The Effect of Gaming on Secondary Students' Thinking, Beliefs, Creativity and Skills: A Preliminary Study in Social Studies Lessons

Chua Tee TEO[a*] & Yam San CHEE[b]
[a]*Psychological Studies, National Institute of Education, Singapore*
[b]*Learning Sciences and Technologies, National Institute of Education, Singapore*
*chuatee.teo@nie.edu.sg

Abstract: Statecraft X, a fantasy multiplayer strategic game designed to assimilate principles of governance and related concepts on citizenship played on Apple i-phones, is developed based on performance pedagogy. Two secondary three classes of students were involved in this study. The study intends to examine any significant shifts in the students' thinking and learning attitudes, beliefs, creativity and skills after playing with the i-phone game Statecraft X in their own time outside Social Studies lessons on governance. The experimental study was conducted at a secondary school in Singapore promoting the use of technology in learning. Pre- and post tests were used to check for experimental effects. Preliminary results of the study served to inform the researchers and teachers on the effects of the use of a game like Statecraft X in helping students to develop inquiry attitudes and process skills. During the intervention, teachers employed non-authoritarian, dialogical and non-indoctrinating pedagogical methods to facilitate independent thinking in students.

Keywords: Gaming, citizenship, governance, creativity, thinking, beliefs, skills

Introduction

To prepare secondary students for a world of unknowns in the 21st century means keeping up with the students' interests in games and technology, and being able to dialogue with teenage students at their mental frequencies. The previous pedagogical method of didactic teaching is probably not very appealing to the more intelligent and IT savvy students today who have tendencies to examine evidence, challenge assumptions and ask thought provoking questions. Teaching adolescents citizenship concepts is specifically not easy as adolescents may not accept modes of government as prescribed by text books. Understanding and knowing the logic behind the principles of citizenship in relation to governance are made easier if the teenagers are able to discover the principles themselves. These are key reasons that prompted the researchers to design Statecraft X, a fantasy multiplayer strategic game to be played on Apple i-phones which assimilate principles of governance and citizenship.

Statecraft X is a client-server game which lasts three weeks. Players are grouped into four factions with fictitious names, each with an ideological affinity [4]. Each player assumes the role of a free agent or active citizen in the game, acting as the first person to manage resources, perform transactions with other citizens and build the town in which s/he resides in the virtual game world. The game may be played any time as long as the student player logs in to execute actions as a virtual citizen. Students are supposed to learn the principles of governance-citizenship as they play and dialogue with their teammates, members of other factions and their facilitating teacher.

Thomas and Brown, (as cited in [3]), said that games help students to think in a manner that they would "learn to be" rather than "learn about" in traditional classrooms. In games, players take on the roles of the fictitious characters and they literally learn through empathetic thinking. Players have to use their imaginations to answer questions on "what if" when they make decisions of steps to take as they play the game. Games naturally have propensities to promote the development of creative thinking in the students playing the game. Personal attributes which are closely associated with creativity are the development of insights or the eureka moment, curiosity, the ability to make associations between and among ideas to make sense, and an inquiring attitude of problem finding, idea finding and solution finding as witnessed in creative problem solving [1; 6; 7; 8]. With the design of the game Statecraft X, it is hoped that assimilation using technology would contribute to the goal of having students to develop to *become* good citizens and creative thinkers and would not merely know or "learn about" citizenship and creativity.

The principal investigator of the project designed the Statecraft X based on the beliefs in reflective inquiry and the development of process and dialogical skills [5], performance pedagogy and Chee's [2] belief in process philosophy for learning. The tenet is that students are dignified beings and as teachers nurture them to become mature beings in the classroom, they have to be treated with respect and most importantly, they have to be guided or led to reason and investigate the reality, and ask questions in the process of learning. Indoctrination or talking down to students will not bring about mature and thinking adults after they leave the school setting. When teachers invite the young teenagers to discuss and dialogue on problems, the adults give the youths opportunities to act or become pseudo adults. Games serve as effective scenarios for practice of such skills as no harm could result in the context of the game. Should the students make blunders or bad decisions in the game, the teacher is in control and in the worst case could simply reset the game. Thus, games also provide a safe environment for students to learn to make moral decisions as no harm is done to any living beings, and yet the students could learn their lesson in various ways since many choices are provided in the game.

