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Chatbots in Education System

Vijaya Lakshmi, Y* and Ishfaq Majid**

With the changes happening around the world, the practices in the education system are also catching up the track. Information and Communication Technology (ICT) has enabled the education system to adopt these changes in a faster way and as a result today we are able to integrate the concepts and ideas like Technology Mediated Learning (TML), customized learning, Intelligent Tutoring System (ITS), Spaced Interval Learning (Spaced Interval learning helps students polish up what they have studied until then), unsupervised robotic assessments, virtual tutor assistance etc. in educational practices (Hephzibah, 2020). The TPACK model of ICT integration (Mishra and Koehler, 2006) also suggests that for developing good quality content, it requires a careful interweaving of all the three key sources of knowledge: technology, pedagogy, and content and hence use of technology is essential in education. ICT also plays a very critical role in not only achieving the Sustainable Development Goals (SDGs) but also addressing the issues of inclusion by giving equal opportunity to everyone to learn. Artificial Intelligence (AI) is being looked up as a potential ICT option to transform how education would operate. It can also help us to move from the stage of knowledge acquisition to knowledge creation (UNESCO, 2011). AI is currently used in education in the form of customizable content through adaptive learning programmes and software, tracking and monitoring diagnostics, automation of grading and even AI tutors. AI will continue to bring in new prospects for the enhancement of learning, new forms of learning and will also offer more adaptable lifelong learning pathways (UNESCO, 2011).

In a study carried out by Ritu and Hayley (2020), it was found that as high as 99.4 per cent of United States higher education stakeholders believe that AI will be instrumental in institution's competitiveness in the next three years and 15 per cent of them called AI a "game-changer," and at least 54 per cent of US higher education institutions have

started to experiment with AI, while 38% have embraced AI as a core part of their business strategy.

Chatbots

The use of AI based Chatbots is on popularity. It all started with a basic question raised by Turing test (1950) that "Can machines think?" From the oldest chatbot Eliza to the latest voice based assistants like Siri from Apple, Alexa from Amazon, Microsoft's Cortana or Assistant from Google, today chatbots are being used in almost all fields to handle various routine/monotonous tasks (Hephzibah, 2020) and thus save the time for productive and creative tasks. The type of communication used by chatbot (text/voice based; facial based or robots) determines the interaction process that takes between the user and chatbot (Gracia, Fuertes and Molas, 2018). Chatbots are the software programmes or applications that has the ability to respond to users' messages by choosing correct expression from a pre-programmed schemes or using adaptive machine learning algorithms (Neff and Nagy, 2016; Gracia, Fuertes and Molas, 2018; Fichter and Wisniewski, 2017). Some bots have the ability to run automatically, while some perform commands when they receive specific input (Colace et al., 2018). Thus, chatbots have evolved over time and now some chatbots can include features like recognition and oral expression, detection of emotional state to communicate with a person or another chatbot and give the feel of presence of a real person (ZEMČÍK, 2019; Gracia, Fuertes and Molas, 2018). They are also emerging as a new interface, designed in such a way that they can replace or complement applications or visits to a website by enabling users to simply interact with help of chat (Knill, et. al. 2004). The advantage of using chatbots in education is that they can be made available 24 X 7 and have qualities like persistence, honest, reactive, friendly (Zoroayka, 2018 and Tsvetkova et. al, 2017). The compound annual growth rate of Chatbot Market is projected to increase by 34.75 per cent from 2019 to 2025 (Artificial Solutions, 2020).

Chatbots are also known by different names such as a talkbots, chatterbots, conversational AI bot, AI chatbot, AI assistant, intelligent virtual assistant, virtual customer assistant, digital assistant, conversational agent, virtual agent, conversational

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interface etc. Chatbots have varying degrees of intelligence and higher the degree of intelligence higher would be its ability to respond satisfactorily.

What Can They Do in Education?

