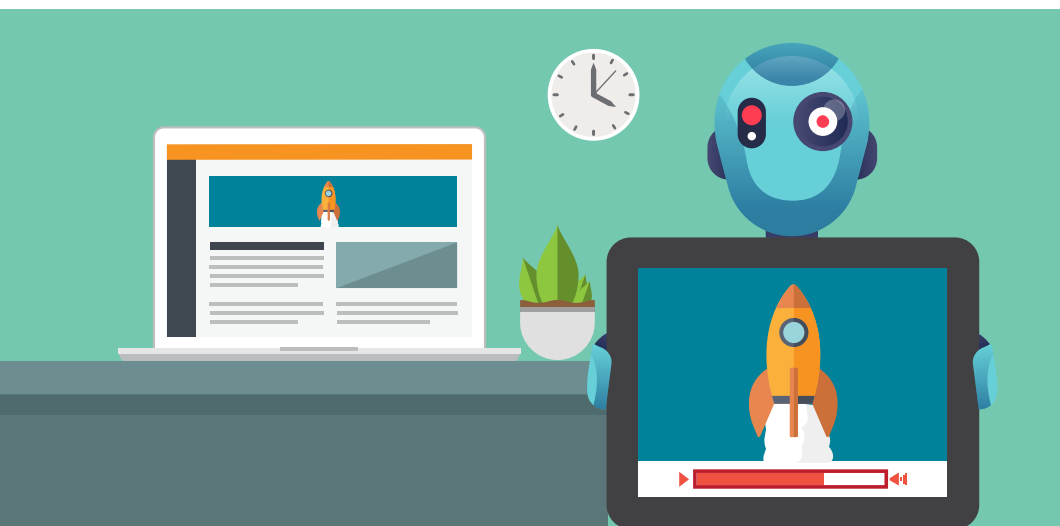
According to a study of colleges employing adaptive learning tech conducted by McGraw-Hill Education[5], adaptive learning technology improves student retention by as much as 20% and pass rates by as much as 13%. This opportunity to use adaptive learning to better engage learners and drive completion is huge. It's no wonder then that adaptive learning has been included in Gartner's list of top 10 strategic technologies impacting education in 2015[6], 2016[7] and 2017[8] respectively.

Another study comparing adaptive learning to traditional learning, by Murray, M. C., & Pérez, J. (2015) For the Informing Science Institute[9] concludes:

> **"There is also evidence that adaptive systems positively impact other aspects of quality such as learner persistence and engagement. More compelling still are the intuitively appealing cases for adaptive learning systems as engines with which institutions can increase access and reduce costs."**

A few words on automated algorithms

In order to harness the potential of adaptive learning in education, one needs to use technology: a learning management system or any other software that can do automation. Adaptive learning is based on automated algorithms.

[5] www.mheducation.com/news-media/press-releases/study-shows-significant-improvement-student-outcomes-adaptive-technology.html

[6] www.gartner.com/newsroom/id/2994417

[7] www.gartner.com/newsroom/id/3225717

[8] www.gartner.com/doc/3557217/top--strategic-technologies-impacting

The most successful adaptive learning platforms employ some form of data mining to design learning content that is fully optimized for students. The platform uses data that it constantly gathers while a learner interacts with any online learning content.

So let's take a closer look at how technology can focus on the individual and provide just the right tools to personalize the learning experience. First of all, the platform has to pay attention and keep track of everything the learner is doing, analyze all that data and use the results to tailor the online content and the medium in which it is being delivered to optimally respond to the unique needs of the individual. It may sound a bit "big brother"-ish and lacking the human touch but though it is an automated process obsessively recording everything a learner does, its ultimate goal is to recognize and celebrate the uniqueness of each individual.
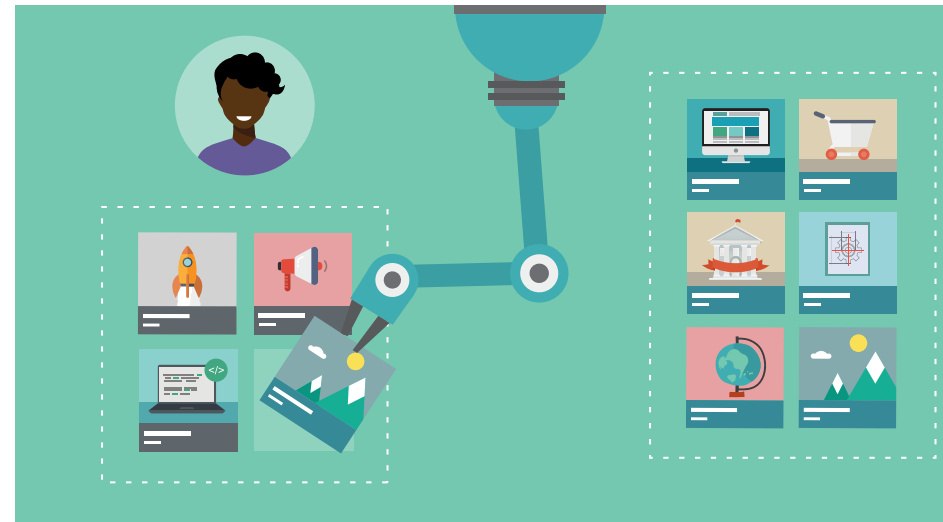
The very well thought algorithms behind adaptive learning have to be able to use all the gathered data to calculate the best possible course to take. If the student completes a test, for example, the algorithm can take into account the correct and incorrect answers and push relevant content forward – it will obviously pick the units that will help that student give better answers to the questions they missed.

