The Social Sciences 11 (Special Issue 6): 7168-7171, 2016
ISSN: 1818-5800

Incorporating Learning Agents in Blended Learning

Choo-Kim Tan and Choo-Peng Tan
Multimedia University, Jalan Ayer Keroh Lama, Bukit Beruang, 75450 Melaka, Malaysia

Abstract: Research found benefits of using blended learning in teaching and learning process. Furthermore, other studies too found students benefited from learning with the learning agents in mathematics. Hence, this project aims to incorporate learning agents in blended learning and examines student's perceptions and opinions on the incorporation of the learning agents in blended learning in order to improve their learning and increase their interest in mathematics. It is hoped that the framework with learning agents in blended learning that will be designed and developed in this study is significant to the instructional designers and educators in helping students to reduce difficulties and anxiety level in mathematics and thus improve performance in mathematics.

Key words: Learning agents, blended learning, anxiety, instructional, incorporation

INTRODUCTION

Students experience difficulties in learning mathematics in a variety of ways. These include fear and anxious towards mathematics. The learning difficulties in mathematics significantly impact student's achievement and attitude towards mathematics, i.e., low performance in mathematics and negative attitude towards mathematics (McCraty *et al*., 2000). In most of the time, students try to avoid taking mathematics or do not pay attention in mathematics class.

Various teaching practices/approaches/strategies have been identified by researchers or educators to help students who have difficulties in mathematics learning. Implementing blended learning may be considered as one of the suitable practices as it provides comfortable learning environment. Students can learn mathematics independently and at their own pace.

In this technologies era, ICTs provide opportunities to educators to be more innovative and creative in delivering teaching materials. Similarly, student's learning process becomes more interesting and interactive. Educators could use learning agents in online learning systems and adopt blended learning concepts to support their teaching.

MATERIALS AND METHODS

Blended learning: Blended Learning (BL) is defined differently by various researchers. It is defined as the combination of various pedagogical approaches by Driscoll (2002); the combination of various media such as activities, technologies, etc. by Bersin (2004) and the integration of opposite approaches by Rossett and Frazee (2006). In addition, Allen *et al*. (2007) stated that BL refers to course blends online and face-to-face delivery. They mentioned that materials could be delivered online using a Learning Management System (LMS) or website. The tools of the LMS were used in BL in supporting face-to-face learning. These tools include blog, discussions, dropbox, email, e-Portfolio, calendar, quizzes, etc. They are used to help students to access course materials, course calendars and assignments during and outside school hours, as well as to interact with their teacher and classmates. BL is a flexible approach. Its implementation depends on the accessibility and availability of technologies and internet. If technologies and internet is available such as in a computer lab, BL can be conducted there where students may completely adopt online learning and consult with teachers on their works. However, if technologies are limited or internet is not available in a classroom, the delivery of materials is done face-to-face but the projects/assignments are completed and submitted using computers (OME, 2016).

Research found many advantages of BL. BL courses are more preferred by students as compared to those that are solely face-to-face or solely online (Center for Digital Education, 2012). A survey conducted by Center for Digital Education found that 92% of respondents agreed that BL was able to provide alternate learning opportunities, 85% agreed that it offered distance learning and 70% agreed that it increased students engagement.

Corresponding Author: Choo-Kim Tan, Multimedia University, Jalan Ayer Keroh Lama, Bukit Beruang, 75450 Melaka, Malaysia

Other benefits include: increased students achievement, better use of classroom capacity, increased students retention and reduced costs.

These advantages also are stated in other institutions such as University of Central Florida and the American Association of State Colleges and Universities. They cited that BL could compensate for limited classroom space for faculty collaboration, a method to offer new engagement opportunities into establish courses as well as offer conveniences of combination of online learning and social and instructional interactions. As such, BL increased student's engagement, understanding in learning and retention. Perez *et al*. (2011) study too found that BL helps in reducing dropout rates and improving student's achievement.

Learning agents: Learning agent is an animated lifelike agent that is used to facilitate learning for students in computer-based learning environment. Research found that learning agents has provided favorable effects on student's learning particularly their attitude toward learning as students have positive emotions and motivated when interacting learning agents (Baylor, 2009). Therefore, student's learning was engaged and motivated by learning agents. Student's anxiety towards mathematics decreased and their self-ability in solving mathematics problems increased which also caused student's learning and achievement improved (Kim and Wei, 2011; Kramer and Bente, 2010). One of the reasons as stated by Cheng and Chen (2012) was that student's learning was assisted by the agents in which the agents provided immediate and appropriate feedback to students when they encounter difficulties in solving mathematics problems.