1. The Statecraft X Educational Intervention Program

1.1 The Intervention Program

The Statecraft X curriculum spanned three weeks in the school curricula program in Social Studies. As students were initiated into playing the game, they would meet the teachers twice a week each week. The students played the game concurrently as they attended their Social Studies lessons to discuss their learning. Each class session was about 50 minutes. Teachers for each class asked questions of the dialogic pedagogy to focus on issues which arise when playing Statecraft X. The teacher would draw on the students' experiences with the game and draw out their thinking and feelings in the process of executing the game and discuss the problems encountered. The teacher would discuss the students' reflections on their learning of what good governorship entails. The results of making different choices in the game with regard to racial harmony, dealing with immigrants, preparing human resource through training, building infrastructure of the town, meeting the defence needs of the nation, managing expenditures and investments, and others [3] would be thoroughly expounded. Students would be assessed after the three weeks of intervention through an individual essay of 300 words either for entry on a blog or to give a speech on the issues concerning how to govern Singapore when they have to deal with the citizens and resources efficiently and creatively. Students were required to substantiate with evidence in the essay the issues raised and the concerns expressed in the manner befitting of good governance.

Teachers would score these essays to check if the Statecraft X had attained its functions of helping students to *become* good government and good citizens, thus fulfilling requirements of the Ministry of Education curriculum.

1.2 Procedures

The entire project was conducted in four secondary schools with six classes of secondary three students or 15 year-olds. This paper reports a pilot study with only one particular secondary school having two classes of secondary three Social Studies students. These were huge classes with 43 students of both genders each. The educational intervention program Statecraft X was first conducted with one class. When it ended, the next class then received the same intervention. Each intervention was taught by two teachers, with each teacher taking half the class in the dialogic sessions. One teacher had a little over a year of prior teaching experience while the other had three years. All the teachers in the project were trained in a 3-day workshop by the principal investigator at the National Institute of Education at the end of the previous year, that is, before the current school year began. The principal investigator helped to fine tune the statements on the self-report inventory, called the "Self-Knowledge on Beliefs, Thinking and Inquiry, Creativity & Skills (Student version), 2012" after the author designed it. Basically, it is intended to identify the attributes of thinking/inquiry, beliefs or mindsets, creative thinking and personal skills of the students before and after the intervention was administered.

2. The Instrument

The newly devised "Self-Knowledge" inventory consists of self-report statements in the areas of inquiry learning attributes, beliefs, creative thinking and skills, each with 7 to 12 items on a 9-point Likert scale, and an open-ended free response section for the students to pen any unique personal learning or thinking skills. Examples of items are "I challenge assumptions", "I develop insights &/ ideas during discussions", "I like the process of learning", "I believe that play is important to develop learning", "I derive great pleasure making new mental connections and modifying old ones", "I am able to express my ideas well", "I am able to learn through meaningful dialogues and conversations", etc.
Results of factor analyses of the "Self-Knowledge" scale are shown in Table 1 below.

Table 1
Psychometric characteristics of the "Self-Knowledge on Beliefs, Thinking, Creativity & Skills (Student's version)"Scale (n = 150)

Subscales (factors/variables)	Items	Cronbach alpha
Inquiry / Thinking Attributes	1, 4, 8, 9, 10	.84
Deep Learning	2, 3, 11, 12	.83
Beliefs in Inquiry	3, 5, 6, 7, 8	.84
Beliefs in Process (of learning)	1, 2, 4, 9	.85
Creativity / Creative Thinking	1, 2, 3, 4, 5, 6, 7, 8	.90
Skills	1, 2, 3, 4, 5	.88

The "Skills" subscale consisted of two variables: the one reported in Table 1 is comprised of personal skills to express ideas clearly in speech and writing and to be able to hold dialogues with others. The other factor was on citizenship. As there were two few items to measure the citizenship factor accurately, this factor was not included. As the number of

students was not large enough for purpose of confirmatory factor analysis, it was not conducted.

3. Results

3.1 Quantitative Findings

The results of pre- and post-tests for each experimental class of students undertaking the Statecraft intervention program was analysed using independent *t* tests as not all students handed in both pre- and post-tests to their teachers. The first experimental class undergoing the intervention program reported a significant increase in the thinking or inquiry attributes of the students after the intervention [$t(60)=2.41$, $p<.05$] with a pre-test mean of 6.83 and a post-test mean of 7.43. No significant differences were reported for the other variables. It is noted that the "Beliefs in Process" factor was near significance.

3.2 Qualitative Feedback from students

Comments made by the students after the intervention at the open-ended section of the scale are grouped according to their similarities in themes and some examples are given below.

Inquiry/Thinking
I noticed that I am able to know what's more important.
I am becoming better at analyzing situations and then decide the best option for everyone.

Beliefs in the Process of Learning/Inquiry
I am able to learn more during discussion with other students &/or teachers.
I noticed that I am able to understand how learning in a playful experience helps me to understand.