If several scenarios have been drawn up, the platform can even pick the right one for every specific student. In case somebody gets stuck on one question or is browsing a lot through the already covered content in search for information or clues, the interactive platform can take the student back to the specific section covering that or take them to an additional section with more detailed information on the subject in order to clear it up.

So how does that translate in the student's learning experience?
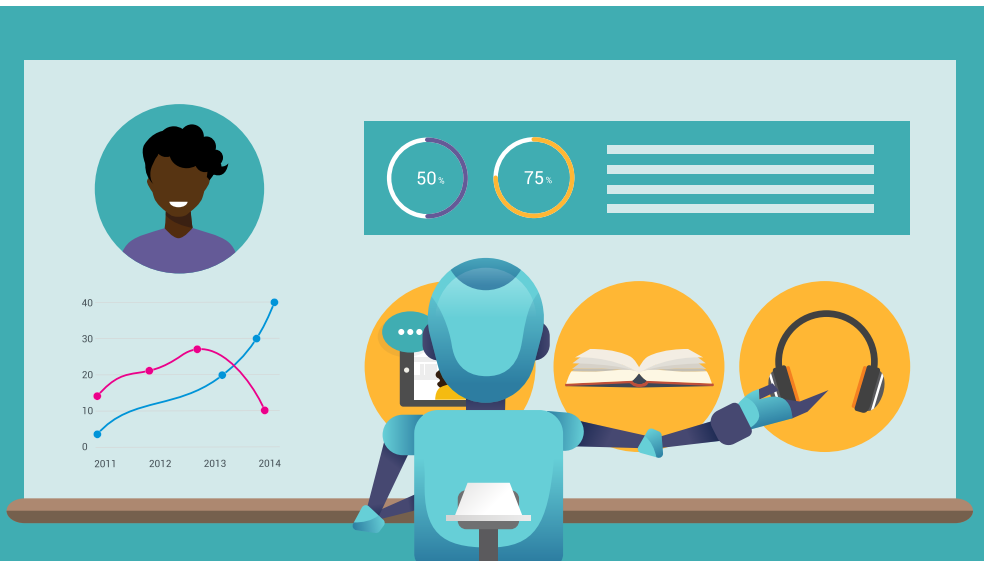
An adaptive learning experience

Adaptive learning transforms teaching and learning for the better. Adaptive learning tools allow teachers to put each of their students on individual learning paths, and then each student can go through their own learning journey at their own pace until they've completed that path.

Initial assessment. In the beginning the software needs learning data reflecting the current situation of a student. In order to get that, an initial assessment will be made to determine the amount of mastery a student already has on the content or skill.

Learning path assignment. The initial assessment will then be scored and, depending on the software being used and the available automation features, the software will automatically assign a learning path for the student to follow. Of course, this can also be done manually by the teacher.

Continuous progress tracking. Students will encounter formative assessments regularly along the way that will measure their level of mastery in the subject of each course or learning path (some learning paths can include more than one course, and other types of learning materials as well). Proof of mastery is very important in a student learning journey and adaptive learning ensures that students don't progress beyond a certain point until they've mastered the previous concept or skill.

