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A NEW LEARNING PATH-ADAPTIVE LEARNING

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Abstract

Providing truly differentiated, individualized instruction has been a goal of educators for decades, but new technologies available today are empowering educational institutions to implement this form of education in a way never before possible. Intelligent adaptive learning software is able to tailor instruction according to each student's unique needs, understandings, and interests while remaining grounded in sound pedagogy. Technology can play a significant role in raising student achievement, and give directions to invest wisely in these new turnaround tools.

Keywords: *Adaptive Learning and Education*

1. Introduction

Today, many universities recognize that a one-size-fits-all learning approach is ineffective. They are more attuned to the diversity of students they serve – from those transitioning to college life directly from high school, to working professionals wanting to further their careers by pursuing a college degree. Universities are also addressing the unique learning styles of students, enhancing traditional brick-and-mortar college experiences and developing innovative online environments to personalize the learning experience. Education is a $7 trillion global industry that's ripe for innovation. Adaptive Learning Platform helps learn better by responding to what the learner does and doesn't know, personalizing the content that's served to learner based on data collected about the learner's learning habits. In short, it enables smarter learning. Consequently, students are better prepared for the learning process, which makes class time more fruitful. But that's not the vision, that's the means to the end. The *end* is a really simple mission. Only 22% of the world finishes high school, and only 55% finish sixth grade. Those are just appalling numbers. As a species, we're wasting almost four-fifths of the talent we produce. What if the person who invents a grand unified theory of physics is growing up in Africa and never gets a chance? What if the girl who invents a cure for ovarian cancer is growing up in some Cambodian fishing village and never gets a chance? There is a need to solve the access problem for the human race once and for all. We've always had this problem, and no one talks about it because we've always had it. Of the 1.25 billion kids in the world, a billion won't finish high school. That's a tragedy, a preventable tragedy.

2. Significance of the study

The call for programs that work for the educational success of each student, including those with special needs and those who are considered to be academically at risk, has become a central issue in education reform programs. There have been significant advances in theory and practical knowledge of effective instruction, and growing evidence suggests a great variability in the ways that students acquire, organize, retain, and generate knowledge and skills. The Adaptive Learning Environments Model aids to cull from the knowledge base on what makes teaching and learning more effective and efficient. The Adaptive Learning Systems aims to promote growth and competitiveness to accelerate development of net-centric, Web-based instructional systems. The overarching goal is to hasten the development of a

learning infrastructure that permits education and training to be pervasive and precisely tailored to the needs of educators and learners.

3. Objectives of the study

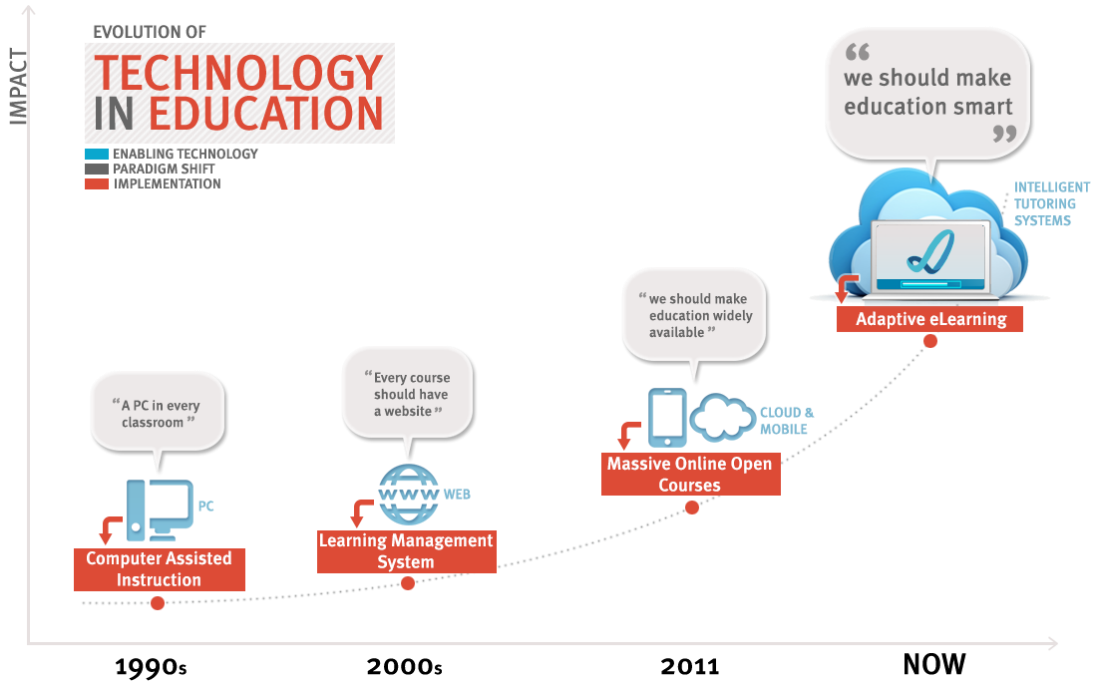
1) To understand the origin and meaning of Adaptive Learning.
2) To explore the operational dimension of adaptive learning intervention.
3) To recognize the yields of adaptive learning intervention.

