

Gaming in Education

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Dr. Maiga Chang is an expert in game-based learning and assessment area and has done a lot of relevant research and developed many games for educational and training purpose. He has been invited to be keynote speakers by various international conferences and events to deliver talks for his research and outcome. He was also interviewed by IEEE TCLT (Technical Committee on Learning Technology, Institute of Electrical and Electronics Engineers) as an expert of Intelligence and Gaming in Educational Research in 2015.

Dr. Maiga Chang: Thank you so much for having me in the text-based interview and I hope my answers and thoughts given here can make some contributes and hope readers of the journal can benefit from this.

Question: How and what characteristics that educational games have can help students learn?

Dr. Maiga Chang: In general speaking, the major differences between educational game and the conventional way that students learn are the visual effects, control and interactivity. Visual effects are obvious, when you see a textbook, what words you will have in your mind about learning with it? Probably static, reading, and boring. If a text has many diagrams, figures, illustrations, and images, would you like it more? Perhaps, right? A game with proper visual effect and good graphics and art works definitely can get your attention and make you want to take a look or even try it yourself.

Second characteristic that educational games have, or say games have, is “control”. Players can choose to play a game in their own way and they may also choose to not play the game – although they might not want to do that when the game is attractive and addicted. How about traditional learning? If you are a student, can you say “no, I don’t want to study today, perhaps tomorrow?” I don’t really think so, right? Moreover, if you ask students why they go to school for learning, most of them may tell you that they are forced to. In fact, psychologists had done experiments with mice and they found that the effect of active learning is better than passive learning and the effects of passive learning and not to learn are same! Which means, if you ask a student who doesn’t want to learn coming to classroom and sit there for several hours, the knowledge and skill he or she learns at the end probably not too much. On the other hand, when students are attracted to play a game, they are “actively” doing that. That makes things different.

Last but not the least, an educational game usually provides its players opportunity to interact with it or even with others. In the most of cases in traditional learning and settings, students are studying along – even sometimes they will try to say “let’s go to library or somewhere to study together” and sit side-by-side, they are barely talking to each other and discuss. Don’t even mention that when a student has issue while learning, he or she cannot get help from peers immediately since not everyone is in the same place at the same time. Educational games, especially multiplayer games, do provide further interaction feature and opportunity for students.

So educational games can help students learn in terms of three ways and stages: first of all, get students motivated to play the games so they can learn while playing; second, make them actively play the games so playing more and learn more; and, at last allow them to interact with materials and cases to dig knowledge and skills deeper and wider as well as collaborate and help others while playing – playing is learning in education games!

Question: How do you think about the addiction of playing games?

Dr. Maiga Chang: If you are asking me whether or not I believe people will get addiction toward game play, I would definitely say “Yes, I believe that.” However, you need to know that even we don’t talk about those not very good habits people, still, actually get addicted to many things and, like jogging, swimming, etc. When you see a boy who likes to read a lot and for very long – he is more willing to stay at his room and read an encyclopedia rather than going out for a movie on Sunday, for instance – would you stop him or say he is addicted to reading? Probably not, probably you would say he is a good boy and he definitely has very good academic performance in the school, right? So let’s review what is the purpose and the goal of educational games – educational games aim to make people learn while playing so more they play, more they learn. Does it similar to the purpose of reading a book – make people learn while

reading and more they read, more they learn? Under such circumstance, I would say “YES, YES, YES, please make it happens”, if you ask me “do you want people to be addicted to playing educational games?” If addiction can happen for playing an educational game, then we can make people to learn more and quicker than traditional passive learning.

Question: Can you tell us about the status and the trend that educational games research have in the world?

