Meta-work on Leveraging COGBLe in Formal School Education

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Abstract: This is a work-in-progress paper in which we discuss the meta-work on our prior research on integrating constructivist online game-based learning (COGBLe) into formal school education. Farmtasia is an online game that we have developed to implement our COGBLe initiative. Based on the theoretical foundation of distributed authentic professionalism, we are further designing and implementing a number of non-player characters (NPCs) in Farmtasia, aiming to better support non-gamer students in the course COGBLe.

Keywords: COGBLe, game-based learning, non-gamer students, non-player characters, Farmtasia

1. Introduction

The advancement of information and communication technology (ICT) over the last decade has changed the landscape of human interactivities (Pachler et al., 2013; Prensky, 2012). From the perspective of education, researchers and technological educators have been looking into the potential of ICT for providing learners with new opportunities of constructivist learning (Papert, 1993; Piaget, 1970). One of the foci has been on constructivist online game-based learning (COGBLe).

Drawing on the notion of situated learning (Lave & Wenger, 1991), we have been studying the possibility of harnessing COGBLe in school education to scaffold students to learn in an authentic, constructivist manner, through interactive multi-player gaming. We proposed VISOLE (Virtual Interactive Student-Oriented Learning Environment) — a pedagogical approach to integrating COGBLe into formal curriculum teaching at school, and developed Farmtasia — an online multi-player interactive game for Geography education (Jong et al., 2011).

In our previous study on VISOLE with Farmtasia (Jong, 2015), compared to the traditional teaching approach, in terms of knowledge acquisition, we obtained a significantly positive results on the pedagogical effectiveness of this educational innovation on students in general, but not on non-gamer students (who had very little prior experience in online gaming). The analysis revealed that the gaming tasks in Farmtasia had introduced strong "extraneous cognitive loads" (Sweller, 1988) in the non-gamer students' learning process. They found the game was so difficult to play. Their bad ongoing gaming results also frustrated them a lot.

Instead of drawing a simple conclusion about VISOLE or COGBLE in general is not suitable for non-gamer students, we are interested in further investigating how to design and implement more effective scaffolds (Brush & Saye, 2002) in Farmtasia so as to better support these students in the COGBLe process. This working paper discusses the meta-work based on our previous study (Jong, 2015).

2. Distributed Authentic Professionalism

Shaffer (2007) argued that games can change education because game technology can empower students to learn on a massive scale by doing the things that humans really do in real-life. He deemed that members of a profession have an epistemic frame—a particular way of thinking and working. From the learning perspective, epistemic frames are the conventions of participation to which learners

become internalized and acculturated. Thus, developing people to be members of a particular profession is a matter of equipping them with a right epistemic frame. He proposed a game-design framework, *distributed authentic professionalism* — the distribution of authentic professional expertise between NPCs and players. Based on this framework, Shaffer and his colleagues developed a number of epistemic games which allow middle-school students to participate in simulations of various professional communities that they might someday inhabit. The communities include, for example, biomechanical engineers in *Digital Zoo*, and ecological thinkers in *Urban Science* (Gee & Shaffer, 2010)

3. Farmtasia: The Second Version

VISOLE consists of three pedagogical phases grounded on the theoretical foundations of scaffolding (Vygotsky, 1978), reflection (Dewey, 1938), and debriefing (Crookall, 1992). In Phase 1 — Scaffolding, through a number of face-to-face lessons, the teacher equips students with "just enough" preliminary high-level abstract knowledge as their prior knowledge to the next phase. The activities in Phase 2 — GBL and Reflection crossover with Phase 3 — Debriefing. Phase 2 deploys an online multi-player interactive game portraying a virtual world in which each student will play a role to shape its development. All tasks in this virtual world are close to the real life and problematically open-ended. In order to accomplish the tasks, students have to acquire new knowledge themselves from some designated learning materials or the Internet. As every single action can affect the whole virtual world, they have to take account of the overall effects associated with their gaming strategies on others. In addition, after each round of gaming, students are required to write a short journal to reflect on what they have learned in the game. In Phase 3, the teacher observes students' gaming proceedings at the backend, and will extract interesting or problematic scenarios in the game to conduct case-study-based debriefing with students through a number of face-to-face lessons. The full details of VISOLE can be found in our previous publication (Jong et al., 2011).

Farmtasia is an online game that we have developed to implement the VISOLE pedagogy. It is a round-based game with 12 rounds in total. Every round (1 hour) equates to six months in the virtual world. The content of Farmtasia is based on the Agriculture module in the senior secondary Geography curriculum in Hong Kong (Hong Kong Examination and Assessment Authority, 2014). Farmtasia features interacting farming systems (cultivation, horticulture, and pasturage) with sophisticated simulations which are modeled upon near real-life geographical, botanical, biological, and economic models. Figure 1 shows the interface of Farmtasia. In the game, each student performs as a farm manager to run a farm composed of a cropland, orchard, and rangeland. He/she competes for financial gain (the quantified gaming outcome) of his/her farm with other students who are at the same time running their own farm somewhere nearby in the virtual world. The financial gain is determined by whether he/she can derive good strategies to yield quality farm products to be sold in the market.

Figure 1. Interface of Farmtasia

Adopting Shaffer's (2007) distributed authentic professionalism framework, we have tried to design and implement a number of new NPCs functioning as virtual tutors in Farmtasia for scaffolding non-gamer students in the course of COGBLe. Figure 1 shows some of these NPCs. At the beginning of Phase 2 of VISOLE, via interacting with the NPCs, students will obtain useful tips on starting up their gaming. In addition, we aim to make the NPCs to be more intelligent so that they will proactively appear in the game to offer weaker students "tailor-made" hints (which are automatically derived from their gaming proceedings in their early rounds of gaming).

Figure 2. Newly designed and implemented NPCs in Farmtasia

4. Coming Work

In order to develop precise and robust mechanisms for triggering the appearance of NPCs to just-in-time assist non-gamer students in Farmtasia, we are still working on analyzing the "big" gaming data obtained in our previous study (Jong, 2015). After working out the mechanisms, another piece of important work will be to compare the pedagogical effectiveness of this revised version of Farmtasia (viz. Farmtasia II) and the original version (viz. Farmtasia I). We believe the findings of our coming study can provide researchers and developers in the field with new insights into leveraging NPCs to address the problem of individual learning differences among students in the course of COGBLe.

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