TEACHING SYSTEMS THAT CAN MIMIC DIFFERENT TEACHING-LEARNING ENVIRONMENTS

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Abstract

Conventional learning guidance systems are typically automated machines for creating teaching materials: quizzes, exercises, examinations etc. In the future, systems will also offer ease of use, attention to sociality, ability to adapt to the pupil's needs and skill levels, and time savings.
Ease-of-use and adaptation can be sought using systems based on Artificial Intelligence (AI). Chatbots would save teachers time by talking with students about their problems automatically. The virtual classroom would release people from the physical state and offer the opportunity to play with different roles. For the teaching of physics, the virtual classroom provides an opportunity to try out things that are not practically possible. AI could enable automatically identify students' strengths and weaknesses and utilize them. On the other hand, AI also could allow pupils to gain strength through peer learning by bringing students of the same level from all over the world to discuss their own views and could automatically filter out sub-standard and clearly false answers. AI can also be capable of automatically creating tailor-made materials based on student-level learning using deep learning. Finally, AI can also be used to treat pupils' reviews to a large extent. In this research we will evaluate how well new technology powered by AI could respond to the demands of different teaching-learning environments.
We will present a learning system that is in use and discuss its differences between opportunities of Artificial Intelligence (AI) can support different teaching-learning environments and discuss little how AI could support different learning styles.
Keywords: *automatic teaching machine, artificial intelligence, student centric learning, learning environment, learning style*.

Introduction

Being bored has been a fruitful source of creativity. Before digital age with mobile phones, tablets, computers and Internet people had to crab a pen and draw and write or read some book. This was essential to the development of linguistic as well as concentration and logical thinking skills. All of this can be threatened by nowadays fast-food culture for brains offered by our new gadgets which are more often used by their users for easy relaxation than for development of their skills. One challenge is to create interactive learning systems that support creativity. Other challenge is to make people actually use them instead of using social media, playing addictive online games, watching streaming videos etc.

Nowadays learning systems are demanded good usability, social aspect, ability to adapt learners' needs and skill levels and time-effectiveness. Artificial intelligence offers many solutions. Chatbots are more or less clumsily able to chat with people and they could be programmed to have intellectual discussions adapted to the people's own needs, intellectual level and stage of development. Virtual classrooms free us from physical phase, people can play with different roles and test things that are not possible in a real world. Artificial Intelligence (AI) can detect people strengths and weaknesses, support peer learning and bring automatically tailored materials supporting deep learning.

Traditional Exercise Creation System

The system presented in this section has features similar to Maple T.A. (Maple, 2019). This means that the application creates parametrized exercises, which have the benefit of ensuring that students never get exercises with the same starting values. Therefore, the system eliminates the dilemma of running the exact same exercises year after year.

Any exercise is first written in the area called "Tehtävä"—in this case "Population of China." The population of China in the year 2012 and growth rate are constants here, but they could have been given as parameter values too. The year corresponding to the population is given as a parameter that is marked as @v_1@. The solution is given in the form x=1344130000*1.0047^(v_1-2012) to the area called "Derivoitava/Integroitava/Vastaus: (ilman @-merkkejä)." The keywords are population growth, exponential, basic and recap. Parameter limits are chosen in the following way: placed at the top or bottom of a page. Figure 2 shows a screen replica of the straightforward interface.

Figure 1. Draft illustration of an exercise editor.

Adding exercises is a relatively simple task for the average instructor. The interface is straightforward, so it is also easy for students to learn, though it is still something new that each student must learn. Currently, the system has 403 different exercise types, from algebra and statistics to partial differential equations. After an exercise is written into the editor, it is added to the database using PHP-code (PHP, 2019). Visualisation is done using a LaTeX2HTML-program called MathJax (MatJax, 2019), which makes use of formulas to improve the appearance of the visualization in the browser's online interface.

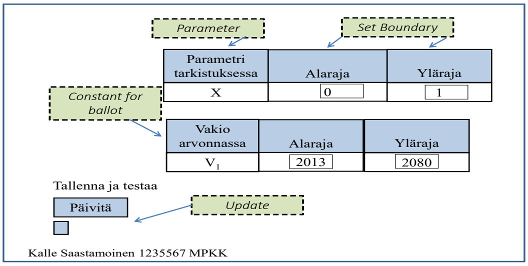

Figure 2. Adding parameters.

Benefits of this system are:

- It offers studying environment in which student has the possibility of recognizing and improving his/her own areas of weakness in mathematics.
- Teachers can concentrate on teaching those areas in which students do not excel in their exercises.
- In general, it is possible to optimally concentrate limited teaching capacities.
- It offers an automated exercise generator.
- It offers parameterized exercises.
- Students *always* get different exercises to solve.
- The system automatically checks exercises and gives immediate feedback.
- The teacher can remotely surveil the exercises through the Internet and see in real-time how students are evolving within the given exercises.

Students' Different Approaches Towards Learning vs. Teaching-Learning Environment

In research article (Parpala, 2013) learning styles were divided to three classes that were 1) Deep approach 2) Organized studying 3) Surface approach and factors measuring experiences of the teaching–learning environments to six classes that were 1) Teaching for understanding 2) Alignment 3) Staff enthusiasm and support 4) Interest and relevance 5) Constructive feedback 6) Support from other students. Table 3 shows the ESEM (Exploratory Structural Equation Modeling) estimated correlations between students' scores on the six factors of experiences of the teaching–learning environment and students' scores on the three factors of the approaches to learning and studying inventory (Parpala, 2013).

Table 1. Intercorrelations between perceptions of the teaching–learning environment factors and the approaches to learning factors (*p*<.001 and *n*=2509) (Parpala, 2013).

Factor	Teaching for understanding	Alignment	Staff enthu-siasm and support	Interest and rele-vance	Con-structive feedback	Support from other students
Deep approach	.43	.16	.22	.32	.25	.11
Organized studying	.18	.24	.12	.36	.23	.22
Surface approach	-.44	-.51	-.22	-.47	-.14	-.23

Discussion

From the table 1 we see that different learning styles affect how students interpret their teaching-learning environment from the table 2 we see how AI and traditional teaching-learning environments mimic different teaching-learning environments. While traditional teaching support system mimic mainly only partially or not at all different environments AI based systems at least have potential to mimic totally these environments presented. The other question is how well these systems could support creativity. This we can study through definition of evolutionary creative (Shneiderman, 1999) that is a process with four phases 1) Collect: learn from previous works stored in libraries, the Web, etc.; 2) Relate: consult with peers and mentors at early, middle, and late stages; 3) Create: explore, compose, evaluate possible solutions; and 4) Donate: disseminate the results and contribute to the libraries. These seem to be demanding still for AI to handle without any human intervention.

Table 2. Conventional teaching support systems vs. AI supported teaching environment in the view of teaching-learning environment.

System	Teaching for understanding	Alignment	Staff enthu-siasm and support	Interest and rele-vance	Con-structive feedback	Support from other students
AI	YES	YES	YES	YES	YES	YES
Conven-tional	PARTIAL	YES	PARTIAL	PARTIAL	NO	NO

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