

MEGA World – A Platform of Multiplayer Educational Game for All

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Abstract: This paper presents MEGA World, a platform that allows teachers to create their own virtual worlds for their course so their students can learn required knowledge and skills as well as be stealth assessed in a non-pressure environment. Students will walk through the learning and assessment activities by wondering and exploring the virtual world via interest driven. In this paper, various quest types will be introduced, and their use cases will be explained with the content from four graduate level and undergraduate level courses in Athabasca University. At the end, users' experiences and their preliminary perceptions toward the use of MEGA World will be summarized – users spent on average 70 to 81 minutes on the gameplay activities even they were introduced MEGA World and its activities in the last second week of the term/semester; moreover, they had very positive opinions on the use of it to replace the supervised exam.

Keywords: Multiplayer, Interest-Driven, Educational Game, Platform, Stealth Assessment, Role-Playing

1. Introduction

Students in the 21st century have more different ways to learn than the students before (Prensky & Berry, 2001). They live in a media-rich environment where they can learn different knowledge from innovative and interactive ways such as games (Chang & Kinshuk, 2010). Computer games have an engaging and immersive nature, have inspired academics to adopt and deploy educational games and game-based learning to courses (Tobias & Fletcher, 2007). Educational games are interactive and can get students motivated in learning; therefore, they can enhance the cognitive process with gradual increase in difficulty while improving students' learning performance and their understanding of the subject (Tobias, S. et al., 2011).

Barr (2018) finds the attitude the undergraduate students have toward the use of commercial video games to develop skills and competencies. Their result shows that the students have positive perception in favor of having video games to assist their learning and also believe they can develop their communication skill as well. Similarly, Wouters and colleagues (2013) find that the adoption of digital game in the learning activities can improve students' learning motivation and make them be more active while working on problem-oriented learning activities.

Although there are different game genres, Gros (2007) lists seven game genres that are agreed broadly: (1) action game; (2) adventure game; (3) fighting game; (4) role-playing game; (5) simulation game (6) sports game; and (7) strategy game. Among the above mentioned seven game genres, Podjačevs and Skorobogatova (2017) indicate that the use of role-playing in learning is one of the most efficient methods to learn a foreign language as well as to develop mental personality. The role-playing game allows students to play a role of fictional character to explore the virtual world – which is aligned with developing skills of decision-making, cooperation, problem-solving, and social interactions (Chang & Lin, 2014).

MEGA World (Multiplayer Educational Game for All) is a platform developed by Chang and Kinshuk (2010). The platform allows teachers to create virtual worlds, quests for learning and assessment, non-player characters (NPCs), quest and reward items/tools for

their students to learning via role-playing in the game. The rest of the paper is organized as follows: Section 2 introduces MEGA World and Section 3 explains the various quest types with real world course content. A preliminary user perception toward the use of MEGA World in a formal university course is summarized in Section 4. At the end, Section 5 briefly makes a summary and discusses the limitations.

2. MEGA World

MEGA World hosts multiplayer game worlds (i.e., virtual worlds) in which students can interact with non-player characters (NPCs), items, and other students. MEGA World as an educational role-playing game platform was proposed and developed by Chang and Kinshuk (2010). MEGA World supports any language and can access any existing external resources, e.g., multimedia, materials, online meetings, etc. Teachers can create their virtual worlds (see Figure 1) as well as create learning and assessment activities (i.e., quests in the game) for students. Students can learn specific knowledge and reach the learning goal of ActionScript programming language (Kuo, et al., 2010), research methodology (Li, et al., 2018), and English (Xu, et al., 2016) by taking and solving those quests while playing.