4. Findings of the study

Objective 1: To understand the origin and meaning of Adaptive Learning.

Adaptive learning or Intelligent tutoring has its origins in the artificial-intelligence movement and began gaining popularity in the 1970s. At that time, it was commonly accepted that computers would eventually achieve the human ability of adaptivity. In adaptive learning, the basic premise is that the tool or system will be able to adjust to the student/user's learning method, which results in a better and more effective learning experience for the user. Back in the 70's the main barrier was the cost and size of the computers, rendering the widespread application impractical. Another hurdle in the adoption of early intelligent systems was that the user interfaces were not conducive to the learning process.

It was not until AutoTutor which was developed by the Institute of Intelligent System around the turn of the century that adaptive learning systems got a voice. This was a major step in adaptive learning systems because it added another medium in communication with the end user. According to the founder and lead on the AutoTutor project - Graesser - "Spoken computational environments may foster social relationships that may enhance learning." Also, in some applications audio content is a necessity, such as in language learning applications. Today, the number of new adaptive learning system companies is growing steadily as more classrooms are becoming computerized and other industries are finding uses for the applications of adaptive learning such as professional development.



Technology in education has evolved from Computer Assisted Instruction (CAI) in classrooms through web-enabled Learning Management Systems (LMSs) to the rapid on-going development of Massively Open Online Courses (MOOCs). However, LMSs and MOOCs are – from a paradigm point of view – little more than enhanced delivery systems for traditional content. The impact on education increases sharply with the adoption of Intelligent Tutoring Systems technology.

But beyond delivery of education, technology also gives universities the ability to leverage learner analytics. This tool – called adaptive learning – helps them to gain insights that improve learning outcomes. Adaptive learning uses student interactions and data to provide a personalized learning experience that best serves the student. This technology certainly isn't new. In fact, adaptive learning technology is very similar to the technology used by business marketers to provide online shoppers with a personalized user experience based on their past Web searches and online purchases. Used in the educational setting, this technology creates a personalized learning plan that gives students extra support where they need it, while quickly moving over areas of competency.

Adaptive Learning is a new learning and teaching medium that uses an Intelligent Tutoring System to adapt learning to the student's level of knowledge. Adaptive Learning provides students with customised educational content and the unique feedback that they need, when they need it. The term *adaptive learning systems* best depicts the role that technology can play in correcting problems that have stymied educational technology markets in the past. This program is designed to facilitate the development of technology that will adapt knowledge to the needs of learners. Experience proves that the best way to avoid a mismatch between supply and demand is to deploy technology in response to clearly articulated needs. Unlike any other tool applied to instruction in the past, many of the latest information technologies can comprise the platform of a future *learning economy* -- where learning experiences are pulled by demand rather than driven by any supply. Thus, if deployed within an open-market paradigm, information technologies can have a positive impact on the accessibility, affordability, and quality challenges that now confront the education and training.