Learning agents play important roles in student's learning. These include the role as motivators, lecturers, tutors, experts and learning companions. According to Tien and Osman (2010), the design and development of the learning agents should be based on these roles as well as the objectives or goals of the instructional modules and the student's background. If the role of the agent is a lecturer, i.e. to provide knowledge and skills to students, the agent must be designed and developed as a highly professional and competent person who provides accurate information for students, especially novice learners. Furthermore, if the agent acts as a motivator, then the agent must be designed and developed as a medium or low-competent learning companion or motivator who builds confidence and motivation among the students. Baylor *et al*. (2003) stated that it is crucial that the agents should be designed and developed as a more like real human mentor because they found that the human-like voice had positive effects on how the students perceived the agent as engaging and human-like.

RESULTS AND DISCUSSION

Proposed framework of incorporating learning agents in blended learning: Research on the incorporation of learning agents in BL was found limited. Therefore, it is proposed that the learning agents are used in BL. This project aims to incorporate learning agents in BL and examines student's perceptions and opinions on the incorporation of learning agents in BL in order to improve their learning and increase their interest in mathematics.

The proposed framework (Fig. 1) will be designed after collecting data on student's opinions towards the incorporation of learning agents in BL. The phases of this project are introduction of learning agents to students, a survey to collect student's opinion towards the use of learning agents in BL, design of the framework.

The purpose of having teaching and learning with learning agents to students first is to introduce the concept of learning agents because maybe they do not know what the learning agent is. In this phase, students will be asked on their feedback on learning agents. In phase 2, an instrument, i.e., a questionnaire will be distributed to students after the teaching and learning of mathematics using learning agents. Students will be asked on their perceptions about 'when' and 'how' the learning agent is to be used in BL. In term of 'when', students are

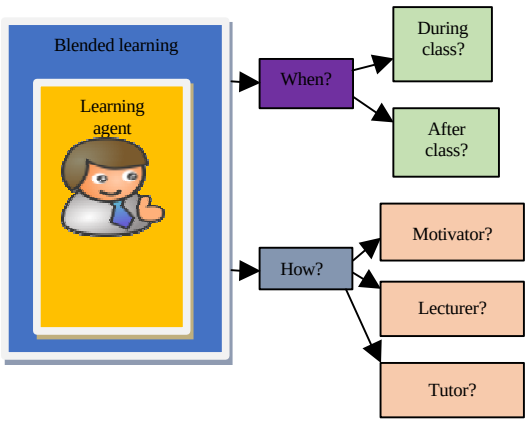

Fig. 1: Proposed framework of learning agents in BL

requested to provide their opinions on their preferences and the suitability of using learning agents in BL, i.e. either during the class or after the class. If learning agents are to be used during the class, 'how' will the learning agents act? That is what are student's preferences on learning agent's roles in helping them in learning? In other words, whether students prefer the learning agent to act as a lecturer who delivers course content/materials for a specific topic? or as a tutor who guides them on problem solving on a specific topic, completing the quizzes/assignments/projects? or as a motivator who provides them encouragement? or act all three roles in classrooms? Then, the lecturer will be the facilitator in face-to-face class.

If learning agents are to be used after the class and in BL approach 'how' will they act? Student's opinions on, in learning a specific topic, whether they want the learning agent to act as a lecturer, a tutor, or a motivator, or all three roles as in the classrooms, are to be collected. As such, the learning of that particular topic is totally does not involve face-to-face with their lecturer. The learning agent is used for interaction and discussion outside the classroom. In addition, information on the suitability and student's preference on using the system with learning agent in BL for submission of project/assignment as well as for conducting online quiz/test will be gathered in the survey.

In third phase of this project, a proposed framework will be designed based on the information collected in second phase.

Some findings of phase 1: At the time of this paper is produced, only phase 1 was conducted. Some data on student's feedback on learning agents have been analyzed. There were 245 undergraduates at a private university involved in phase 1 which consisted of 125 males and 120 females. All students stated that they have not been exposed to learning agents prior to this project. Figure 2 shows that 147 (60%), 60 (24%) and 38 (16%) students categorized themselves as having high, average and low anxiety level in mathematics, respectively. The high and average anxious students hoped that the learning agents could help them to reduce their anxiety level in mathematics.