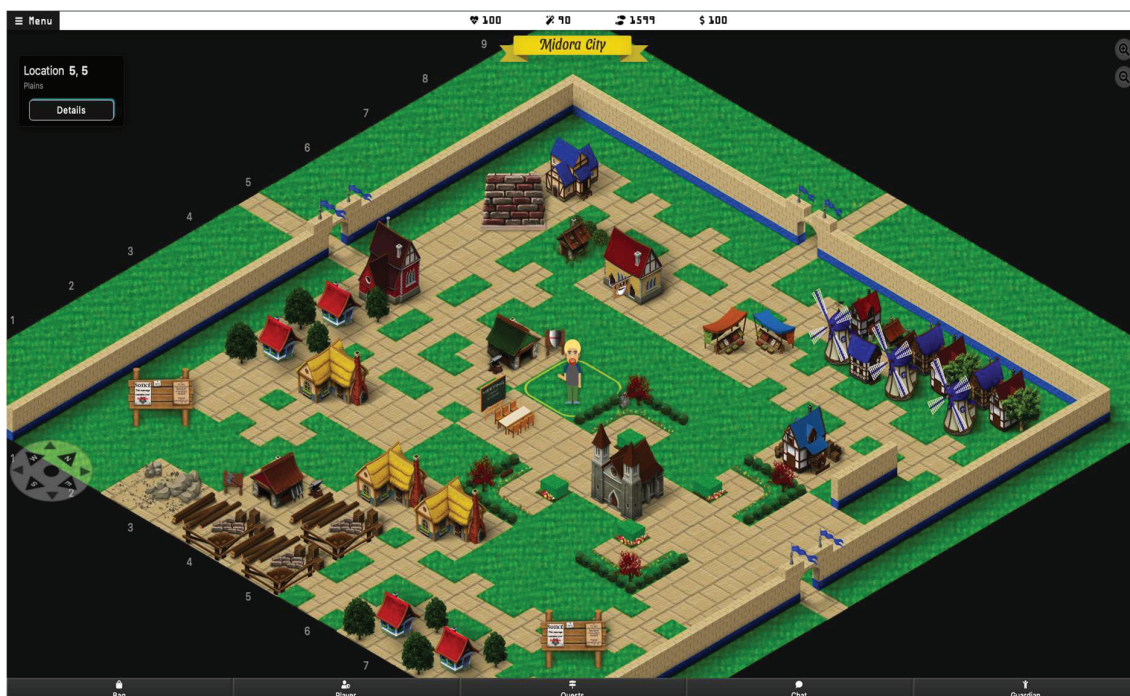


Figure 1. MEGA World v3.0 in Dark Theme (access: <https://megaworld.game-server.ca>).

MEGA World v3.0 currently has **twelve** (12) quest types include calculation, conversation (Chang, et al., 2019), fill-in-the-blank, greeting (check-in), item collection and delivery (check-in with item), multiple choice, short answer, single choice, sorting, speaking, treasure hunting (coordinates), and true/false quest type. Teachers are also provided management portal (see Figure 2) in which editors like map and quest editors are available so they can freely expand their game worlds and design quests in different levels for different subjects/topics according to their own teaching plan.

A virtual world (map) can host students who enroll in different courses. Teachers can design one or more professions to associate to a course they teach and any quest the teachers design and create should be linked to a profession if it is related to the course/subject matter. With this design, students must become a designated profession first (see Figure 3) before they can start the learning process and they won't be able to see

advanced level of the knowledge/skill as the teachers can control the learning progress via profession levels and/or hierarchy.

