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Avatar as Open Student Model to Enhance Student Learning

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Abstract: In this paper, we describe My-Hero system that is an open student model system developed to enhance student learning, including promoting their awareness, improving, and interaction. Since awareness is a key element for triggering behavior change (e.g., improving and interaction), enhancing students' learning awareness is the first step to change their behaviors. Thus, the learning process of the My-Hero system is initiated by enhancing learning awareness via open student model. In this way, students' effort can be guided in improving their current status and peer interaction.

Keywords: Avatar, open student model, learning awareness

1. Introduction

In the research filed of technology-enhanced learning, students' data (e.g.., profiles and portfolios) collected by educational systems to know what, how, and why the students learn is a critical element (Self, 1988). This is because students' data can enable educational systems to "understand" students, and further "care" them in some ways, such as providing students with more adaptive instructions according to their learning progress, or offering students different learning strategies based on their various learning styles. In addition, students' data not only can enable educational systems to understand students, but also promote their self-awareness and self-control through presenting these data to the students themselves—the concept of Open learner model, OLM (Bull, Gardner, Ahmad, Ting, & Clarke, 2009; Vélez, Fabregat, Bull, & Hueva, 2009).

Open student model refers to making students' learning data collected by educational systems "visible" to the students themselves. With open student model, students can know what they have learned and have not mastered by interacting with the open student model. In other word, open student model can be regarded as an external representation of students' profiles or portfolios. Students have more opportunities to observe, control, edit, or negotiate their learning status with educational systems. Thus, such "visible" and "open" features can benefit students in several aspects, including a planning basis for learning goals, better communication between systems and students and more self-assessment and reflection about learning (Bull & Nghiem, 2002; Mitrovic & Martin, 2002; Zapata-Rivera & Greer, 2002).

Because of the significances, different technologies have been explored to promote the use of open student model. One of technologies is virtual characters in different visual forms, such as virtual characters, virtual pets, and avatars. Based on the learning by teaching, virtual characters are used to enhance students' self-regulatory skills (Kinnebrew et al., 2015). Based on the psychology of emotional attachment to pets, virtual pets are used as open student model to promote students' self-reflection (Chen, 2012). Based on the game technology for engaged learning, avatars are applied to educational settings (Dickey, 2007). More specifically, students can project themselves into the game world. With the representation of avatars, students not only could see what they do, but also observe the results from a first-person viewpoint, which could enhance students' feelings of engagement, tele-presence, and even serve as their second-self or alter-ego (Qiu & Benbasat, 2005).

In addition, avatars can be further related to narrative or storytelling that can foster system communication and students' participation in learning activities (Alexander, 2011). From the historical perspective, narrative and story are one of useful approaches to accumulating experience, knowledge and culture (Lebowitz, & Klug, 2011; Crawford, 2012). Additionally, from the perspective of brain science, narrative and story are also a critical structure of remember and process

(Gottschall, 2012). When information is conveyed in the form of story, human can remember it effectively and efficiently. In other words, narrative and story can be regarded as a potential means to transmit, communicate, and share ideas and knowledge.

Although avatars have been applied to game-based learning, few studies investigate their possible application in the use of open student model, and further examine their influences. Thus, this study proposes an educational system named My-Hero as open student models to promote students' efforts in improving their learning status and peer interaction. By developing this system, the influences of such learning systems can be further examined in the future.

2. My-Hero system

In My-Hero system, every student owns a hero to represent their learning status. On one hand, the student can be more aware of their current learning status, such as what has learned and what have not learned, and not attempted. On the other hand, the student can make efforts to improve their current status by leveling the hero. In addition, students' heroes can be used in peer competition, where the results are determined by the strength of heroes. Through hero competition, students' motivation to improve their heroes can be also enhanced. The My-Hero system contains three components: leveling, OLM, and competition components. The details are described as follows:

Regarding leveling component (see Figure 1a), the goal of this component is to promote students' awareness through the technique of *leveling avatars*, where students need to correctly answer a set of questions to level their heroes. In other words, to level their heroes, students are guided to learn materials, and then answer related questions. In particular, each question is related to core concept of materials. Thus, during this process, students' learning status can be diagnosed by analyzing the results of answering these questions. In this way, students have more opportunities to further remedy their problems through the following component.

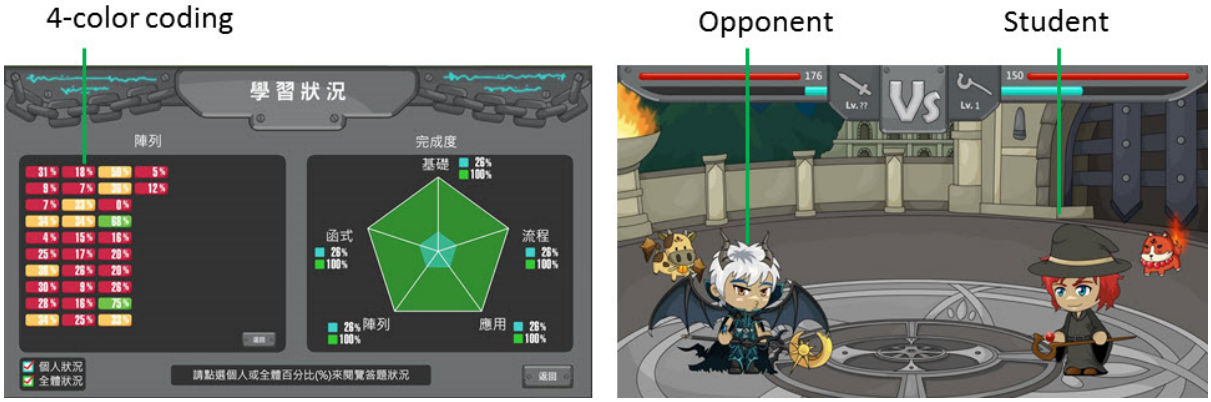
(a) Leveling component (b) OLM component: macro view

Figure 1. Snapshots of My-Hero system

Regarding OLM component, the goal of this component is to point out the directions in improving learning status through the technique of *open student model*, which can indicate which concepts students have mastered or which concepts student do not master according to the results of answering questions. In particular, the representation of OLM is implemented in the graphic format with two views: macro view (see Figure 1b) and micro views (see Figure 2a). Taking the subject domain of programing language as an example, the former reveals the five core concepts: variable, flow control, application, array, and function. Students not only can observe their learning status in terms of the five concepts, but also the comparison with the peers in terms of the five concepts. The latter shows the detailed correct ratio of each question for a specific concept by 4-color-coded approach: white means "not attempted"; green implies "excellent"; yellow denotes "moderate"; red means "poor". In this way, the students can quickly get the idea of what the learning status for this concept.

Regarding competition component (see Figure 2b), the goal of this component is to foster students' social interaction via the technique of *surrogate competition* (Chen & Chen, 2014), which makes students compete against each other via their avatars in the games. In the My-Hero system,

this component is implemented by a peer-based arena mechanism, where students can find another peer to have a surrogate competition based on the comparison of the data in the open student model.



(a) OLM component: micro view (b) Competition component

Figure 2. Snapshots of My-Hero system

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