

# What is teaching machines



**What is Teaching machines and Adaptive Learning**

Teaching machine is a device that presents series of problems and provides immediate “reward” or reinforcement to students when they give the correct answers to the posed questions (Holland, 1960). The first teaching machine was invented by Pressey in 1925. It was a device that asked a single question to the student. If the student knows the answer, he moved to the next question. If not, the question was presented again on the screen until he found the correct answer. This machine allowed students to proceed at their own rate (Skinner, 1958) and recorded their progress (Seattler, 1990). Although this machine was designed for teaching, it was developed against a background of psychological theory (Skinner, 1958). The main disadvantage of this machine was being against the psychological theory. Although he understood that students had different pace, he did not do anything to change it. His device was designed to avoid forgetting. They were testing device, they should be used after the some amount of learning had been taken out of somewhere. (Skinner, 1958).

The popularity of teaching machines was increased with programmed instruction movement proposed by Skinner (Saettler, 1990). Based on his experiments conducting in laboratory with animals, Skinner propped an idea that “by arranging appropriate contingencies of reinforcement, specific forms of behavior can be set up and brought under the control of specific classes of stimuli” (Skinner, 1958). however, the reinforcement have to be given immediately to the students. Because, the delay between the response and reinforcement of a few second reduce the effectiveness of the reinforcement. Moreover, it eliminates the undesirable forms of responses

that would be successful in obtaining the right answer (Holland, 1960). It was difficult for teacher to provide reinforcement just after the correct responses were given. Thus some kind of machines was needed to help the teachers. This machine is an attempt to obtain the kind of behavioral control shown possible in the laboratory (Holland, 1960).

Skinner describes the teaching machine incorporating the following principles of learning;

- Practice of the correct responses,
- knowledge of results and reinforcement of the right answer,
- minimum delay of reinforcement,
- successive small steps with hints (McKeachie, 1974)

Teaching machines brought advantages to the educational environment. First of all, it provided an opportunity for students to study at their own pace (Skinner, 1958). According to Skinner (1960), it inspired the students and gave high degree of competence and confidence. The students were provided buttons in terms of “ guessing”, “ maybe”, “ sure” so by pressing those buttons after giving the answers, they estimated their level of confidence. By this method, they learnt to evaluate their confidence and adopt a useful strategy. Thirdly, unlike the other media such as tv, students were active while they were using teaching machine during their learning process (Skinner, 1960). It was such kind of private tutor which alerted students and kept them busy during the learning process (Skinner, 1958). Since it gave immediate feedback, students were able to see where they stood without waiting for an hour test or final examination. Finally, teaching

machines provided opportunity for teachers to analyze the responses of the students. By this, they see what students understand item by item (Skinner, 1960)

Teaching machines also brought some disadvantages to the educational environment. First of all, they were inconvenient and poorly designed (McKeachie, 1974). They were designed in frames that all students had to go through in linear sequence. (Seattler, 1990). The machine was designed in a way that the steps identified by the instructor were taken by students in a prescribed order (Skinner, 1958). And it was assumed that for human being, just being right is the sufficient reinforcement (Holland, 1960). The machine did not motivate the students to go on studying. Teaching machines locked so that neither the students see the correct answer until he responded correctly or altered his answer after he saw the correct answer (Calvin, 1969). For all of these reasons, most of the students found teaching machine boring and destructed their machine. In addition, it was seen that some of the students were unable to pass tests after successfully completing the program (Seattler, 1990). For teacher side, most of teaching machines were not readily portable and required maintenance (Calvin, 1969). Difficult to prepare programs, they are time consuming thus, teacher must be clear what they want to teach at the beginning of the program preparation (Skinner, 1960).

Due to these problems, by the late 1960s, the popularity of teaching machines was decreased. Despite its problems, teaching machines had great contribution in educational environment. It revived the early ideas of individualizing instruction. Moreover, it fostered the growth of sounder

technology in the development of instructional programs and influenced number of programs in 1960s, 1970s. Finally, it promoted computer assisted instruction and system approach to instruction ( Saettler, 1990).