The aim of use of chatbots in education is not to replace the teacher but to reduce the burden of repetitive and low cognitive level tasks carried out by the teacher and thus increase her/his efficiency. In field of education the use of chatbots can be divided into those used with educational intention and those without educational intention. When used with educational intention, they can work as virtual assistants/virtual tutors; exercise and practice programmes etc. to improve productivity and hence they can be developed on the grounds of socio-constructivist approaches of learning (Gracia, Fuertes and Molas, 2018). Chatbots when used without educational intention can be used to answer FAQs related to various elements of the syllabus/course, can handle many repetitive questions raised by students regarding project guidelines, deliverables, deadlines, grades, etc. and thus work on the basis of behaviorist and cognitivist approaches of learning (Gracia, Fuertes and Molas, 2018, Pradana, Goh, and Kumar, 2018; Fleming et al. 2018). Ndukwe, Daniel and Amadi (2019) explored the scope of using Chatbots in providing automated assessment and foster engagement with students and claimed that a good inter-rater agreement was observed between the automated and the human grading. Han (2017) remarks that chatbots can be utilized to execute tasks like providing reminders, introducing new concepts, answering FAQ's and offering training to new employees. Chatbots can act as a means to provide virtual language practice to students anytime. Fryer and Carpenter (2006); Nghi et al., (2018) claim that in Foreign language learning, students felt more comfortable in conversing with the bots than with a student partner or teacher and also they created fun and excitement in them for learning. Zoroayka, 2018 claims that in higher education especially in online courses, where the instructors are often required to answer high number of emails which are to be answered in a time-bound period, the use of chatbots can be very useful. Chatbots can also engage students in classroom activities by providing them with interactive quizzes. Students can also ask take the help of chatbots to access information that is difficult to find in a Learning Management System (LMS) environment at any time and place (Clark,

2018). Chatbots can also be useful in hybrid courses that mix face-to-face classroom experiences with student self-directed learning online. In class, AI based chatbot applications can also take attendance and perform other administrative functions. Some institutions have begun to use AI to help grade tests and even assess some student work (Artificial Intelligence and Chatbots in Higher Education, 2020). Use of chatbots in teaching learning process can act like a programmed learning material which can direct the students to learning objects as per the ability of the learner. Lundqvist et al., (2013) claimed that the chatbot developed by them worked as an automated interviewer and was able to understand most users feedback with a 96.7% success rate. Thus, chatbots by asking students challenging questions can create curiosity among students and thus support their learning process (Oudeyer, Gottlieb, and Lopes, 2016). APA (Animated Pedagogical Agents) software agents guide users through virtual (computer-based) environments and are potentially beneficial for learning and decrease anxiety and also can act like social interaction schema that influence student motivation positively (Clark and Choi 2005; Gulz 2005; Atkinson 2002; Choi and Clark 2006; Domagk 2010; Frechette and Moreno 2010). Schroeder, et. al. (2013) reported a small, but positive and significant effect of using APAs on learning. However, studies by Van der et. al., (2015) and Heidig and Clarebout (2011) which explored the utility of APA in enhancing student motivation and learning concluded that effectiveness of APA in learning is still largely an open questions which needs to be explored much further and also the design of the APA to a great extent determines its effectiveness. Winkler and Soellner (2018) in their work through systematic literature review concluded that chatbots are still in the very beginning of entering the field of education and for them to be successful they should be designed by keeping the cognitive as well as emotional status of students. Colace, et al., 2018 asserted that the results of designing and experimenting the integration of chatbots in their university platform proved effective and such experiments have good perspective. David Kellermann (as cited by Dan Ayoub) developed a question bot which is capable of answering questions on its own, delivering video of past lectures, flag the questions of student for Teaching Assistants (TAs) to follow-up. Anne G Neering chatbot developed by Crown, et al., (2010) helped to combine learning and fun in teaching learning of the course content.

Are They Really Helpful?

Designing, developing and using the chatbots in education is still at very nascent stage. However, the development of chatbots whether they are rule based or machine learning based demands hard work and deeper knowledge about the content and stakeholders. The chatbots developed on the basis of rule based approach may not be efficient in answering questions, the pattern of which does not match the rules on which the chatbot is trained. Further, the Chatbots developed on the basis of machine learning based approach try to respond on basis of both the keywords and human language and hence are better in performance but tougher in development than chatbots developed on the basis of Rule based approach (Shridhar, 2017; and Kharchenko, 2017). Skerrett (2017) remarks that the response given by chatbot depends on the variables included during their development and hence all of them are not useful. It also needs to be noted that development of chatbots includes a cost factor and hence one needs to think twice before planning for using them. Molnar and Szüts (2018) claims that in many areas of education, chatbots can only be used to disclose supplementary information and cannot be used to solve or improve content related issues. They also assert that if chatbots are not designed effectively they can also increase frustration of users which arises due to unsuccessful communication. Gracia, Fuertes and Molas (2018) remarks that the acceptance of chatbots by education stakeholders and the ability of the chatbot to adapt to various contexts need to be explored further.

Conclusion

Chatbots could be involved in performing various tasks like design textbooks, deliver course content, develop test questions and evaluate the answers, monitor online discussions, and tutor students. The effectiveness of chatbots depends on ability, creativity, and imagination of its developer. However, there is still a paucity of research which can confidently declare about the impact of use of chatbots in education. Hence, there is a strong need to explore more in this area.

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