AI as Learning Companions: A Concise Literature Review

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Abstract

This is the abstract.

Keywords. *AIED, Collaborative Learning*

1   Introduction

Artificial Intelligence (AI) has revolutionising modern education by assisting teachers or students or even take their roles and become part of the learning environment. The recent boom of generative AI technologies has introduced further opportunities, attracting research and investment into its implementation in AIED (Artificial Intelligence in Education). With learners, teachers, and educational institutions embracing this trend, the global AIED market which valued at USD 1.82 billion in 2021, is projected to grow at a compound annual rate of 36% from 2022 to 2030 (GrandViewResaerch, 2021) (Wang et al, 2024).

In an intelligent learning system which involves Artificial intelligent as educational agents (which are pieces of educational software with human characteristics), the AI could have distinct roles: tutors, teaching assistants, student assistants, peers, etc.. When computers simulate as tutors, such a system is called an intelligent tutoring system (ITS). The idea behind this is that "private tutoring has been shown to be four times as effective as classroom teaching, according to a study conducted by Bloom (1984). **CHOU**" AI agents in this kind of system would "model a tutor and mimic tutoring interactions such as looking over a student's shoulder, and offering just-in-time and adaptive feedback **CHOU**". Instead of being a tutor, in another system called learning companion system (LCS), AI agents become co-learners, or "simulated student", "artificial student", name varies among different researches. They could act like peer tutors, tutees, teachable students, collaborators, competitors, troublemakers, critics, or clones. We will explore in details later. The idea behind this system is social learning model or theory. "A social learning activity enables a student to interact with other people, such as a teacher or a fellow student, during the learning activity. These people are either computer-simulated or real human beings. Furthermore, a social learning environment is an environment promoting students to engage in social learning activities **CHOU**" System that supports social learning would involve multiple agents, either they are AIs or real humans.

This term paper is a literature review on the implementation of artificial intelligent agents as learning companions in the collaborative learning environment (or system). Despite the well-development

of AIED literature review, there aren't much directly focus on AI as learning companions. The few ones are either wild-ranging or fundamentally theoretical. So this paper aims to serve as a practical guidance on the future development of such a learning system, providing supports on theoretical framework but more importantly on system design.

More specifically, in this review paper we seek insights into the following key questions: (1) How to design a collaborative learning environment with AI agents as learning companions? (2) How do AI learning companions contribute to collaborative learning? (3) How can such contribution be evaluated?

2 Collaborative Learning

"Collaborative learning is a process that involves a group of people working together on a shared learning goal [1]. It has been proven by both scientific research and empirical observations that learning environment enhanced with peers facilitates the quality of study process and learning results. Some of the examples of collaboration include helping each other, doing learning activities together, competing or collaborating depending on what motivates the students in the group. These are the reasons why experienced teachers use various group-based learning methods to facilitate the learning process. **Puduane et al 2018**"

3 System Design

> What are the actors? What are their roles and functions? How they should interact to maximise user performance?

In the social learning environment, "a student has access to many learning resources, which can be classified into three categories—content, community, and computational support (Chan, Hue, Chou, & Tzeng, 2001; see Fig. 1). The content includes the student's learning materials, such as books, libraries, museums, and databases. The student can participate in communities and communicate knowledge with fellow students, teachers, volunteers, and parents. Additionally, the student is empowered by computational support, such as calculators, note-pads, and different kinds of computer software. **CHOU**"

3.1 The Role of Artificial Intelligent Agents

The characteristics of the agent can be expressed to students in text, graph, icons, voice, animation, multimedia, or virtual reality **CHOU**.

3.2 Interactions

3.3 Evaluations

4 Implementation Issues

5 Reference

GrandViewResearch. (2021). *AI In education market size, share & trends analysis report.* Grand View Research. Retrieved Aug 30, 2024 from https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-education-market-report.

Shan Wang, Fang Wang, Zhen Zhu, Jingxuan Wang, Tam Tran, Zhao Du, Artificial intelligence in education: A systematic literature review, Expert Systems with Applications, Volume 252, Part A, 2024, 124167, ISSN 0957-4174, https://doi.org/10.1016/j.eswa.2024.124167.