Real-time adaptation. The software algorithm adapts in real time to every interaction the student has with the software. Such an intelligent platform can figure out what learning activities, in what sequence and in what form of delivery will ensure the most effective learning for the individual student and deliver that based on all interactions.
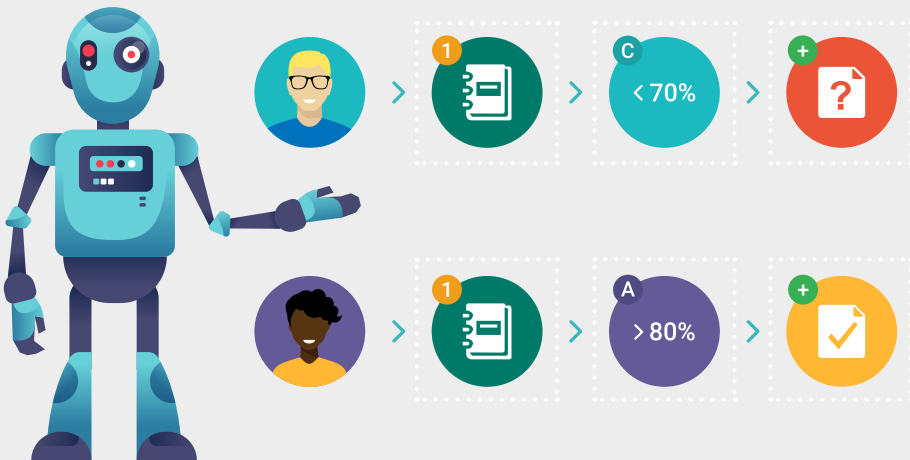
Manual intervention if necessary. In many cases, and depending on the type of adaptive software being used (and its level of automation) the teacher can override the software in order to adjust even more to a student's learning pace. But if the software is powerful, this should happen on a need-to basis.

It's no secret that students feel more engaged when they feel recognized as individuals, so providing them with this type of learning that adapts to their needs will result in better acquisition and retention of the subjects being taught, better academic results and ultimately more successful lives.

What can be automated to ensure an adaptive learning experience?

Automation is an innovative concept that allows teachers to make learning more personalized and flexible. Automation helps them save time on teaching tasks and replaces a lot of rigourous manual work by automatically triggering actions throughout the learning platform when certain tasks are performed.

The possibilities are endless and teachers can use automation in various areas of the learning platform they use, such as classes, learning paths, groups, accounts and more. Teachers can create automated rules for almost any aspect of their online class.
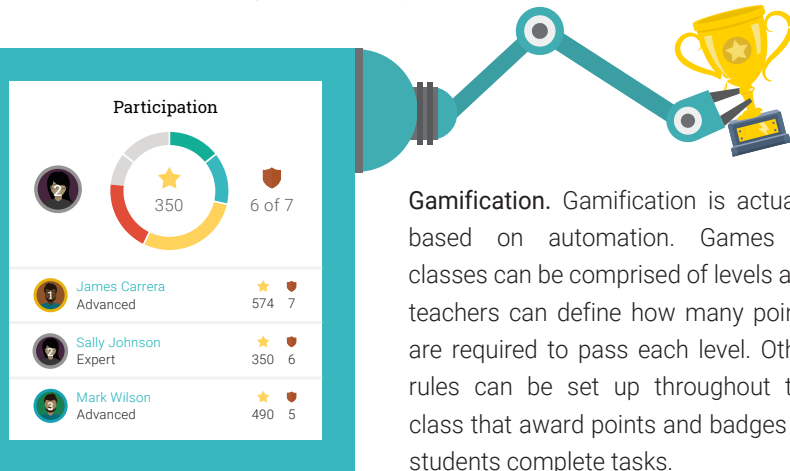
Automation for classes. Teachers can use automation to set different actions when students complete certain tasks in classes: when they enroll, when they are unenrolled from a certain class, when they complete lessons and sections, and more. Here are some of the most common uses for automation and areas in a class where you can use them:

- **Enrollment, unenrollment and inactivity actions**. For example, upon enrollment to a class, students can be automatically added to a chat group dedicated to all the students that are taking that particular class. When a student is unenrolled from the class, they can get an automated message to request feedback about it. If students are not active in the class for a specified number of days, they can be sent a reminder to visit the class.

- **Class completion actions.** Teachers can trigger actions when students complete classes. The most common example here is when a student is awarded with a certificate of completion when they finish taking a class.
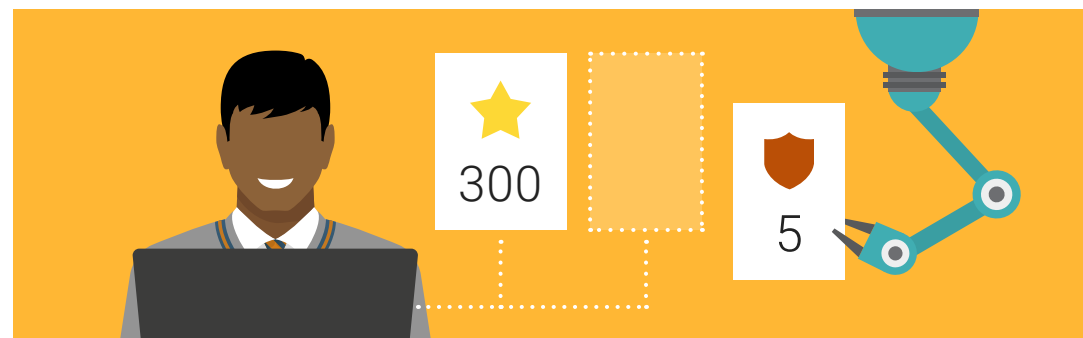
- **Completion actions for lessons, content sections and assignments**. For example, when a lesson is completed each student can be awarded a badge. In the case of assignments teachers need to set a minimum score that is required for the assignment to be completed. When a student gets the set score, the assignment is considered complete and they can automatically get a number of points for the class game, or any other reward.