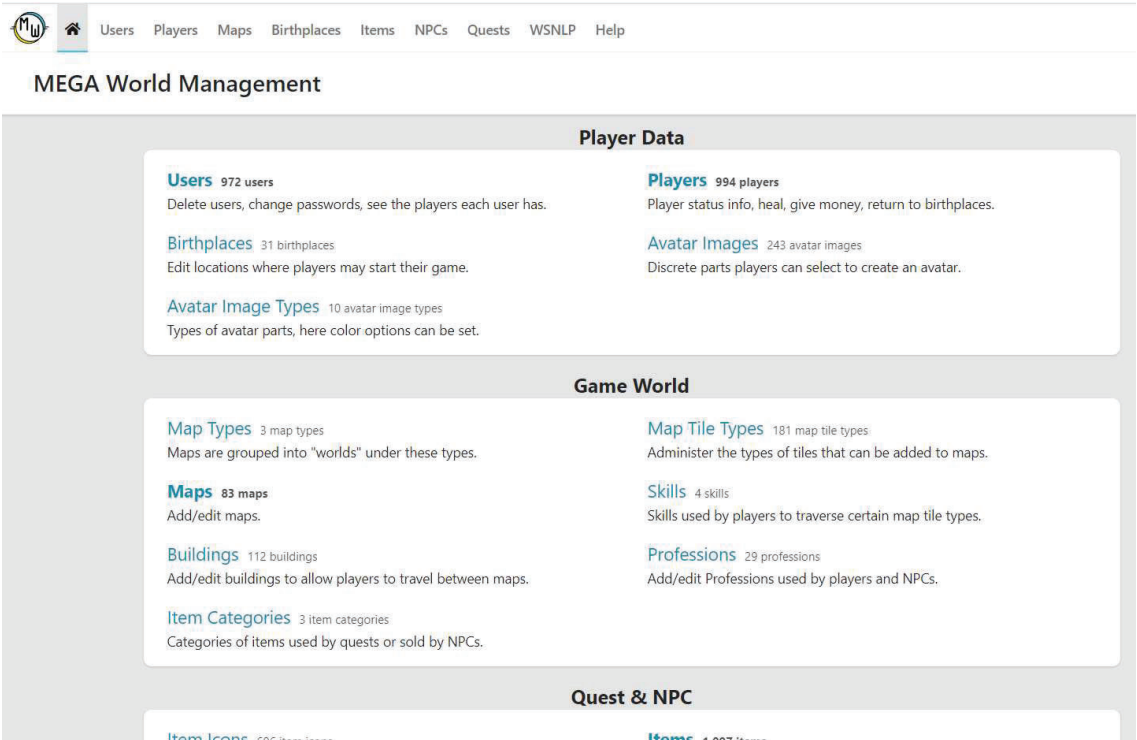


Figure 2. Management Portal for Teachers.

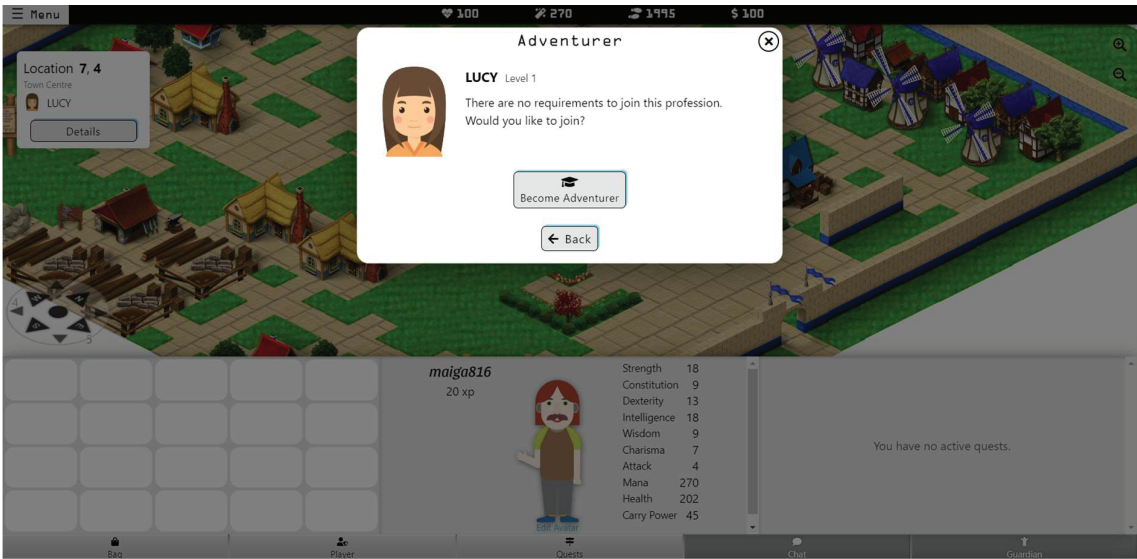


Figure 3. A profession is associated with a course or a learning subject.

3. Example Quests in Real Course

In this section, several quest types include Sorting Quest, Speaking Quest, Treasuring Hunting Quest, and Conversation Quest, are introduced with the course content in the real world.