The term *adaptive* also relates to the flexibility and scalability of the envisioned learning system. In the future, content and courseware must be reusable, interoperable and easily organized at many different levels of complexity throughout the on-line instructional environment. Tools for developing instructional content and courseware will need to operate across different platforms and communicate with other tools used to build and manage learning systems. The systems themselves must accommodate numerous and varied learner requirements, needs and objectives. The needs of instructors and instructing organizations must also be addressed. Achieving this level of adaptability will require advances in a wide range of technologies that support diverse training and education tasks. They include but are not limited to authoring systems, multi-sensory interfaces, search technology, and network middleware. Continued progress will also be required in software reusability and interoperability, especially for high-bandwidth applications.

Adaptive Learning creates the best possible learning experience for students by emulating the talents of great educators. This is achieved by using technologies that adapt and shape teaching to the

needs of the individual student. Each student is unique, has varying levels of knowledge and learns differently. Research has shown that student performance improves when educational content is personalised.

Adaptive Learning is not about some sort of magic, super complex, black box algorithm. Instead it empowers educators with a suite of easy to use tools that allows them to create and teach with – rich, interactive, and adaptive educational courseware. Teachers should have complete control over *how* the content adapts to the student.

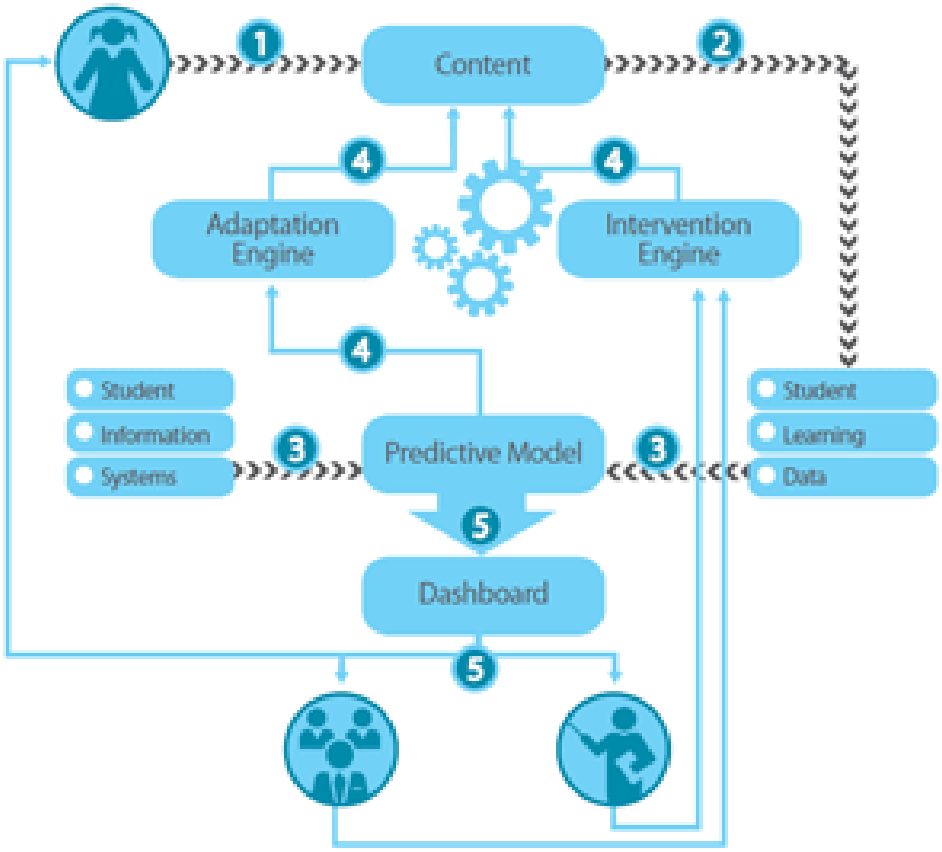
Additionally, an Adaptive Learning Platform provides teachers with a window into their students' learning for the lessons they've created. Real time Learning Analytics provide actionable insights into what students know, what misconceptions they may have, and how they are interacting with content. This feature keeps teachers in control – and allows them to continuously adapt and improve their lessons.

There will be a personal algorithm which constantly evolves and dynamically generates recommendations in real time. Within a few hours, a unique bundle of material will be targeted towards the learner. Within a few weeks, tons of information about the learner would be known. This understanding will be as a percentile of how strong the learner is in every concept in the course opted for. It would be really possible to accurately know what strengths the learner has in the concepts that they haven't even seen yet, based on the correlation analysis with the concepts we the learner would have seen.