Adaptive learning is a usage of technology to help the students in their learning process (Francois, 2011). It provides content and services to meet individual or group learning needs with improved learning achievement and efficiency (Martine, 2003). Adaptability in learning has become very important issue in educational area. As stated by Nguen and Do, learning environment is complex structure that includes many students who has different characteristics. They physically and mentally are different, so their preferences are various. Thus, adaptation in educational environment is necessity (Nguyen & Do, 2008).

With the help of technology, the adaptive learning environment have become more efficiently and effectively. Especially, development in computer hardware and software allow creating those kinds of adaptive environments. These computerized learning environments allow immediate feedback and adaptation to students' learning curves. These programs pace courses using sophisticated tracking of skill development, instant feedback, and help levels based on mastery of concepts by providing game like interface. (verilen makaleeeee)

The advantage of adaptive learning environment has taken the educators attention. Especially, e-learning professions have given their attention on adaptive learning and created adaptive e-learning environments. An adaptive e-learning environment is an interactive system that personalizes

and adapts elearning content, pedagogical models, and interactions between participants in the environment to meet the individual needs and preferences of users if and when they arise (Stoyanov & Kirschner, 2004).

There are lots of factors to contribute the popularity of adaptive e-learning; the diversity in the access media and modalities that one can effectively utilize today in order to access, manipulate, or collaborate on, educational content or learning activities, alongside with a diversity in the context of use of such technologies, the anticipated proliferation of free educational content. (Paramythis, Loidl-Reisinger, tarihi bul)

There are lack of research about adaptive learning. But according to ..... there are lots of opportunities those environment provides both students and teachers. They are cheap and can be given both online or blended form. The order of instruction is defined by the students not instructor. Everyone have different experience so their knowledge and needs are different

- Especially large classes prevent instructors from deviating much from the syllabus.
- Adjust course to the student
- Present every topic, a series of skills and building block concepts.
- Animation, videos, interactive diagrams and other web based features entered while needed.
- Interactive tutor help students to master of each skill, give short quizzes, score them, and offer additional help.
- Software adapt, keep students personal profiles.
- Students do not move until develop proficiency.
- Instructor decides the proficiency level.

- Instructor weight the material
- Instructors were informed about the students' process.
- Increase motivation
- Game like enviroment informs what have left to do thus motivate to go on.
- Research shows students completed the course in shorter , performed better

#### Cons:

- Few studies conducted to assess the outcomes
- Research problems: effectiveness of these programs are not done in isolation
- Researchers examine the effects of multifeatured environment, not isolate one element.

#### **Are teaching machines and adaptive learning similar or different things?**

Teaching machines and adaptive learning are different things although they have similarities. Firstly, both of them aim to help students in their learning process. Furthermore, they acknowledge the fact that students have different pace and it was difficult to adapt traditional classroom environment to the pace of all students. Both of these try to create an environment in which students study at their own pace and be active during the learning process. In addition, both of them keep the students' progress and inform the teacher about it. Teacher analyzes their progress and help students to reach the desired goals.

The first difference between teaching machine and adaptive learning is their technologies. Teaching machine was designed in 1920s and spread out in <https://assignbuster.com/what-is-teaching-machines/>

1950 when technology was not advanced as it is now. Thus, teaching machines was not portable and it was difficult to modify it for teachers. Thus teachers had to participate in the design process and decided what he wanted to teach at the beginning. In contrast, systems in adaptive learning creates flexible environment for teachers. They can modify the system based on the needs that may not be predicted at the beginning of the course.

The second and the main difference between teaching machine and adaptive learning was the learning theory underlying them. Teaching machine uses behaviorist approach whereas adaptive learning is more suitable for constructive approach. Teaching machine was designed for modifying the behaviors of the students. Although teaching machines was designed in 1920s, its usage in educational area was spread out by its modification by Skinner. Skinner designed the teaching machines based on the operant conditioning and its aim was to provide a small unit of information to the students and wanted their response. Since the instructional sequence is so simple, the students hardly make a mistake (Saettler, 1990). Students responded to the questions posed by teaching machines and getting reinforcement, they gained the desired behavior such as pronouncing a word or saying the results of a mathematical equation. There is a logical order in the teaching machine and all of the students have to follow the same path. Although the students are active, the teaching machine decides what question is posed in which order.

