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# The Seven Roles that AI Can Play to Transform Learning

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## I. Introduction

The goal of artificial intelligence (AI) in education should be not to replace teachers but to work alongside them, to assist both learning and teaching. AI can perform tasks that are time consuming and difficult for teachers to perform on their own. We can identify at least seven roles that AI can play in the learning process: Communicate, Assess, Critique, Guide, Summarize, Orchestrate, and Construct. Advances in natural language processing and machine learning and the availability of learner data increasingly make all of these roles possible. As AI combines these roles it sets the stage for a fundamental transformation of learning and teaching. These seven roles are being realized in Alelo Enskill, a cloud-based platform for learning communication skills. Students and teachers in over twenty countries are learning English with Enskill. It is a finalist for the British Council's award for Digital Innovation in English Language Teaching.

## II. Relevant Theories of Learning

### *A. Cognitive Skill Acquisition*

These roles for AI can be illustrated in the context of spoken communication skills, particularly in a foreign language. Spoken communication is both a motor skill (the ability to produce sounds of the language accurately and fluently) and a cognitive skill (the ability to understand language and produce language that has the intended meaning). Enskill therefore draws on the work of Fitts and Posner [3] and Anderson [2]. Fitts and Posner modeled motor skill learning as a staged process from the cognitive stage through the associative stage to the autonomous stage. Anderson adapted this into a model of acquisition of cognitive skill, in which learners reach the autonomous stage through a process of knowledge compilation. This takes place gradually over time and requires practice. The overall goal is to achieve what Segalowitz [5] refers to as cognitive fluency, i.e., the ability to understand and communicate easily and without effort.

### *B. Training Complex Cognitive Skills*

The learning methodology in Enskill is influenced by the instructional design methodology for complex cognitive skills of van Merriënboer [6], who argues that complex cognitive skills are best learned through a combination of whole-task practice and part-task practice. Enskill supports dialogue simulations that provide whole-task practice, and practice exercises provide part-task practice of specific communicative functions.

## III. Enabling Technological Advances

In Alelo's webinar series on the Future of AI in Education and Training [1], experts in AI and Education have discussed the potential of AI to transform education. Out of these webinars a number of key roles for AI in education have emerged.

Four roles provide support to learners. First, advances in natural language processing make it possible for intelligent systems to Communicate with learners in unscripted conversation. Unscripted conversation is a valuable learning activity because it requires learners to articulate and apply their knowledge, thus revealing gaps in their knowledge and skills.

Intelligent learning environments need the ability to Assess learner responses, not just for their correctness but also for evidence of knowledge gaps and misconceptions. A system that can automatically assess student work significantly reduces the burden on teachers to grade homework.

Once a system evaluates learner knowledge and skills it should Critique the learner's performance and provide feedback. Feedback should be provided at the appropriate time, in a manner that motivates learners to continue learning and improving their skills.

The system should then Guide learners as to what learning activities they should work on next. Personalized instruction is one type of guidance, but there are other possible approaches that give learners more control over their own learning paths.

The next two roles provide support for teachers and institutions. The system should Summarize the performance of groups of learners, within a class or across an institution, to identify when learners are having difficulty. It should then help teachers to Orchestrate learning activities across the group.

Finally, AI can and should assist course authors in Constructing learning materials. Machine learning techniques make it possible to automate the construction of learning content from examples, instead of having to laboriously author every possible learner input and response.

## IV. Real World Applications

The Alelo Enskill platform [4] is being developed to support all of these functions. In Enskill learners practice unscripted conversations with animated agents in common tasks, such as buying a ticket or interviewing a job candidate. During the conversation Enskill evaluates learner responses to identify errors. It also generates quantitative measures of the fluency and accuracy of the learner's spoken language. Enskill then provides critical feedback at the conclusion of each exercise, summarizing which objectives the learner has met and

the fluency and accuracy of their communication. It provides personalized recommendations of additional practice exercises, focusing on the areas where the learner is having difficulties.

The first application of Enskill is in developing spoken English skills. People around the world want to learn English but many have limited opportunity to practice with native speakers. Enskill English lets learners practice with animated characters that speak and understand English, in a safe environment where they are free to experiment and make mistakes without fear of embarrassment.

We are now opening up the Enskill platform so that teachers and institutions can take advantage of the data and analytics that Enskill collects, and so that authors can create their own content on the platform.

Enskill is being developed through an iterative, data-driven methodology. As learners interact with Enskill it continually collects learner data, which are used to evaluate performance, train and retrain models using machine learning, and evaluate algorithm improvements.

## V. Evidence of Potential Impacts

Because Enskill runs in the cloud on servers located around the world, institutions in many countries have adopted it. It is now being used in over twenty countries and a version is available for use in China.

Laureate International Universities has adopted Enskill English for use across its network of higher education institutions, and also offers it to other institutions. Laureate institutions are distributed throughout Latin America and around the world, with a worldwide total of nearly one million students.

Data collected by Enskill are used continually to measure system performance and learning outcomes. Recent evaluations with learners in Serbia and Croatia show that the number of conversational turns per minute increases and the frequency of dialogue misunderstandings decreases through repeated practice with Enskill English. Surveys of learners indicated that they felt that it was a good way to practice English and they personally benefited from it.

The British Council has recognized the Enskill English courses developed for Laureate as a finalist for its 2019 award for Digital Innovation in English language teaching. A total of 150 entries from 45 countries were submitted and judged by a panel of experts. The Laureate English course was selected as one of five finalists.

## VI. Summary

This article has identified seven key roles that AI can play in promoting learning. These enable systems to assist learners and at the same time assist teachers. They can provide each learner with a personalized learning experience while reducing the burden on teachers to evaluate and grade homework. Enskill is an example of system that is designed to perform this range of roles. Because Enskill runs in the cloud it scales easily and can support learners and teachers around the world. This combination of intelligent capabilities has the potential of transforming teaching and learning, by making it more personalized, responsive, and data-driven.

## References

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