Artificial Intelligence Enabled Smart Learning

Debdeep Bose, Pathan Faisal Khan, Department of Computing, Letterkenny Institute of Technology

Introduction

Smart Learning includes new educational contexts in which the importance is focused on the student's use of technology at their fingertips. It does not only depend on the software and hardware available, but on how they are articulated in the classes. The main problem with traditional learning is that it cannot be suited to every child in the class. Some children may grasp the concepts well, some might have difficulties in grasping them while some might be more of an auditory or visual learner. The World Bank report on education has indicated that the learning gap created by this problem causes many students to dropout out of school. Personalized learning has been able to solve this grave problem. The theory and development of computer systems able to perform tasks normally requiring human intelligence is known as Artificial Intelligence (AI). Nevertheless, it can also be used in the classroom. For instance, China's largest AI education platform Squirrel AI has successfully implemented its system in many cities providing personalized learning. They claim that their system was better in improving math test scores than experienced teachers teaching in a four-day experiment program conducted in October 2017. Similarly, there are a few more like ALEKS and Classcraft that are into K-12 programs. However, these are just a couple of examples regarding the use of AI inside the classroom and to enhance learning activity. Moreover, these personalized teaching methodologies using AI have been predicted to reduce the cost of education, which is quite high, even in developed countries.

Classcraft

What?

Classcraft is a new, game-based approach to teaching. It's designed to encourage participation, good behavior, and 21st-century skills like collaboration. Increasing a child's engagement with their lessons. and has a very positive impact on student's motivation and engagement, academic performance, school attendance, and classroom culture.
Launched in 2015, Classcraft is an award-winning, teacher-friendly gamification tool that is now used in more than 50,000 classrooms in 75 countries in 11 languages. The Quebec- and New York City-based education technology company that uses gaming principles to address student motivation. It utilizes gaming principles to foster social-emotional development and personalized learning, enabling educators to adapt curriculum and teaching style to an individual student's needs. Highly customizable, this revolutionary educational approach can be adapted to any subject and has been proven to be very effective at improving student motivation, increasing student engagement, and creating a positive classroom community by fostering strong team building.

How?

Student- In class, students create a character and work together with their team of classmates. They're able to earn and use special "powers" to support their own academic learning, as well as help their teammates when they need it. They get some other cool perks, too, for their hard work. It promotes a positive class culture by encouraging 21st-century skills like collaboration, caring, and engagement. In Classcraft, students gain Experience Points (XP) and lose Health Points (HP) based on their behavior in class. They work in teams, level up, and unlock real-life benefits as they progress (powers). It focuses on collaboration more than the competition.
Teacher- In the teacher section, they have their own characters and powers that they can use. And they are all connected to relevant student characters from their classes on the platform with every detail. As such, the teacher, or Gamemaster, determines the behaviors linked to XP gains and HP losses, and those behaviors are usually tied to the school's rules of conduct and student engagement. Here, it is suggested adding examples of prosocial behaviors (XP) and antisocial behaviors (HP) to your list of positive and negative behaviors in the game.
Parent- This parenting app is designed to keep you updated on your child's progress in school and extend part of the game experience to your home.

Why?

- It turns your existing curriculum into personalized quests (Gamification). As games become a bigger part of the culture. By the time kids are 21, they've played 10,000 hours of video games, the same amount of time they've spent in school. Because of this, they are more likely to respond to the use of games in other settings, like the classroom. This is called gamification, which is applying gaming principles to non-gaming situations.
- It is also based on PBIS Framework (Positive behavioral interventions and support) which is used to encourage good behavior in students. Positive Behavioral Interventions and Supports (PBIS) is a framework for delivering universal (entire school) and additional tiers of behavior support to improve educational outcomes for all students.
- Data is essential to PBIS. Classcraft provides educators with the type of high-fidelity data that can only be generated by a student-driven implementation. Because the data pertains not just to behavior but to student engagement, it helps educators make decisions that not only promote behavior change but also foster SEL (Social and Emotional Learning) growth and improve school climate. Classcraft's behavior presets make it easier for educators to identify opportunities for targeted intervention at the school level — and to ensure those interventions are both consistent and personalized.

Facts!

- Nearly, 54 % of the EU's population plays video games which equals some 250 million players in the EU. Nearly half of the players are female: 46% are women and 54% are men [2].
- 58% of parents play video games with their kids as a way to socialize with them [3].
- The study, funded by the British Academy and published in the journal Computers in Human Behaviour, found that 13-14-year-old girls classed as 'heavy gamers' – those playing over nine hours a week – were three times more likely to pursue a PSTEM (physical science, technology, engineering, and math) degree compared to girls who were non-gamers [4].
- A study by Centre de Liaison sur l'Intervention et la Prévention Psychosociales, or (CLIPP) showed that Gamification can help prevent bullying [1].

