

My-Investment: Simulation Games to Help Primary Students Learn Financial Management

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Abstract: In this paper, we describe a simulation-based game environment, My-Investment, which is developed to foster primary students' financial management learning. Before introducing the detailed functions of the My-Investment system, we elaborate two design guidelines to underpin the system development, including fostering participation cycle as well as offering learning by doing opportunities. According to the two principles, six major functions are developed in the My-Investment system.

Keywords: financial education, game-based learning, simulation

1. Introduction

Recently, digital games have been regarded as a potential learning strategy that could engage students to learn specific skills or subject knowledge. In terms of *specific skills*, a number of significant skills are promoted in game-based learning environments, such as critical thinking [1], problem-solving [2], exploration and reflection [2], and independent learning [3]. This is due to the fact that most digital games are a kind of goal-oriented activity that invites students to discover, explore, think, and overcome a set of challenges in a joyful way. During the game playing, these games demand students to apply specific skills to solve their problems. Thus, these significant skills are developed and improved.

In terms of *subject knowledge*, some studies utilize digital games to help students acquire knowledge in the domain of software engineering [4], medical education [5], and sports education [6]. A major reason for this lies that digital games could integrate various advanced technologies, including multimedia effects, distributed computing, and augmented reality, to offer specific educational affordances to help students understand abstract knowledge. That is, students have more opportunities to understand the subject knowledge from multiple perspectives and in different representation ways, which in turn results in better learning outcomes.

Moreover, digital games are not only regarded as a highly interactive environment that could engage students to acquire knowledge in a more joyful way, several significant opinions or philosophy about game-based learning are advocated, such as serious games [7], commercial off-the-shelf games [8] and epistemic games [9]. Nevertheless, some studies have pointed out that the research field of game-based learning still lacks sufficient practical studies [10], although the natural characteristics of digital games are attempted to identify, some philosophy or theories are tried to develop as well. Insufficient practical studies would result in a major problem: the gap between conceptual theory and practical application. The lack of practical studies, on one hand, cannot provide specific feedbacks to revise the underpinning conceptual theory. On the other hand, it is difficult to develop some guidelines for applying digital games to practical settings; however, this is one of the major goals for game-based learning. Thus, in this study, we develop a simulation-based game to enhance students' financial education.

In recent years, financial education has become more and more important, because of the emergence of the global village. Although many activities in our daily life are related with financial management, elementary students have relative fewer opportunities to acquire financial management knowledge. A possible reason is that younger students are often looked after by their parents, and have little experience in working, money-making, or investment. It is difficult for them to deepen their understanding of financial knowledge. Therefore, we attempt to develop a simulation-based game environment, in which each student plays a responsible “master” to look after their virtual pets. Through eliciting students’ nature instincts of loving pets, students are encouraged to learn financial management well in the simulation game so that their pets could have happy lives. During this process, related financial management knowledge is also offered to help students learn in the simulation game.

2. Design guidelines

With respect to financial games, monopoly [11] is a typical one in this genre. Although monopoly often involves buying and selling of real property, its major purpose is for entertainment, instead of financial education. To design a financial game for educational purpose, we first identify two design guidelines to direct the development of My-Investment system.

2.1 Fostering participation cycle driven by game and learning activities

The first guideline of developing a game-based environment for financial education is to address the relationship between game and learning activities, so that students’ participation could form as a positive learning cycle. To this end, we attempt to borrow a *needs-learning-investment* model from human society, since the model is a pervasive working one in our society. The model consists of three elements—needs, learning, and investment. We use game and learning activities to realize the three elements in the working model.

With respect to “needs”, we choose a pet-nurturing game as a basic structure to create requirements for students. This is due to the following two reasons. The first reason is that taking care of pets seems to be a natural way to initiate and deepen human-computer interaction. Research had found that people tend to look after subjects who are weaker than themselves [12]. For students, pets might be a suitable candidate to elicit such looking-after behaviors and emotional involvement, which might be helpful to initiate and sustain students’ participation in a learning environment.

The second reason is that pet-nurturing could further involve an economic process, in which students could be guided to do something (including learning tasks) for earning their pets’ happier lives. In other words, learning tasks could easily be embedded into the pet-nurturing game. Under such a structure, undertaking learning tasks is quite similar to a kind of “work”. This is just like the working model in our work-centered society [13]. Based on this metaphor, the second element, “learning” could be realized by learning activities.