As Figure 4 shows below the sorting quest type could be used by teachers to ask their students to match and connect the key concepts and their definitions. Of course, the

sorting quest type can also allow teachers to ask their students about the correct steps and actions of a procedure or process. The teacher of Java Programming language course asks students to match the definitions of the three types of Java: Java Mobile Edition, Java Enterprise Edition and Java Standard Edition.



Figure 4. Sorting Quest

Besides the open-end short answer quest type, MEGA world also supports “speaking” based short answer quest type. It is like the short answer quest, but it asks students to enter their answer via speaking into a microphone instead of typing their answer. With the speaking-based quests, teachers can force students to practice their speaking skill under a non-pressure environment. Figure 5 shows a similar speaking quest that International English Language Testing System (IELTS) has. While speaking to the mic, students can see how the computer recognizes their words correctly or incorrectly – so they can make proper changes and practice more to ensure people could read their words.

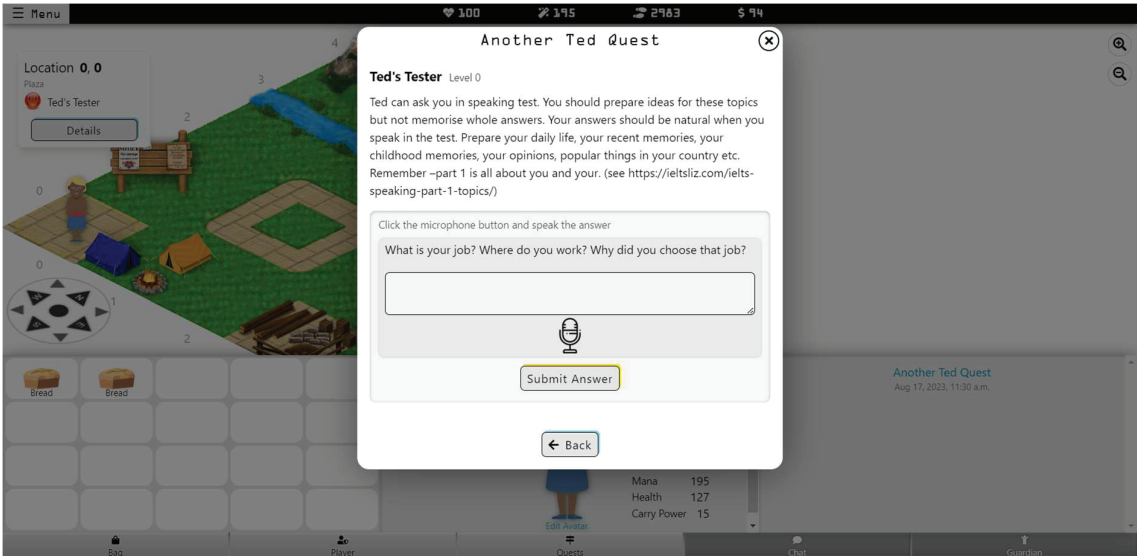


Figure 5. Speaking Quest

Another worth to mention quest type in MEGA World is the treasure hunting (coordinates) quest. This quest type allows teachers to create a scenario that students may see in the real world while conducting a task. For example, for conducting literature review

students may use their devices (e.g., computer, laptop, or even mobile phone) to access the academic database via their university library. Figure 6 shows a quest, “finding the literature”, that gives the student a “Computer” as tool and asks the student to “go to library at (4, 1)” on the map “digging” the mentioned paper out and bringing back to the NPC “Ted’s Tester”. When the student reaches the library at (4, 1), he or she uses the given tool to “Dig” and finds the article. This kind of quest solving experience makes students not only get familiar with the operation and flow of doing a task, but also emphasizes the **important tools** students will need for completing a task.