Dr. Maiga Chang: Sure. When we are talking about educational games, the first thing comes out is game genre – that means how a game is played; for instance, a game is a shooting game if it asks players to use different ways to shoot enemies or zombies. Many research have found that role playing games and adventure games are most suitable for educational purpose. Simulations and nurturing games are also widely adopted as they can give students a better and detailed look for the phenomena (common or rare to be seen in the real world) and causal effects and consequences that an action may cause. Nurturing games can apply to both of knowledge and human beings; for instances, students can apply their knowledge of math in a game that they have to make a local builder become a world-class business and they can also learn and practice their critical thinking skills and humanity in a game that they need to nurture a non-player character (NPC) who is an orphan they adopted in the game.

Besides these game genres, mini games are also popular for educational purpose. Mini games are the games that players only need to take couple of minutes to finish a game play every time. As most of people nowadays have a lot of fragmented time in their daily life and have nothing to do for those fragments, mini games can help them recharge with new knowledge or sharpen their skills instead of sitting there and making a day dream OR chatting online with meaningless words and emoticons on social media apps. Last but not the least, the use of board games and card games for education are getting researchers’ attention. The games can have direct connection to domain knowledge and skills. Moreover, roles, collaboration, and competition are also involved. For instance, a card which is about a chemical equation or a physics law can be designed for a detective board game. In the game, the student needs to play most appropriate card at correct timing to solve a case for his or her client.

Question: Can you share with us some important educational games research or teams in the world?

Dr. Maiga Chang: Yes. Of course there are many researchers and research teams in the world keep designing and developing educational games for learning, training, and assessment purpose. Different subjects (e.g., history and science), student targets (i.e., primary school students, high school students, etc.) and technologies (e.g., computers, tablets, smartphones, head-mounted devices, etc.) are focused when they design the games. Most of the educational games, as I said, have their own limit – subject or target – and it is understandable because the researchers or the research team may need to put more efforts and time if they want a game to cover more knowledge or various skills, to accommodate the needs that students with different mastery levels, or to allow different ages of people to play the game.

Among all educational games research, I would like to bring your attention on THREE. The first one is eAdventure (<http://e-adventure.e-ucm.es/>) done by Universidad Complutense de Madrid. The eAdventure platform not only provide game editor and game engine, it is also capable of being integrated into learning management system like Moodle. The second one is Farmtasia (<http://www.farmtasia.com/>) done by The Chinese University of Hong Kong. Farmtasia is a massively multiplayer online game which involves different kinds of knowledge like weather, geo-science, marketing, and so on. There are random events happening in the game and the students need to apply all their learned knowledge of different disciplines to make their farm make money. The third one is Learning Games Network (<http://learninggamesnetwork.org/>) – an organization which aims not only developing game-based learning tools but also collaborating with other organizations. LGN designs and develops many games for different subjects, including biology, ecology, science, etc., on different platforms like Windows and Mac.

Question: You didn’t mention your research at all. As you are an expert in game-based learning and assessment, can you briefly talk about some of your successful research?

Dr. Maiga Chang: Definitely. Just like the THREE I mentioned earlier, our goal and vision for educational games are also big and more complete than having a game which aims to limited subject and target. I would like to bring up two relevant research that my research group has done, ICER Moodle Module and MEGA World. In the past, my research group developed a web-based discipline independent trading card game (TCG, <http://tcg.vip.game-server.cc>) which allows teachers to use in any of their courses. The game has hundreds of cards and can be expanded further as we wish because we developed it. In such case teachers can give any in-game card to their students according to student performances in different learning activities (e.g., classroom participation, discussions, assignments, quiz, exams, etc.).

Although the effect of using in-game cards as educational reward is perfect and better than expectation, we still find that teachers have slightly more workloads while adopting the TCG. We, therefore, proposed and designed the ICER (In-game Card as Educational Reward, <http://tcg.vip.game-server.cc/tcg/ICER.zip>) Moodle plug-in which aims to assess students' performance in Moodle against the awarding criteria the teachers set and to deliver correspondent in-game cards as rewards automatically. Students can have more fun with the new cards they received and perhaps show-off the cards to others. For this reason, they may work harder on their homework and active participated in the discussions in the class so they can get rewards.