Benefits

- ✓ *Enhanced and Interactive Learning Experience.*
- ✓ *Follows the "Go Green" Concept*
- ✓ *Making students Digitally native.*
- ✓ *Easy access to a Multitude of Online resources.*
- ✓ *Highly effective for Student-Teacher relationship.*
- ✓ *Cost Benefits- Just a one-time expense.*
- ✓ *Increased productivity with no limitations.*

KNEWTON | alta

What?

Alta is a software product built on personalized learning engine for students pursuing higher education by Knewton, a New York based adaptive learning company. Alta was released by Knewton in January of 2018 after 10 years of Knewton's gig with publishers set to compete with these publishers with their own tool. It is powered by their in-house high-quality content curated with experience in the industry over a long duration. The software is available for students as a standalone package and as well as for universities and institutes to deploy it as a general tool for all students to study on. The product covers courses in mathematics, chemistry, economics and statistics. The course contains textual, graphical and video based contents. It also provides personalized assignments and reading materials to the students. The software is on shelf for students as a standalone version for just $39.95. This price has made it an affordable software to use with all the course material a student needs to complete his module successfully. Alta's mobile app has made it a mobile software for every student to use it on the go. The best thing about Alta is that they have not left out their students alone just with the software, they provide 24/7 online chat support to clear doubts and queries of the students.

How?

Knewton was established with a goal to help students prepare for competitive exams like GMAT and GRE. They developed their own content which made it less prone for students to cheat on such exams as researchers found out this back in 1995 due to problem of small question pool. Alta provides a unique experience for the students in affordable and personalized way. The AI adapts itself based on each student's learning capability, their strengths and weaknesses and their pace. The algorithm continuously improves itself by learning from experiences of all the students using the software. It has spread to around 15 million learners and based on each of these students, it is getting better in what it does. The software can be accessed from a personal computer or even on a smartphone.
Alta works on an individual basis for each student, if two students start working on a class assignment, though the outcome will be same for both, but their path will be different. Student A might lag in a topic, the algorithm will detect this problem faced by the student and show the student the relevant content to boost his knowledge in that topic and then get back to the assignment after the student successfully learns it. Alta diagnoses the problems faced by students and quickly helps them by providing them instructions to solve it. The instructor has full control over the content to align the student experience with the course's outcome thus giving instructors full confidence over the software.
The software enables instructors the power to transform how students succeed in their course and beyond with its mastery-based personalized learning technology that artfully interweaves instruction, assessment and analytics into one easy-to-use platform, while simultaneously lowering costs and improving outcomes for students.

Facts!

- 87% of the time students using Alta completed their assignment with proficiency.
- Students who struggled in their assignments, 82% of them completed it.
- Students who used Alta and did not completed an assignment scored 55% while those who completed their assignment scored and average of 81%.
- Students who were struggling has shown improvement in their scores from being at 40% to achieving 78% correct answers.
- 85% students feel Alta is improving their skills.
- Arizona State University has claimed that after implementing Knewton's adaptive learning technology, on which Alta is based, has shown decrease in dropout rates from 13% to 6% and rise in pass rates from 66% to 75%.

Mc Graw Hill ALEKS®

What?

Assessment and Learning in Knowledge Spaces (ALEKS) is a Web-based, intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course. ALEKS instructs the student in over 100 different mathematics, science, and business courses at thousands of K-12 schools, colleges, and universities throughout the world. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained. The model of ALEKS refers to a theoretical basis in mathematical cognitive science known as Knowledge Space Theory. It is an Artificial intelligence-powered technology developed in November 1996 from research at New York University and the University of California, Irvine, by a team of software engineers, mathematicians, and cognitive scientists with the support of a grant from the National Science Foundation.

- **Knowledge Space Theory (KST)**: - It is a theoretical basis in mathematical cognitive science formulated by (Doignon and Falmagne, 1985), which proposes mathematical formalisms to Operationalize knowledge structures in a particular domain. Knowledge Space Theory applies concepts from Combinatorics [It is an area of mathematics primarily concerned with counting, both as a means and an end in obtaining results, and certain properties of finite structures] and Stochastic processes [defined as a collection of random variables that is indexed by some mathematical set] to the modeling and empirical description of particular fields of knowledge[6].
- **KST Implementation in ALEKS**: ALEKS "knows," at each moment, with respect to each individual topic, whether each individual student has mastered that topic. If not, ALEKS knows whether the student is ready to learn the topic at that moment. ALEKS uses this knowledge to make learning more efficient and effective by continuously offering the student a selection of only the topics she is ready to learn right now. This builds student confidence and learning momentum.

How?

As previously stated, it applies Knowledge space theory, ALEKS avoids multiple-choice questions and instead uses flexible and easy to use answer input tools that mimic what would be done with paper and pencil.

