Training My-Dragon: Using Educational Agents to Facilitate Student Learning

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Abstract: In this paper we develop a My-Dragon system, in which students not only learn Chinese idioms, but also train their pet dragons through learning by demonstration. More specifically, students need to demonstrate correct procedure and answers for their dragons so that their knowledge can be improved. By doing so, students not only can be engaged in a game-based learning context, but they are offered more opportunities to master their subject domains. This is a work-in-progress study and the current status and future work are described in this paper, too.

Keywords: Game-based learning, educational agent, learning by demonstration

1. Introduction

Interface design, in general, has been a significant issue to facilitate human computer interaction, and further enhance students' learning achievement. For learning, *interactive agents* have been incorporated into the interface design [1]. Interactive agents are essentially embodied as virtual characters, which on the one hand attract students' attention, and on the other hand facilitate the system's communication with students [2]. For instance, *animated pedagogical agents* are used to enhance students' motivation and facilitate communication bandwidth through the agents' body language, such as nodding, gestures, and eye contact [3].

Although these studies offer valuable experience in designing intelligent agents, there are great challenges in terms of development cost and participatory motivation. One possible reason might lie in the fact that educational agents are often designed from a "smart" (i.e., intelligent and autonomous) perspective, and so are used in learning technologies as intelligent tutors offering vivid and adaptive interactions with students. In addition, another possible drawback to the "smart" agents is that students might not be so interested in interacting with these educational systems, especially when they find that these educational agents are not as intelligent as expected [4].

On the other hand, purposely "non-smart" agents have also been designed as a means of evoking active and responsible attitudes in students, such as peer tutees [5, 6] and teachable agents [7, 8]. Studies demonstrate that such agents have positive effects on student learning, meaning that it is worthwhile to investigate how they meet the two challenges. In such vein, this study aims to develop an educational agent, named the My-Dragon, so that the effects of such a "non-smart" agent on student learning can be investigated. In particular, the My-Dragon in this study is incorporated with the characteristic of pet-nurturing to develop a close relationship with students. In addition, the model of "learning by demonstration" is used to train the My-Dragon, during which students' mastery level of Chinese idiom could be improved because they are required to demonstrate Chinese idiom to their dragons.

2. My-Dragon system

1.1 Training mode

In this study, Chinese idioms are used as the subject domain because Chinese idioms form a significant part of Chinese literature [9]. A numerical format scoring system is used because such a numerical format is useful to classify students' learning status of Chinese idioms into three aspects: Remembering, understanding, and applying. More specifically, a "*learning by demonstration*" model is used in a game scenario, in which students improve their learning by training their dragons. To this end, two functions are offered: *Awareness* and *improving*. The former is designed to help students understand their learning status and their dragons' status, including the mastery level and progress for a specific Chinese idiom. By doing so, students can know which topics they have or have not mastered yet. The latter is to further encourage students to improve their learning by demonstrating correct learning process for their dragons so that students' "effort" value and their dragons' "knowledge" value can be enhanced. Figure 1 illustrates an example, where a student needs to pick out four words one by one in the correct sequence according to the given context, avoiding the selection of similar but erroneous words. During this process, the dragon will watch and learn, increasing their knowledge.

Figure 1. Training mode in the My-Dragon system

1.2 Nurturing mode

Regarding the nurturing mode, previous studies have indicated that developing relationships with pets can enhance students' participatory motivation, and learning achievement [10]. To this end, two functions are offered: *Feeding* and *nurturing*. As shown in Figure 2, the former is to enhance students' sense of being a "master", who is responsible for their dragons. Some types of food are used to feed them. In addition, the "hungry" value of the dragons is also presented to indicate whether they are hungry. By doing so, students can obtain feedback and further adjust their behaviors. Likewise, the latter is to enhance the students' sense of being a "care-giver", who not only satisfies the dragons' needs, but also influences their "loyal" value, implying that students can different kinds of services to enhance this value, and further offer participatory motivation and opportunities.

Figure2. Nurturing mode in the My-Dragon system

3. Current status and future work

The My-Dragon system described above is now developing. In particular, to make students perceive that training their My-Dragon is an interesting and meaningful task in terms of affective and cognitive aspects, two mechanisms are planned to further incorporated into the system: emotional feedback and growing-up mechanisms. The former might enhance the quality of human-computer interaction; the latter might maintain students' long-term participatory motivation and the goal-pursuing. In addition, an experiment is also planning to conduct in an elementary school, of which purpose is to examine the effects of the My-Dragon system on student learning. The results are expected to offer valuable comments on the further development of educational agents within a game-based learning environment.

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