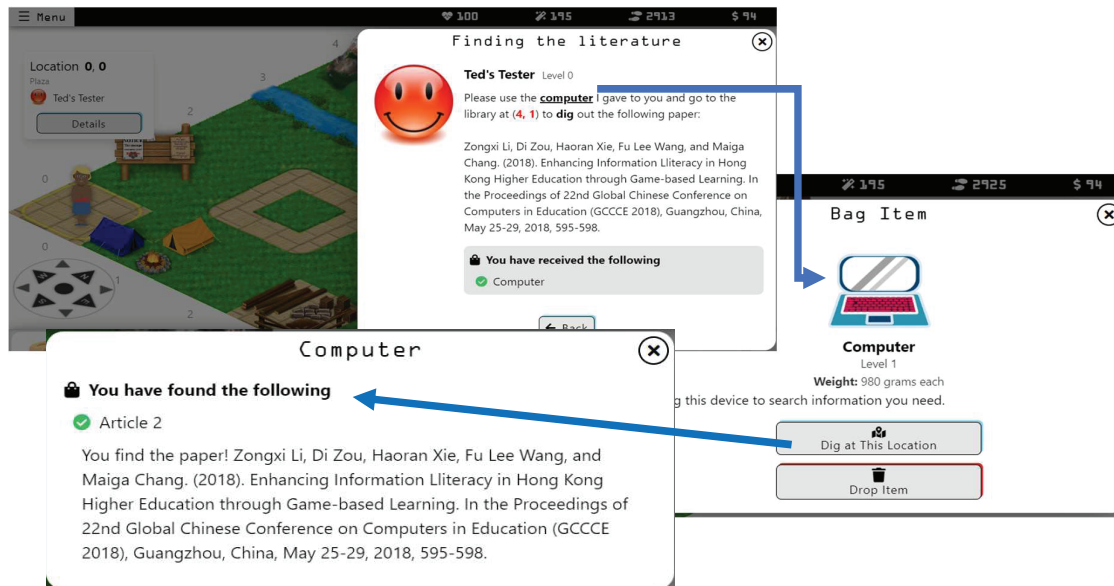


Figure 6. Treasure Hunting Quest

MEGA World also bridged with Speaking-based Conversation Quest (SCQ) System at <https://conversation.megaworld.game-server.ca> (Chang, Chen, Wu, & Yu, 2019; Chen, Chang, Wu, & Yu, 2018; Li, Chang, & Wu, 2020). Teachers can create and manage (see Figure 7) the conversations that they want their students to learn and practice via speaking to the mic. A conversation can be on any topic and difficulty level in any language. The speech recognition is supported by the Web Speech API built-in majority of the browsers include Chrome, Edge and Safari (https://developer.mozilla.org/en-US/docs/Web/API/SpeechRecognition#browser_compatibility).

https://conversation.megaworld.game-server.ca/conversationList.php

MEGA WORLD

Demo Video NPC List Conversation List NPC Create Add Conversation Sign In

Conversation List

Topic	Title	Level	
Food	Ordering food and beverages - Subway	3	  
Greetings	How are you doing?	1	  
Greetings	How are you doing?	2	  
Hobbies	What did you do during the last holiday?	2	  
Hobbies	What do you do in your free time?	1	  
Hobbies	What will you do during the next holiday?	3	  
Introducing yourself	What is your name?	1	  
Introducing yourself	What's your name?	2	  
Introducing yourself	What's your name?	3	  
Movie	What movie would you like to see?	1	  
Music	Have you ever been in a Coldplay concert?	3	  
Music	Were you a Michael Jackson fan?	2	  
Music	What kind of music do you like?	1	  

Figure 7. Conversations can be created by teachers.

Since teachers would like to have their students learn proper responses to people in speaking a language, they can create and arrange the conversation branches alone or with other teachers together. A branch can be reused, and a conversation can continue by jumping from one place to another place in the conversation tree as Figure 8 shows below.