On the other hand, adaptive learning met the assumptions of constructivism. According to Ertmer and Newby (1993), constructivist learning environment emphasis on learner control and provides opportunities for learner to



manipulate information. In addition, the information is presented in a variety of different ways in terms of its order, modes, perspectives etc. Adaptive learning does not aim to change the behavior of the students by giving reinforcement or force them to follow the start at the same where and follow the same path. Instead, an adaptive learning provides a personalized learning environment for each learner, by both adapting presentation and navigation through the course materials (Retalis & Papasalouros, 2005). It acknowledges the differences between the students and create learning environment based on these differences. It can dynamically reorganize learning resources in order to achieve specific learning objectives by analyzing learner's profile or learning portfolio (Brusilovsky, 2001). It offers opportunity to uniquely address the specific learning goals, prior knowledge and context of a learner so it improves learner's satisfaction with the course and motivate them to complete that course (Dagger, Wade,& Conlan, 2005). For all of these, adaptive learning systems are beyond the teaching machines.

### **Strengths and weaknesses of technology supported adaptive learning**

Adaptive learning environment provides opportunities for teacher to apply range of methods. Teacher can either use problem based instruction, case reasoning etc. Moreover, it acknowledges the differences between the students. All students have different experience, background so their needs are different. Adaptive learning aims to recognize these differences and offers personalized learning that is determined based on these differences. Students take the control of their learning process, access the resources appropriate to their needs and study them at their pace.

Although the ideas behind the adaptive learning systems are dream of all educators, the implementation of these ideas is difficult. While the idea “adaptation based on individual differences” is good, it may cause problems if these differences are not identified correctly. Nguyen and Do (2008) states that the system must gather information and data about user and create a user model based on this information. But which information should be gathered? Adaptive systems have to decide this. Moreover, it should decide what to adapt. It has to identify the differences such as background, pre-knowledge about the content, learning style and offers a learning environment to suit these differences.

The maintenance of these systems is additional weaknesses of adaptive system. Technological knowledge of the teachers may not adequate to maintain such kind of systems. For this reason, an expert should control the system and intervene if there is any problem.

Finally, there is lack of research about the implementation of this system. What it offers and how it accomplishes this should be analyzed and the learning results should be investigated deeply. Moreover, it should be investigated what should be adapted, when and how it should be adapted and what should be kept constant in adaptive learning systems.

### **Suggestions to instructional designers**

Adaptive learning is just includes system that create an effective and efficient learning environment. So without a good design, it will not help either instructors or students in the learning environment. First of all, the instructional designer should decide which learning theory he will apply in

adaptive learning. Based on the learning theory, he needs to identify the overall goals of the course, which method he will use. Moreover, he needs to consider the possible needs of students from different backgrounds experiences and knowledge. To achieve this, he should get knowledge about his students. Since adaptive learning keeps the students progress, the instructor should monitor each student's progress and see where they are, what problems they face etc.

If adaptive learning is used by different instructor, instructional designer should inform the teacher about the benefits and weaknesses of it. Moreover, it provides guidance and help when needed and support the adaptation process of instructors to use adaptive learning.

In addition, these systems are complex and should be designed carefully. There should be multiple modes of presentations; the resources should be prepared for different background information etc.

Motivation components eklemeli

1. Learner-led adaptation. Learners should be able to find both what they want to learn and how they want to learn it.

3. Learner self-management. They can see where they are in the curriculum or competence map and what learning task or activity to carry out next, consult course-tracking data, and monitor their learning. They have an opportunity to prebrowse and search for learning content.

5. Learner auditing. learners should have possibilities to test the level of their knowledge and learning styles, and to be able to see their learning results.

#### Discussion

14. Learning communication. This second communication cluster emphasizes interaction

between learners and instructors. An LMS should support instructor-learner, instructor instructor, and learner-learner communication.

15. Collaboration. Instructors should be able to use different modes of group discussion and be able to collaborate with learners synchronously on group learning tasks. Experts also emphasize the possibilities of peer learning.

17. Socialization. Experts underline the need for an LMS to provide a social context for learning and professional socialization of learners.