Furthermore, all students opined that they prefer learning agents play the roles as a tutor and a motivator in learning mathematics. 240 (98%) students preferred learning agents play the role as a lecturer. It was found that 126 (51%) of the students preferred the male agent while 119 (49%) students preferred the female agent to be used as the learning agent in mathematics learning. Further analysis found that male students preferred male agent, whereas female students preferred female agent.

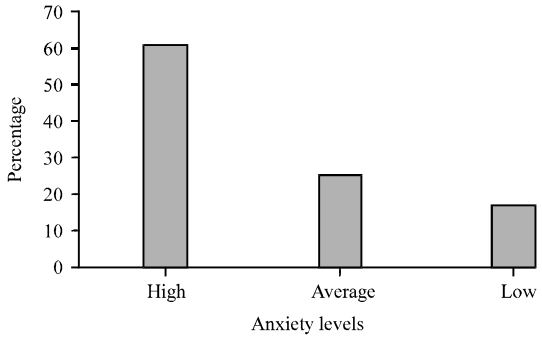

Fig. 2: Bar chart of high, average and low anxiety level in mathematics

Table 1: Impact of using learning agents

Variables	Frequency	Percentage
Increase interest in mathematics	244	100
Increase confidence	242	99
Increase understandings	245	100
Improve mathematics performance	240	98

All students felt that learning agents will increase their interest and understanding in mathematics. Furthermore, 242 and 240 students opined that learning agents will increase their confidence level and improve their performance in mathematics, respectively (Table 1).

Lastly, it was found that majority of the students (235, 96%) liked to use learning agents in mathematics learning. Only 10 (4%) students had no opinion.

CONCLUSION

Since findings from studies found advantages of BL and learning agents, it is hoped that the integration of both provides more benefits and advantages in the field of teaching and learning of mathematics in a large scale. Hence, this project will collect student's opinions on the incorporation of learning agents in BL in order to design a framework for the benefit of all parties. It is hoped that this study contributed to the design and development of a framework with learning agents in BL. The framework will be significant to the instructional designers and educators in helping students to reduce difficulties and anxiety in mathematics and improve performance in mathematics. Lastly, this project also provides another alternative teaching and learning approach to lecturers and students.

REFERENCES

Allen, I.E., J. Seaman and R. Garrett, 2007. Blending in the extent and promise of blended education in the United States. Online Learning Consortium, Needham, Massachusetts.

Baylor, A.L., 2009. Promoting motivation with virtual agents and avatars: Role of visual presence and appearance. Philos. Trans. Royal Soc. London B. Biol. Sci., 364: 3559-3565.

Baylor, A.L., J. Ryu and E. Shen, 2003. The effects of pedagogical agent voice and animation on learning, motivation and perceived persona. Proceeding of the Annual World conference of Educational Multimedia, Hypermedia and Telecommunication, June 23-28, 2003, Honolulu, Hawaii, pp: 452-458.

Bersin, J., 2004. The Blended Learning Book: Best Practices, Proven Methodologies and Lessons Learned. John Wiley and Sons, San Francisco, CA., Pages: 330.

Center for Digital Education, 2012. Realizing the full potential of blended learning. Center for Digital Education, Folsom, California.

Cheng, Y.M. and P.F. Chen, 2012. Autonomous pedagogical agents to e-learning in elementary school. J. Inf. Hiding Multimedia Signal Process., 3: 378-380.

Driscoll, M., 2002. Blended learning: Let's get beyond thehype. E. Learn., 1: 1-4.

Kim, Y. and Q. Wei, 2011. The impact of learner attributes and learner choice in an agent-based environment. Comput. Educ., 56: 505-514.

Kramer, N.C. and G. Bente, 2010. Personalizing E-learning: The social effects of pedagogical agents. Educ. Psychol. Rev., 22: 71-87.

McCraty, R., T. Dana, A. Mike, A. Pam and J. Stephen, 2000. Improving test-taking skills and academic performance in high school students using heart math learning enhancement tools. Institute-Heartmath, San Jose, California.

OME., 2016. E-learning ontario: Blended learning. Ontario Ministry of Education, Toronto, Ontario.

Perez, L.M.V., P.M.C. Lopez and R.L. Ariza, 2011. Blended learning in higher education: Students perceptions and their relation to outcomes. Comput. Educ., 56: 818-826.

Rossett, A. and R.V. Frazee, 2006. Blended Learning Opportunities. AMACOM Publisher, New York, USA..

Tien, L.T. and K. Osman, 2010. Pedagogical agents in interactive multimedia modules: Issues of variability. Procedia Soc. Behav. Sci., 7: 605-612.