MEGA World (Multiplayer Educational Game for All, <http://megaworld.game-server.cc>), on the other hand, is a web-based multiplayer educational game platform that supports any languages and any existing external resources, including multimedia, social media, and online applications. Teachers can feel free to create their own virtual worlds and learning and assessment activities in the game for their students. They can create activities (i.e., quests) in any of the seven quest types offered by the platform: greeting, item collection and delivery, sorting, treasure hunting and digging, calculation, fill-in-the-blank, and short answer. Teachers can also arrange their quests in different levels for different subjects/topics freely according to their own teaching plan. Students can then learn specific knowledge and reach the learning goal by taking and solving those quests while playing.

Both of the ICER Moodle plug-in and MEGA World are discipline independent. Furthermore, different teachers' virtual worlds can be bridged to allow students further learn, travel and play. When more virtual worlds created by the teachers in a school, a city, or a country, students would be even more engaged to perform better since they might want to be seen on the ranking lists; for instances MEGA World has ranking lists like Most Richest Players and Highest Level Players. On the other hand when more courses adopt and enable the ICER Moodle plug-in, students can get motivated to participate in the learning activities, including assignments and classroom discussions since they want to receive more powerful cards to win the match in the game or have their card collection book more complete. Therefore, if multiple courses in a school or multiple schools in a city could adopt ICER and MEGA World, then the effect could be huge and student's learning motivation and could be carried to the followed courses and schools.

Question: How do you think of the future direction and development of educational games?

Dr. Maiga Chang: For this question, I would like to answer it from two ways – game genre and technology. From the viewpoint of game genre, I would say that board games (as well as card games) could be one of major directions in the future – not only because the games can be strongly connected to knowledge and skills and can accommodate elements like role playing, collaboration, and competitions, but also because the games are not required too fancy visual effects, graphic artworks, and animations. It may be quite important for researchers, especially when the researchers have not much resources (i.e., budget and manpower). Of course, since most of people nowadays have mobile phone and a lot of fragmented time, mini games may also be a good direction.

Regarding technology's point of view, many people now like virtual reality. However, from my perspective, wearing a head-mounted device and cannot see your surroundings is really not a good choice. First of all, it requires extra equipment. Second, it limits your space – where you can only stand in a small area and you would be also afraid of touching or kicking something as you cannot see the real world. In fact, an interesting finding that our research group's unpublished research results shows that only 5% of players (hardcore and casual players) have willingness to play virtual reality games. I, however, think Augmented Reality based games would be extremely important. With AR technology's help, interactivity and supplemental information can be provided for students and can still allow them playing at anytime and anywhere.

Question: Thank you so much. One last question is do you have any suggestions for researchers and teachers who are going to do educational games research or using educational games in their courses or classes?

Dr. Maiga Chang: Yeah, let's first review the Basic 101 of educational games – educational games are supposed to allow people to learn implicitly while playing and they should be able to attract people to active play them; longer and continuous playing may make people learn more and better. So if an educational game is not fun and cannot attract students to active and keep playing, then it is useless and it is what I call a “serious” game.

Before I make some suggestions for researchers and teachers, the very first thing I need to say is – I think educational games are NOT an ultimate solution NOR a replacement of any existing learning approaches. I treat educational games an option for students who don't like traditional way of learning and cannot learn effectively through other ways but like playing games. Not everyone needs educational games to engage them to learn or practice. Educational games are only available and become an option for those students who really need and want.

Basically the fundamental thing for researchers is that you need to know what a game is. Having experience of playing the state-of-the-art games can help you what kind of games and their features nowadays can attract students and make them keep playing. This also applies to teachers. If a teacher doesn't really know the reason that why his or her

students love to playing games and tries to introduce to his or her students a “serious” game that he or she think it contains a lot of knowledgeable and is perfect for learning, we may be able to foresee a not-so-successful experience. The teacher may then come to a conclusion according to this experience and argue that “no, educational games are not so effective like you say.”