It would also be possible to predict the failure in advance, which means there is scope for pre-remediate in advance. For instance, we can say, "Oh, she'll struggle with this, let's go find the concept from last year's materials that will help her not struggle with it." So the learner will not just get a textbook, but gets a subscription to the huge content portfolio, and the adaptive learning platform will just go find the perfect little bit to help the learner master a concept. For instance, it can be a video clip, text or a video clip with text if it is known that the learner learns better that way. In addition, if the learner learns quantitative things better in the morning and abstract things better in the evening that will be known. If the learner learns English literature concepts best in 25 minute bursts, [that's what the platform would do].

The Adaptive Learning Platform will know everything about what the learner knows and how the learner learns best because the platform gets so much data. And education is the highest stakes media product in life. It's infinitely more important than Facebook friends' status updates or Google search results, because it's the learner's future. Adaptive learning has been partially driven by a realization that tailored learning cannot be achieved on a large-scale using traditional, non-adaptive approach. Adaptive learning systems endeavour to transform the learner from passive receptor of information to collaborator in the educational process. Adaptive learning systems' primary application is in education, but another popular application is business training. They have been designed as both desktop computer applications and web applications. Adaptive learning has also been known as adaptive educational hypermedia, computer-based learning, adaptive instruction, intelligent tutoring systems, and computer-based pedagogical agents. Furthermore, Adaptive learning is a computer-based and/or online educational system that modifies the presentation of material in response to student performance. Best-of-breed systems capture fine-grained data and use learning analytics to enable human tailoring of responses. The associated learning management

systems (LMS) provide comprehensive administration, documentation, tracking and reporting progress, and user management.



Objective 2: To explore the operational dimension of adaptive learning intervention.

Pedagogically and research-based intelligent adaptive learning technology accesses and stays in the Zone of Proximal Development (ZPD) for each learner. That means it provides the right next lesson at the right level of difficulty at the right time.When work is easy, learners can do the work on their own without any help. It's in their "comfort zone." If all the work a learner is asked to do is always in the comfort zone, no real learning will take place and the learner will eventually lose interest. Conversely, when the work is too hard, the learner becomes frustrated and will likely give up.

The area between the comfort zone and the frustration zone is the one where true learning will take place – the optimal learning zone. It's the area where a learner will need some help or will need to work hard to understand a concept or complete a task.

By keeping the challenge appropriate, the learner is guided to be a mathematical 'doer' — someone who thinks and strategizes in ways they can apply in the educational institution and in their real life experience. This is optimal teaching and optimal learning.Advances in adaptive learning systems and platforms with their power feedback loops are used in blended learning environments for greater personalization. The ability for students to track their own learning means that they can develop

valuable self-monitoring skills, and engage in their personal learning progress.

The basic question that comes to mind is about how exactly is the learning adaptive.

Generally, there are **three** levels of adaptivity that will be built into the platform in order to empower teachers – **Adaptive Feedback** based on what the student does and knows, **Adaptive Pathways** that offer varying sequences of content to each student, and the ability for an instructor to **Adapt their Teaching –** change the content based on an analysis of how their students learn.

- **Instant Adaptive Feedback**

Students make mistakes: they forget what was said in the lecture, they confuse terms, they use the wrong formula. When this happens teachers provide feedback to students as they learn in order address a misconception. Adaptive Learning systems allow teachers to do the same by providing instant intelligent feedback exactly when it is needed. Feedback can come in two forms:

- ✓ **Informative** – text, images or videos that appear based on a student's interaction, which is aimed to guide them to the correct answer or offer additional information in order to formalise a specific learning objective. For example, after recognising a common misconception based on a student's response to a question, feedback from lecture notes can be shown to the student to refresh their understanding of the concept being assessed.
- ✓ **Intervention –** stepping in to actively help a student if they are struggling with a particular concept. For example, show a student the correct response after too many incorrect attempts, or dynamically set the state of a simulation, like calibrating an apparatus in a Virtual Lab, to indicate the next step towards the solution.