- **Score-based actions.** Teachers can also add rules that are triggered when students achieve a certain score. This is the base of reaching mastery, as an automated rule can be created so that when a student gets a low score, the next lesson will stay locked until they improve through other supporting learning materials.

- **Mastery rules.** Automated actions can be created for when students reach a certain competency level. For example, if a student achieves a high percentage on a competency they can unlock an advanced lesson on the same subject. If a student gets a low percentage on a competency for a longer period of time, teachers can set up a rule to get an alert when this happens and send students recommendations on how to improve in that area.

- **Drip content.** Automation can also be used to schedule student access to lessons rather than having them all available at once. Teachers can use automation to lock or unlock lessons at a specified time, or unlock a lesson when a student completes an assignment.

Participation

350   6 of 7

James Carrera		★	◆
Advanced		574	7
Sally Johnson		★	◆
Expert		350	6
Mark Wilson		★	◆
Advanced		490	5

Gamification. Gamification is actually based on automation. Games in classes can be comprised of levels and teachers can define how many points are required to pass each level. Other rules can be set up throughout the class that award points and badges as students complete tasks.

Automation for learning paths. Teachers can set up a rule that when students are enrolled in a learning path they are also added to a study group. When students complete a goal in the path, an API can be automatically invoked through a webhook. When students complete the learning path they can be automatically enrolled in an additional advanced class. Learning paths can also have games, so teachers can also trigger actions that award badges and points, which helps students advance through the game.

Automation for accounts. This allows users to trigger actions that are performed when new accounts are created. For example, when new parents join the platform, an automatic rule can enroll them in a group dedicated to parents. Or, when new students join, they can be automatically enrolled in a class or learning path based on their grade level.

Automation for groups. When users are added to a group an automated action can enroll them in a learning path. Likewise, when a member is removed from a group, this information can be sent to a learning record store through xAPI.

Adaptive learning can help schools deliver a highly personalized experience and close knowledge gaps for their students. Using automation, teachers can create rules that, when triggered, show or hide specific classes, content sections or assignments, award points, badges, certificates of completion and other rewards, manage groups and accounts, and so on. This dynamic personalization of what learning content, assignments, assessments and rewards a student gets in classes and learning paths, based on their progress of course, contributes to an adaptive learning experience.

Conclusion

To sum up, plenty of the available educational technologies today are based on smart algorithms. These allow teachers to create automatic rules for their classes, so that students have individual learning experiences. Not only that, but they also adapt the learning content delivered to each student based on every interaction they have with the software.

These smart algorithms are just another face of Artificial Intelligence. And they are constantly being developed in order to increase the level of personalized instruction that can be created.
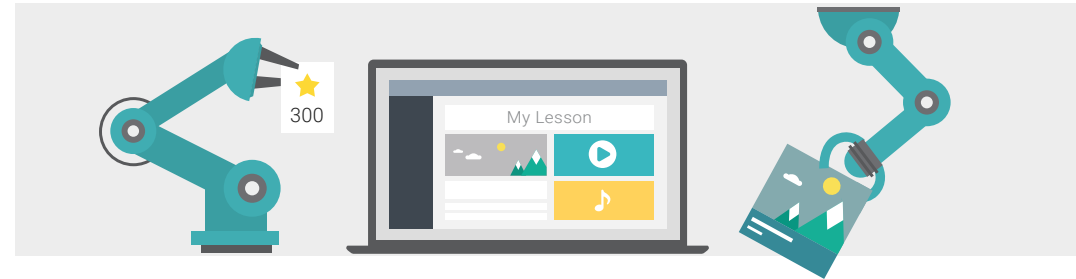
It is only a matter of time until teachers will be able to create incredibly personalized learning experiences for each of their students. Until then, they can harness the potential of Artificial Intelligence in education by using the available tools that make adaptive learning possible.

If you're looking for a tool to help you get a grip on adaptive learning, try out NEO LMS, a learning management system for schools and universities with a comprehensive set of features. Automation is one of these powerful features and can be used to set rules on many aspects of each student learning process, from drip content and gamification to mastery and competency-based learning, and therefore create adaptive learning experiences for students.

www.cypherlearning.com

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