If a teacher himself or herself doesn't like playing games, then I would suggest to not adopt educational games in his or her courses or classes. The reason is simple, if you don't like games, how you know game likers' feelings. Most important thing is, if you don't like games, probably you won't be glad to see your students spending time on playing educational games and you may jump in and stop their game play since you think the game play has taken them too much time. But in such case, what the Basic 101 says “longer and continuous playing may make people learn more and better” will never have chance to happen, right?



Dr. Maiga Chang is Associate Professor in the School of Computing Information and Systems at Athabasca University, Canada. His researches mainly focus on game-based learning, training and assessment; mobile learning and ubiquitous learning; museum e-learning; learning behaviour analysis; learning analytics and academic analytics; data mining and artificial intelligence; intelligent agent technology; and, mobile healthcare.

He is now Executive Vice Chair of IEEE Technical Committee of Learning Technology (TCLT), an Executive Committee member of Asia-Pacific Society for Computers in Education (APSCE), Global Chinese Society for Computing in Education, and Chinese Society for Inquiry Learning. He is also chair of Digital Game and Intelligent Toy Enhanced Learning special interest group (SIG) under the TCLT. Dr. Chang was new initiative chair in the executive board of IEEE Technical Committee of Learning Technology (TCLT) during 2015 to 2016 and (co-)chair of APSCE Asia-Pacific Region Game and Toy Enhanced Learning and Society special interest group (SIG) during 2014 to 2017.

He is editor in chief of International Journal of Distance Education Technologies (an EI and Web of Science's ESCI journal without publication fee), section editor of Education and Science (a free SSCI Open Access journal), and advisory board member of Journal of Computers and Applied Science Education. He is guest editor of Education and Technology Society (a free SSCI Open Access journal), Multimedia Tools and Applications (an SCI journal), Mathematical Problems in Engineering (an SCI journal), and The Scientific World Journal (an SCI journal). He has also been the guest associate editor of IEEE Technology and Engineering Education, guest editor of International Review of Research in Open and Distance Learning (a free SSCI Open Access journal without publication fee) and Research and Practice in Technology Enhanced Learning (a free Open Access journal with publication fee covered by APSCE).

Dr. Chang also serves academic international conference events include being program chair of International Conference on Smart Learning Environments (ICSLE 2015 and 2018), general program chair of IEEE TCLT flagship conference International Conference on Advanced Learning Technologies (IEEE ICALT 2017 and 2018), IPC Coordination Co-Chair of International Conference on Computers in Education (ICCE 2018), executive program chair and program co-chair of Global Chinese Conference on Computers in Education (GCCCE) in 2017 and 2016, track program chair of Digital Game and Intelligent Toy Enhanced Learning in IEEE International Conference on Advanced Learning Technologies 2014 to 2018, executive chair of GCCCE 2014 sub-conference on Joyful Learning and Society and co-chair for the sub-conference in GCCCE 2013 and 2015, executive chair of ICCE 2014 sub-conference on Game and Toy Enhanced Learning and Society (GTEL&S) and co-chair for the sub-conference in ICCE 2011, 2013 and 2015, advisory board member of IADIS International Conference on Mobile, Hybrid, and On-line Learning (2012~now), steering committee of International Conference on Systems and Networks Communications (2017~2018) and special area chair of pervasive education (2011~2016), program co-chair (2011), general co-chair (2009), and advisory board (2013) of Edutainment, and local chair of IEEE DIGITEL 2008.

He has given more than 80 talks and lectures in different conferences, universities, and events; He has participated in more than 285 international conferences and workshops as a Program Committee Member; and, he also has (co-)authored more than 205 edited books, book chapters, journal and international conference papers. He is an IEEE member for seventeen years since 1996 and also a member of ACM (since 2001), AAAI (since 2001), INNS (since 2004), and Phi Tau Phi Scholastic Honor Society.