- Creation of student account with an ALEKS Assessment. It assesses the students' current course knowledge by asking a small set of questions about the chosen subject.
- Each question asked is randomly based on the answer to the previous questions given by the student. Every question is unpredictable and unique to each student.
- Therefore, by analyzing all the answers given by the student. The model develops an understanding and precise picture of an individual's level of knowledge on the subject. Knowing which topics, the student has mastered and which topics he/she hasn't.
- The student's knowledge is represented by a multicolor pie chart. The pie chart is also basically the student's entry into the Learning Mode. In the Learning Mode, he/she is offered a choice of topics that they are ready to learn.
- To ensure that topics learned are retained in long term memory, ALEKS periodically reassesses the student, using the results to adjust the student's knowledge of the course. Because students are forced to show mastery through mixed-question assessments that cannot be predicted, mastery of the ALEKS course means true mastery of the course.

Why?

- ALEKS avoids multiple-choice questions. All questions are algorithmically generated and require a "free response."
- ALEKS offers "textbook/syllabus integration" to align students' work with the syllabus of the course.
- ALEKS has a sophisticated answer processing, enabling real-time machine evaluation which includes immediate feedback whenever desirable. This makes it more reliable.
- ALEKS offers a comprehensive message center that allows the student to communicate with their instructor about the content using subject-appropriate notation.
- Unlike, other online learning systems the Learning rates of ALEKS are quite high. The Average Historical Student Learning Rates with ALEKS is approximately 90%.

松鼠AI·智适应 Squirrel AI Learning

What?

Squirrel AI is a Shanghai based after-school tutoring company with nearly 2000 physical classrooms in China. Squirrel AI was founded in 2014 by Derek Li Haoyang after stepping down from the CEO position at his previously founded education company with an IPO. Using a laptop computer with the company's software installed on it, students study lessons on their subjects in a classroom supervised by a teacher of that subject. The teacher monitors a real time dashboard which shows the activity and performance of each students and if a student faces difficulty in understanding a problem which the software fails to solve, the teacher is then notified for personal assistance to the student. The study plan is personalized for each student based on their performance, interests and learning ability. The outcome of the module is same for every student even though their study plan might differ.

How?

The core engine of their product is AI-powered adaptive learning. The AI adapts as per each student's learning ability, strengths, weaknesses and personalities and then uses its vast data to appropriately target study materials to the student. It has helped in identifying emotional changes of students and fostering their capabilities.

This AI engine can go to the basics of a module and learn the knowledge gap of the student to eventually fill it. The engine has proved a ground breaker in decomposing a problem to identify the student's weakness, helping student's make them comfortable with learning lifelong, equipping unique unrelated knowledge-points association likelihood that enabling the engine to make more reliable decisions with fewer test questions.

Ideology behind Adaptive Learning: The first is a necessary part of all learning is the content itself. Some subjects are better-suited to this than others. it comes down to the strength of the content itself: "How strong is the content? How complete is the content? How deep is the content? These questions apply whether you're going to introduce adaptive learning or not: it's the content you're going to be teaching." What makes adaptive learning special is that it figures out exactly which of those items a student is strong and weak at in order to identify what they're ready to learn. Unlike a traditional classroom where all 30 or 40 students are taught the same thing—regardless of individual progress—adaptive learning is able to provide a highly individualised course syllabus in order to maximise a student's progress [8].

Why?

Squirrel AI's main motive was to address the problems faced in education system; lack of personalized attention in classrooms and unequal distribution of educational opportunities. The inefficient rigid education system has decreased the student's enthusiasm for learning, this motivated Derek Li to build China's largest AI powered education product. Squirrel AI's scope and reach is impressive, However, the concept behind adaptive learning systems like Squirrel AI and others aren't about to make teaching professionals obsolete any time soon. Instead, Squirrel AI is designed to support and augment the work of teachers by taking away the need to teach what is called the 'nuts and bolts' (basics) of each course [8].

Facts!

The software has had a positive impact in China such that the company has expanded its research team to the United States at Carnegie Mellon University so that they can improve their product and launch it globally. It has been branded as the largest AI experiment in China. The China market has proven to be an experimental window for other countries to look at the product.

- SquirrelAI has proved to show their system can teach 48 knowledge points in eight hours on an average whereas a human teacher is capable of teaching 28 knowledge points in the same duration.

Conclusion

In summary, Artificial Intelligence enabled Smart Learning is the next logical phase of the introduction of technology in classrooms and educational centers. The global educational landscape has been changing all over the world with an introduction to recent state-of-the-art intelligent environments, a few have termed it as "***Climate change***" in education. Hence, with this poster, we have put forward a few latest and successful software's with its implementation, which is all based on AI-enabled smart learning. However, it's not always about selecting the tool or technology but most importantly we should choose to deploy a proven methodology that accompanies the students and develops their skills in a progressive, natural and effective way. Whether we like it or not, technology is an essential concept to learn. Because it changes so quickly, students are better off learning about it sooner. It is a primary part of every industry, and there is no way around it.
Nevertheless, we bear in mind that these technological and pedagogical advancements are not meant to overrule current teaching and learning education system, but rather to provide a holistic spectrum of complementary supporting tools in order to harness and exploit such emerging paradigm to its full potential for the purpose of smarter education [7].

Citations

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Author Details
Debdeep Bose- L00150890@student.lyit.ie Pathan Faisal Khan- L00151142@student.lyit.ie