- **Adaptive Pathways**

Each student is different. They learn at varying rates, have different levels of knowledge, and different misconceptions. Teachers need to cater to the individual student. For example, if a student already knows what they are doing they should skip ahead to a more challenging task, or if a student is struggling and missing some required knowledge then they should be directed to resources that help them understand that particular concept.

Adaptive Learning systems lead students via different **Learning Pathways.** But content to students based on rules that the teacher controls – so that each student gets a customised learning path based on their demonstrated understanding to a set of questions.

- **Adapt your teaching**

A good teacher adapts their teaching to their students. Every time a lecture is given, it's an improved version based on past experience teaching that subject. Teachers regularly adapt homework and assignments based on their students' performance. **It's all about continually learning how to teach better**.

But once teachers are using technology, changing educational content often involves the need to work with programmers, designers, and complex software systems. A truly Adaptive Learning system has analytics tools that allow teachers to understand their students' learning and then modify their lessons accordingly using authoring tools. This empowers teachers with the ability to easily and continuously improve their content and teaching.

Adaptive Learning Model Implementation design elements

The Adaptive Learning Environments Model is designed to provide instruction that is responsive to

student needs and to provide school staff with on-going professional development and school-based program implementation support to achieve student success. Implementation features the following design elements.

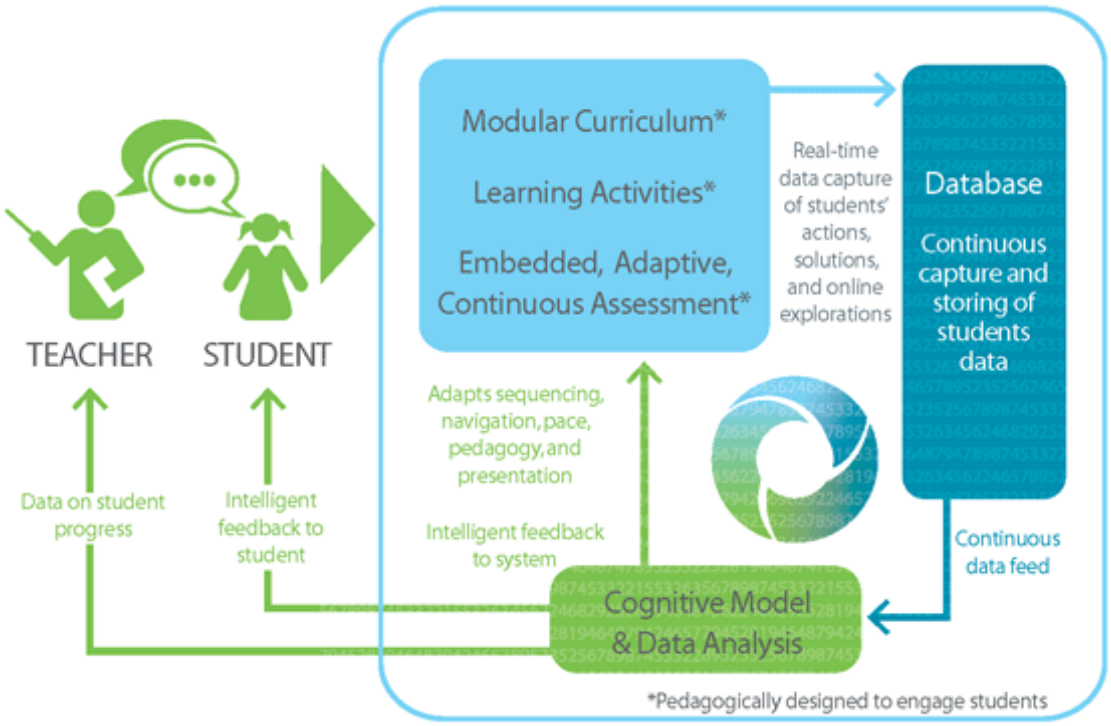
- *Individualized Progress Plans* consist of two components. The first is a highly structured prescriptive component for basic skills mastery. In addition, an exploratory component provides learning opportunities that foster student self-direction and problem-solving ability while fostering social and personal development to enhance student learning success.
- *A Diagnostic-Prescriptive Monitoring System* incorporates a standards-based curriculum and assessment system to ensure student mastery of subject-matter knowledge and learning skills.
- *A Classroom Instruction-Management System* provides implementation support that focuses on student self-responsibility and teacher teaming in implementing a coordinated approach to instructional and related service delivery.
- *A Data-Based Professional Development Program* provides on-going training and technical assistance support that is targeted to meet the implementation support needs of the individual staff.
- *An institution-Based Restructuring Process* provides institution and classroom organizational support and redeployment of institution resources and staff expertise to achieve and sustain a high degree of program implementation.
- An active *Family Involvement Program* is targeted to support student learning success.