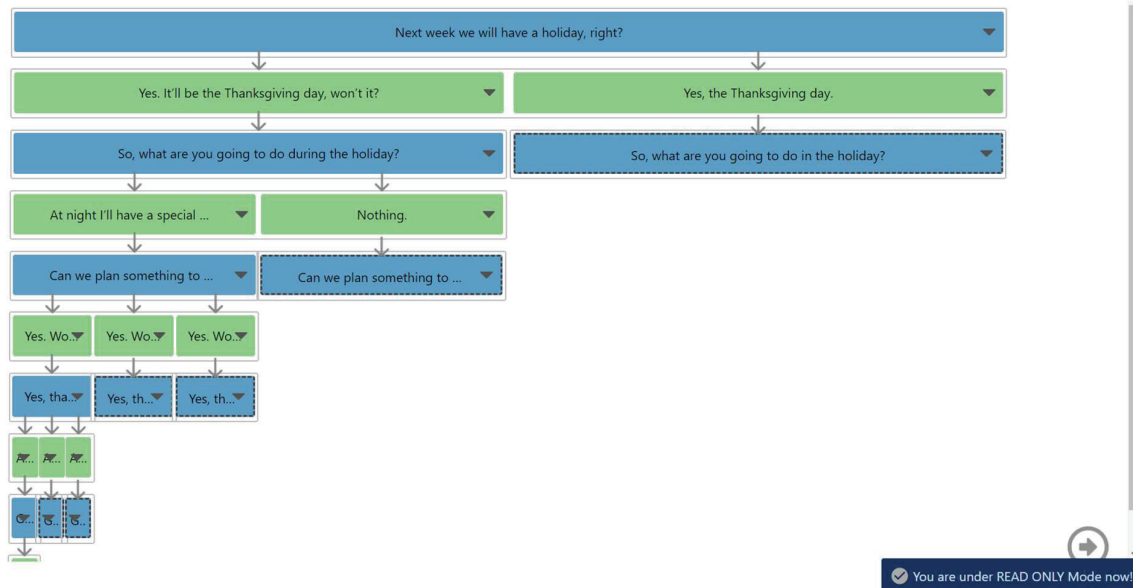


Figure 8. A Conversation Tree.

Teachers then can create a conversation quest in MEGA World and link the quest in MEGA World with the conversation tree in the SCQ System with the conversation identifier (i.e., an id number). When students work on solving the quest, they will be redirected to the SCQ System and speak to the Non-Player Character (NPC). When they complete the conversation, the NPC will send a mark back to MEGA World so the conversation quest can be concluded.

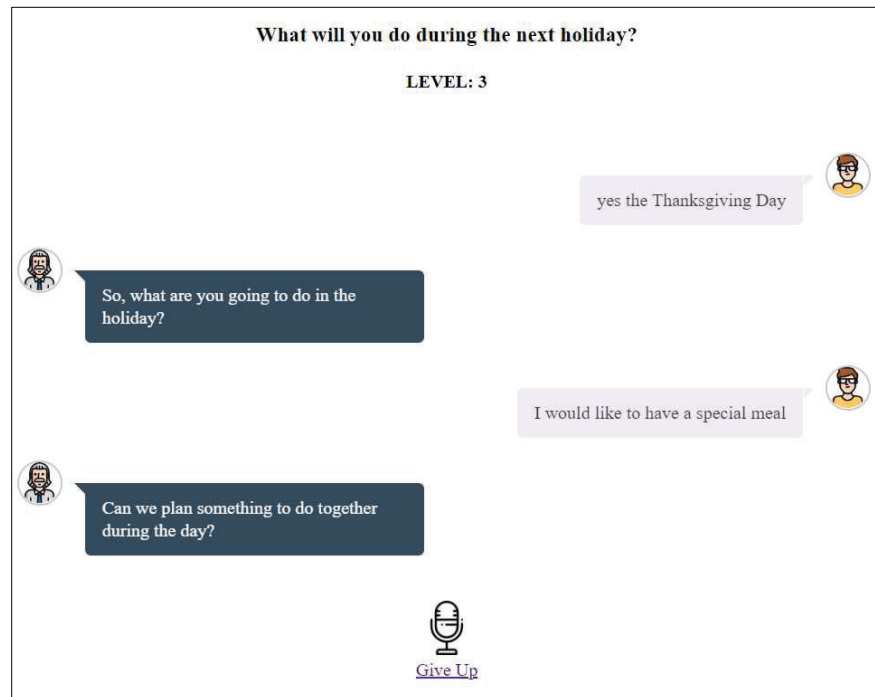


Figure 9. Conversation Quest

4. Preliminary User Perception

Four undergraduate and graduate level courses at Athabasca University have virtual worlds (i.e., maps), NPCs, and quests created on MEGA World; they are Java Programming, Managing Innovation and Change in Information System, Research Methodology, and History of Psychology. This section summarizes users' perceptions toward the use of MEGA World in Java Programming learning subject. The Java Programming course has four maps, twenty-four NPCs, and 108 quests distributed in 10 levels.

