Critical Literature Review on Chatbots in Education

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ABSTRACT

Chabot, a virtual teaching aid diminishing the monotonous duties of educators, is being researched and exploited in the sector of education. It has been configured in such a manner that customized learning atmosphere is generated and doubts raised by learners are cognitively responded to. This is achieved through vigorous analysis of response and the learning techniques undertaken by students. This paper assesses previous literatures published by researchers on the use of chatbots in the area of learning.

KEYWORDS: Chatbot, Education

I. INTRODUCTION

Chatbots are thinking processors and mentors used to impart knowledge to either a novice or a professional based on analysing the learning patterns and comprehension and adapt to their pace through a series of messages. The technology used in such implements is **Artificial Intelligence** in which computers are replicated as how humans learn, reason and communicate. These interactive agents are embodied with tons of data including templates and patterns. ALICE (Artificial Linguistic Internet Chat Entity) is an example. Individual feedbacks assist to self rectify in case of corrections. Individual attention to students has offered improved results. Educators can collect student data through forms and can store the information. For instance; SnatchBot is an educational Chabot that does not require coding and works according to the creator's purpose [1]. Chatbots are considered to democratize the study procedure irrespective of the language and geography of students [17].

II. LITERATURE REVIEW

Considering the advantages, the review of a handful of research done by scholars in the use of Chabot for tutoring is summarised below.

A. Customised learning:

Personalised attention to students advances their results as the tutors get to knowledge of the domain where the learners are fragile in. The availability of personal educators to individual students of different capacities can conceive larger number of professionals. Students can acquire deeper knowledge of their interests. Technology Mediated Learning (TML) is defined as "an environment in which the learner's interactions with learning materials (readings, assignments, exercises, etc.), peers, and/or instructors are mediated through advanced information technologies" [2]. Chatbot mediated learning is also considered as a branch of TML where the study is personalised and students can dynamically use these bots for their learning.

The Differ chatbot used in BI Norwegian Business School brings together students of similar situations so that they won't feel judged on the queries they put forth and reminders are set for their continued involvement [1]. The chatbots assess the discernment of the students and provides the subsequent lecture. For instance, the Summit Learning Project uses chatbots to identify the weak areas of students and adapt to their leaning style and help them manage the modules [18]. The chatbots further conducts quizzes and submits the results to the tutors, who provide immediate feedback to the students. This is accomplished through digital forums. Botsify epitomizes the same behaviour [3].

The Intelligent Tutoring System (ITS) along with IM Bots termed as Open Learner Modelling has been utilized in the Wizard-Of-Oz Paradigm where a real person acts as the virtual tutor and studies the learners [5]. The real time experiment was conducted using 30 students from the University of Birmingham.

Anne G. Neering is another automated conversational agent that was produced by a set of engineering students that

dispenses the course content and ideas and instils fun along with learning [4].

B. Spaced Interval Learning:
Spaced Interval learning helps students polish up what they have studied until then. The students can recall what they have memorized. Super Memo is an application that reminds students when they are about to forget. It uses an algorithm to monitor the frequency mode in which the learning happens and repeats subjects already covered [1].

C. Assessment of composition skills:
Currently, educators tend to assess the students through Multiple-choice questionnaires easing their tasks. A student can be assessed better based on their writing and composition skills which can be acquired through essay writing. This has been explored through an automated evaluating system where the researchers have executed unsupervised machine learning on performing robotic assessment and have also done an analysis on the performance of the robot which was analysed using an amalgam of combination of term frequency inverse-document function (tfidf) with cosine Euclidean distance [6]. A real time study was conducted on a set of medical students, where the web tutoring program increased their test scores and cognitive efficacy to three fold the size which was measured in Cohen's D effect size (95%) and confidence interval (CI) [7].

D. Student teacher interaction:
An effective way to enhance interaction among mentors and learners in Massive Open Online Courses (MOOC) is the use of the virtual tutoring assistance, Chatbots. Though there has been an enormous rise in the number of courses provided online, there has been low student maintenance. This has been mainly due of exchange of communication between the mentor and the student. To illustrate, a study was conducted by employing a teaching assistant (TA) named by Jill Watson (JW) for the Georgia Tech OMSCS 7637 study on Knowledge Based Artificial Intelligence (KBAI) [8]. The JW was experimented from 2016 and different versions of the TA, developed using IBM BlueMix Toolsuite and Semantic Information processing technology, were used as discussion forums where it provided knowledge and collected feedback from students. The main challenge they faced as a result was lack of mentors for the expanding community of students that was joining.

A real-time investigation was conducted at University of Salerno for a set of Computer Science students where Latent Dirichlet Allocation (LDA) algorithm was used in the operation of managing queries [9]. This produced a satisfactory outcome.

Analysis of existing chatbots such as Facebook Chat, Natasha from Hike and Wechat was done by Rasika and an attempt to develop a better performing system was experimented using recurrent neural network (RNN), pattern matching, Natural Language Processing (NLP), and data mining algorithms [10].

E. Easing tasks of tutors:
It is a false assumption for teachers who think the chatbots may take up their job and they will be laid off. It only simplifies tasks for them by helping students with frequent queries and assessing them personally. Teachers can equip themselves with the latest research during the supplementary time they get. Ashok Goel, is one among the initial educators who used this method and developed his own chatbot and named it Jill Watson [8]. Jill attempted to answer the students through an online forum dispensing all available information including technical doubts.

A study was done to find the viewpoint of teachers to the usage of the talkbots in their syllabus and it was found that an attitude rating score (mean) of 3572 was obtained which proved they were optimistic to this technology [11]. They also suggested improvements where chatbots should incorporate an option to search similar to web search.

F. Integration of chatbots to classrooms:
Apart from standalone chatbots, there has been an increase in the integration of these chatbots in social platforms such as Facebook, Google classroom and so on. Based on the category, language and development platform chatbots used for education in Facebook has been studied in and the efficacy has been evaluated. Quality allocation was tabulated using Analytic Hierarchy Process (AHP) [12].

G. Appealing methods of online education:
How effective can chatbots be in education, also relies on its attractive design. Reeves, B. & Nass, C. (1996) [13] exemplified in their investigation that most of the humans consider social platforms such as televisions, computers and internet as their fellow beings and treat them with more respect. This finding led few researchers to think with ingenuity to impart knowledge as a dignitary or an influential person from the past. To elaborate, in the research conducted in 2014, a talkbot labelled Freudbot was built using non-proprietary software called AIML (Artificial Intelligence Markup Language) and ELIZA kind of control features [14]. The highlighting feature of Freudbot was that it communed with the learners as a famous personality from history. Though it provided neutral results, it was assumed to be more promising for the future online education.

H. Competent in language:
There are applications that help users to learn different languages. Its fusion along with chatbots is still being experimented. A study exclusively for English learners was done, where the chatbot designed was integrated to an existing English Practice application available [15]. Quizzes, Grammar test, spoken language tests, vocabulary assessment et cetera are available for the users to practice their linguistic skills. The application also reminds the users if they remain inactive for a period of time.

An investigation was done by Jia and Chen on how to inspire learners in the sector of English language. The study was conducted over a period of 6 months and was integrated into an English high school classroom. The analysis found that students felt more self-assured, and could enhance their learning potential. Duolingo is an application that uses bots to learn languages [16].

III. CONCLUSION
To summarize, there has been a lot of investigations on the use of the artificial conversational entity over ages and the research still continues for enhanced results and switch over to a digital era. While there are limitations to its usage that

includes lack of funds and qualified teachers, this paper reviews previous literatures where chatbots benefitted the students and teachers simultaneously which outweighs the limitations and promises a better education.

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