When a high degree of implementation is achieved, a unique classroom scenario is created. Students can be found working in virtually every area of the classroom, engaging in a variety of learning activities, including participating in small-group instruction, receiving one-to-one tutoring, or engaging in peer-based collaborative activities. Teachers circulate among the students, instructing and providing corrective feedback. Instruction is based on diagnostic test results and informal assessments by the teacher. Every student is expected to make steady progress in meeting the curricular standards. Learning tasks are broken down into incremental steps, providing frequent opportunities for evaluation.

The same feedback that improves student learning success is also good for teachers. The ability to see current data allows teachers to understand each student's performance. Using current data as part of Multi-Tiered Support Services (MTSS) and Response to Intervention (RTI) helps identify students who are not making adequate progress in the core curriculum and are at risk for poor learning outcomes. Armed with true understanding, teachers can provide interventions appropriate to the student's level of need and responsiveness.

Continuous formative assessments formed by adaptive learning systems throughout the learning process also help shape the process itself. Because every interaction is tracked in real-time, there is parallel insight into student strategies. Then, based on that insight, individual learning paths are dynamically created to guide the student to advance through the curriculum.

Intelligent adaptive learning technology in the classroom



Source: Intelligent Adaptive Learning: An Essential Element of 21st Century Teaching and Learning, Cheryl Lemke, Metiri Group, 2013

Objective 3: To recognize the yields of adaptive learning intervention.

Personalized learning helps create relevancy by offering students an experience that adapts to their unique skill set and knowledge base. Rather than deliver rote learning tasks focused on short-term memorization of facts and information, personalized learning guides students to acquire practical skills and knowledge they can use.

Adaptive learning offers students many benefits, including:

- Increased control: Students can move quickly through areas of mastery to immediately address those areas where they need to improve, which helps prevent students from falling behind in the coursework.
- Higher confidence: Students report feeling a stronger sense of confidence as they proactively address learning gaps.
- Better engagement: Students say classes are "more fun" and, as a result, they engage in the learning process at a deeper level.
- Long-term learning: Students retain knowledge and skills that can be applied in practical ways both in and out of the classroom.
- Improved results: According to faculty, students perform better in class because they get extra support in the areas they find most challenging

Ask any faculty member, teaching a diverse student population isn't easy. They are placed in the difficult position of needing to deliver a specific set of learning outcomes to students who arrive to class

with a wide range of skills, knowledge and abilities. Attempting to apply a one-size-fits-all learning approach is ineffective, but with deadlines and limited data to effectively assess student progress, faculty members are left with few alternatives.

Adaptive learning offers faculty many benefits, including:

- Improved context: Faculty members have access to more information from which to make instructional decisions.
- Personalized interaction: Faculty can address student issues in a personal way rather than apply a broad approach.
- No guesswork: Instead of trying to figure out why students are struggling, faculty can quickly recognize and act on problematic areas.
- Higher quality instruction: Faculty can focus on delivering quality education rather than trying to predict reasons for learning gaps.
- Increased engagement: Faculty gets to know students on a more personal level, engaging with each one in a way that uniquely speaks to his or her needs.

5. CONCLUSION

As a result, learning is personal. More important, there is sustained learning rather than short-term memorization. This long-term knowledge retention builds a foundation for success both in the classroom and beyond it. Adaptive learning catapults faculty-student interaction to the next level so as to enhance the learning experience. Adaptive learning lets faculty and students receive immediate feedback about a student's strengths and weaknesses, which opens the door for communication to bridge the learning gap. Moreover, the intention of students and faculty is not to make just a difference but a positive difference.

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