Creativity/Creative Thinking
I noticed that I am able to think in a different perspective (different perspectives).
I am now able to connect ideas with other current suggestions/issues.

Skills
I am now able to apply what I have learnt to my everyday life.
I am now able to hold conversations confidently with others, both one-to-one and as a group.

Citizenship
I am better at knowing how to become a better citizen.

4. Discussion

Gaming is one of the innovative pedagogies to educate young adolescents on governance and citizenship. It is unlike the old ways of telling the students what to do to be a good citizen or government. The related concepts are discovered through inquiry and discussion as students assume the roles of the governor and citizens in a game. Failures are acceptable and mistakes may be reverted, while the players learn to adjust their decisions consultatively in a team of equals. Perhaps this is also the ideal place for the practice of true democracy, in a fictitious, friendly and safe manner.

Preliminary results of the experimental intervention show that the game Statecraft X was able to enhance the thinking ability of the teenage students significantly for one intervention class but not the other. The thinking or inquiry attributes captured in the "Self-Knowledge" scale include the students' ability to generate insights, curiosity, questions, reflections, evidence to substantiate their personal views and the ability to make sense of their learning. The other factor which was statistically almost significant was the

beliefs in the process of learning which encompasses a liking for and the enjoyment of the process of learning, a belief that the process is more important than the products of learning, and finally the belief in learning to recognise patterns of connections and interactions. The study has to be replicated with more classes of Social Studies before the effects of Statecraft X may be generalized. Perhaps, control groups from other schools may be deployed to add rigour to the study.

Gleanings of the qualitative comments given by the students after the intervention program indicate that Statecraft X has been successful with individual students. Though not for large numbers of students, the Statecraft X appeared to be able to bring about the desired outcomes intended by the designers of the game. These cover having greater inquiry and thinking skills or the ability to develop new ideas, to support them with evidence, etc.; increasing beliefs in learning in a fun way and through discussions, etc.; having more creative thinking tendencies or the generation of insights, thinking out of the box, etc.; becoming better at listening to others, expressing self, dialoguing and communicating more confidently, attaining better study skills and even becoming more patient with others; and finally one student expressed that s/he is on the way to become a better citizen.

Perhaps, more items on citizenship should be included in the "Self-Knowledge" scale to identify the students' views on citizenship and governance in future studies. Paired *t*-tests, if possibly conducted, may serve as a better check for the effects of the intervention program Statecraft X. The study is on-going at the moment, and perhaps the students might be asked to fill in the "Self-Knowledge" scale again in the next semester to see if the effects of the intervention are lasting. The intervention program could have been extended to four or five weeks as three weeks may be too short a time to witness any real growth in the thinking of the students as the attitude of inquiry and discovery takes time to develop. The possible effects of the intervention could also be more rigorously ascertained if more schools and more classes could be involved. Inquiry and discovery learning is a method suitable for maturing adolescent students and this paper only reports its preliminary results.

References

[1] Carson, S. (2011). The Unleashed Mind. *Scientific American Mind, 22*(2), 22-29.

[2] Chee, Y. S. (2010). Studying Learners and Assessing Learning: A Process-Relational Perspective on the Learning Sciences. *Educational Technology, 50*(5), 5-9.

[3] Chee, Y. S. (2011). Learning As Becoming Through Performance, Play, and Dialogue: A Model of Game-based Learning with the Game Legends of Alkhima. *Digital Culture & Education, 3*(2), 98-122.

[4] Chee, Y. S., Mehrotra, S., & Liu, Q. (in press). Effective Citizenship Education Through Mobile Game Based Learning: The Statecraft X Curriculum. Paper to be presented at the *6th European Conference on Games Based Learning*, Cork, Ireland, October 2012.

[5] Chee, Y. S., Gwee, S., & Tan, E. M. (2011). Learning to Become Citizens by Enacting Governorship in the Statecraft Curriculum: An Evaluation of Learning Outcomes. *International Journal of Gaming and Computer-Mediated Simulations, 3*(2), 1-27.

[6] Piirto, J. (2004). *Understanding Creativity. Scottsdal*e. Arizona: Great Potential Press.

[7] Treffinger, D. J., Selby, E. C., Isaksen, S. G. (2008). Understanding Individual Problem-Solving Style: A Key to Learning and Applying Creative Problem Solving. *Learning and Individual Differences, 18*(4), 390-401.

[8] Willings, D. (1980). *The Creatively Gifted: Recognizing and Developing the Creative Personality*. Cambridge: Woodhead-Faulkner.