In the Java Programming course, 11 students were asked to use MEGA World as a self-assessment tool and then voluntarily report their perceptions include whether or not they have seen similar game before, do they think MEGA World can be a self-assessment tool, do they think if MEGA World can replace the supervised exam, and do they want to play more in other courses in the future. Among nine users who provided their opinions, at the end seven users' feedback is considered and summarized in this paper due to two users were not really playing in the course's virtual world but other virtual worlds instead.

In average, the seven users played 70 to 81 minutes and most of them solved 10 to 25 quests while two of them solved only 2 to 6 quests. Six users rated the quests are easy, not difficult, beginner level, or easier side while one user rated 7 out of 10 for the difficulty level of the quests. Most of the users, five of them, had never seen similar games before while one had seen, and one had not seen such game in Massively Multiplayer Online (MMO) game form.

Regarding their perceptions on whether MEGA World can be a self-assessment tool, most of them believe so – only one user disagreed and explained that he or she preferred quizzes with selectable answers and automated code testing instead. While six out of seven users believed MEGA World can be used as a self-assessment tool, they all suggested having more quests in higher difficulty levels. This is understandable as the virtual worlds' first 28 quests belong to the first two levels of the course and none of the users proceeded beyond that probably because this activity is voluntarily, and they want to spend more time on it after 70 to 81 minutes or more.

For the possibility of replacing the traditional supervised exams with MEGA World, six of them except the one who preferred quizzes and automated code testing had very positive

opinions including “while I prefer project-based assessment but consider it is and supervised exams are equivalent,” “I get very stressed and overwhelmed on exams and I would think this platform would lighten that aspect for me,” “this is a good idea to replace traditional exams actually,” “assuming the exam question are replaced by the question or activities in the quest, then it could replace supervised exams,” “I would heavily support this.” Besides the positive perceptions, users also suggest to still having some supervision so MEGA World is not considered an open book exam that students can research answers while playing it.

5. Conclusion

This paper introduces MEGA World, a multiplayer education game platform that allows teachers to create their own virtual world maps, non-player characters (NPCs) and role-playing quests for their courses. MEGA World currently has 12 quest types that cover most of the question types used in a quiz and exam. Besides the common question types like true/false, single choice, multiple choice, and fill-in-the-blank, MEGA World also supports sorting, speaking, conversation, treasure hunting, and open-end short answer quest types.

The research team has created virtual worlds, NPCs, and quests for four courses at Athabasca University, including Java Programming, Managing Innovation and Change in Information System, Research Methodology, and History of Psychology. Taking Java Programming course as example, the course has 24 NPCs dispatched on 4 maps offering students 108 quests distributed in 10 levels.

The research reports users’ preliminary perceptions toward the use of MEGA World in the Java Programming course as a self-assessment tool and the possibility of replacing supervised exams with MEGA World. Six out of seven users believed MEGA World is good for use as self-assessment tool and had very positive opinions on the use of it to replace the supervised exam. One user expressed his/her feeling about exams – stressful and overwhelming – and thought MEGA World can lighten this aspect very much. Finally, one user considered MEGA World to be equivalent to supervised exams while he or she prefers project-based assessment.

There is one recommendation according to the results the research team would like to remind practitioners, including teachers and educators who may want to adopt multiplayer educational game activities into their courses. As the results show that on average the users spent 70 to 81 minutes on the gameplay in MEGA World, they have done about 10 to 25 quests out of the 108 quests the virtual world has for the course content. The 10 to 25 quests belong to the first two difficulty levels while the 108 quests created for 10 difficulty levels. Under such circumstances, users explicitly express their desire to see more difficult quests and have positive willingness and attitude toward the use of MEGA World to replace the supervised exams.

Since the course has MEGA World and its gameplay activities arranged at the last second week of the course, one week before they are supposed to write the supervised final exam. They cannot put more effort and time in terms of doing gameplay activities and completing more quests. The research team would recommend practitioners to start the gameplay activities earlier and even at the beginning of the course. In such a case, users can have time to play more – the more they play, the more difficult quests they can see and practice to solve. Their gameplay progress could match the syllabus and weekly teaching/learning plan and even be considered as either preview or review of the course content that they have been taught in the class.

Acknowledgements

Thank all the NSERC, Mitacs Globalink, SIL research interns/assistants and various university students (see <https://megaworld.game-server.ca/#team>) who help to improve MEGA World in terms of (sub-)systems development, features implementation, graphic assets design and creation as well as help to create virtual worlds, NPCs, quests for courses.

References

- Barr, M. (2018). Student attitudes to games-based skills development: Learning from video games in higher education. *Computers in Human Behavior*, 80, 283-294.
<https://doi.org/10.1016/j.chb.2017.11.030>
- Chang, M., & Kinshuk. (2010). Web-based Multiplayer Online Role Playing Game (MORPG) for Assessing Students' Java Programming Knowledge and Skills.
- Chang, M., Chen, C.-T., Wu, K.-H., & Yu, P.-S. (2019). Conversation Quest in MEGA World (Multiplayer Educational Game for All). In *the Proceedings of International Conference on Smart Learning Environments (ICSLE 2019)* (pp. 77-82), Denton, TX, USA, March 18-20, 2019.
- Chang, S.-M., & Lin, S. S. J. (2014). Team knowledge with motivation in a successful MMORPG game team: A case study. *Computers & Education*, 73, 129-140.
- Chen, C.-T., Chang, M., Wu, K.-H., & Yu, P.-S. (2018). Web-based Conversation Quest for Enhancing English Speaking Skills. In *the Workshop Proceedings of the 26th International Conference on Computers in Education*, Manila, Philippines, November 26-30, 2018. Access: https://apsce.net/conference_4.php
- Gros, B. (2007). Digital games in education: The design of games-based learning environments. *Journal of Research on Technology in Education*, 40(1), 23-38.
- Kuo, R., Chang, M., Kinshuk, & Liu, E. Z.-F. (2010). Applying Multiplayer Online Game in Actionscript Programming Courses for Students Doing Self-Assessment. In *the Proceedings of Workshop on New Paradigms in Learning: Robotics, Playful Learning, and Digital Arts* (pp. 351-355). Putrajaya, Malaysia.
- Li, K.-C., Chang, M., & Wu, K.-H. (2020). Developing a Task-based Dialogue System for Language Learning. *Education Sciences*, 10(11), Article #306. Access: <https://doi.org/10.3390/educsci10110306>
- Li, Z., Zou, D., Xie, H., Wang, F. L., & Chang, M. (2018). Enhancing Information Literacy in Hong Kong Higher Education through Game-based Learning. In *the Proceedings of 22nd Global Chinese Conference on Computers in Education (GCCCE 2018)* (pp. 595-598), Guangzhou, China, May 25-29, 2018
- Podjačevs, P., & Skorobogatova, O. (2017). Computer Role-Playing Games as One of the Most Efficient Methods of Teaching and Learning in Higher Education. *International Journal on Information Technologies and Security*, 9, 65-78.
- Prensky, M., & Berry, B. D. (2001). Do they really think differently? *On the Horizon*, 9(6), 1-9.
- Tobias, S., & Fletcher, J. D. (2007). What research has to say about designing computer games for learning. *Educational Technology*, 47(5), 20-29. Access: <https://www.jstor.org/stable/i40186175>
- Tobias, S., Fletcher, J. D., Dai, D. Y., & Wind, A. P. (2011). Review of research on computer games. In S. Tobias & J. D. Fletcher (Eds.), *Computer Games and Learning* (pp. 127-222). Charlotte, NC: Information Age Publishing.
- Wouters, P., Van Nimwegen, C., Van Oostendorp, H., & Van Der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, 105(2), 249.
- Xu, B., Chang, M., Chen, G., Chen, Z.-H., & Kinshuk. (2016). Preliminary Study on the Influence of Role Playing Quests in Educational Game. In *the Proceedings of 20th Global Chinese Conference in Computer Education (GCCCE 2016)* (344-347), Hong-Kong, May 23-27, 2016.