With respect to “investment”, we choose a financial simulation game as a primary structure to offer opportunities for students to learn how to invest their money either in a bank or a stock market. This is because a simulation game is good at representing specific scenario or context in an efficient, economical, and safe way. Because students have little experience to invest a great deal of money in the bank or stock market, some financial management knowledge is too abstract to understand. If we could create a simulation game for students, they might learn the management knowledge better, and easily apply to practical contexts.

2.2 Offering learning-by-doing opportunities within the participation cycle

The second guideline is based on the participation cycle to develop a simulation-based game environment for offering learning-by-doing opportunities within students' participation. This is because learning-by-doing is an apparent educational characteristic that a simulation-based environment could bring. Specifically, a simulation-based environment has the following three educational features: *helpful to concept learning*, *offering practice in decision-making* and *good at dealing with time and scale* [14].

First, a simulation-based environment is helpful for students to understand abstract ideas and concepts, because simulations could bring more concrete representation and manipulations, which could deepen students' understanding. In other words, through learning by doing, students could acquire knowledge in a more interactive way, instead of reading a passage merely to memorize the definition of a formula. Students who learn in a simulation-based environment could have different learning experiences, in which these ideas or concepts could be discovered or identified by students' actions.

Next, a simulation-based environment could simplify complex situations as simple but core models, where students could have sufficient practice to make decisions before they face these situations in real life. Because the situations are simplified, students could understand easier the core models behind these situations. On one hand, such simulations could prepare students practices in "life-like" situations so that they have more opportunities to experience and learn how to react in these situations. On the other hand, simulations could reduce the risk or cost if students' experiencing these situations might be dangerous or resource-demanding.

Finally, a simulation-based environment could speed up the result of actions, so that students could gain an immediate outcome, instead of taking a long period of time or a great deal of resources. In other words, within a simulation-based environment, students have more opportunities to operate by themselves, make decisions, and observe the consequences in a short time. The shortened time is helpful for students to link what they do and what the result are, and have a clear cause-and-effect relationship, which might contribute to a better understanding for the potential impact of the decision they made, particular in the large-scaled or long-term domain subjects.

3. My-Investment system

According to the two guidelines, a My-Investment system is developed for elementary school students. The My-Investment system contain the following six major functions. First, every student keeps a virtual pet, My-Pet, and the game goal is to take good care of the My-Pet. To this end, the student needs to purchase pets' food and goods in the pet store. However, it requires virtual coins, EduCoins, to purchase these items for satisfying the My-Pet. These pet-keeping functions (step 1 and step 2 in Table 1) are all related to the game activities. To some extent, these game activities are an incentive for the following learning part.

Next, two kinds of learning activities are provided as "work". The first one is animal-caring program (step 3), which provides students knowledge about how to take good care of their pets, such as how to treat their pets when the pets are unhappy or ill. Students are taught to decide give some medicines to cure them, or have some exercise with them. The second work is financial management program (step 4), which provides students knowledge about how to invest their money in a bank or a stock market. No matter animal-caring program or financial management program, when student complete the learning tasks, they could earn their Edu-Coins as salary.

Finally, when the students gain the salary, they could save them in the bank for an interest income (step 5). In addition, students could also apply the bank to a credit card, so that they could buy pets' food or goods by the credit card. During the process, they could learn how to use the credit card under the credit line, and how to maintain a good credit position. In addition to the bank, students could invest their money in the stock market (step 6). They could buy some stocks from the stock market. They might earn money from the stock market; however, they need to risk losing their money as well.

Table 1. Six major functions in the My-Investment system

Function	Location	Description
1) Needs	Backyard	A student keeps a virtual pet, My-Pet. The game goal is to look after the pet better, including satisfying her basic needs: hungry, thirsty, healthy needs.
2) Needs	Store	To satisfy the pet's needs, the student needs to earn Edu-Coins to buy pets' food, goods, and other services. That is, pet-nurturing games create requirement for students to fulfill these requirements.
3) Learning	Hospital	Two kind of work (i.e., learning activities) in games are provided for students. One is animal-caring program, which teaches students how to look after animals.
4) Learning	Library	Another program is financial management program, which offers students the knowledge about how to distinguish what we need and what we need, and how to invest money.
5) Investment	Bank	Students are offered two kinds of approaches to invest their money. The first one is bank, in which they could save the money to earn an interest income (see Figure 1).
6) Investment	Stock market	Another approach is to invest the money in the stock market. They could earn some money at the risk of selling the stocks, since they might lose their money as well (see Figure 2).



Figure 1. Snapshot of Bank



Figure 2. Snapshot of stock market

4. Work in progress

After the My-Investment system is developed, a case study is undertaking to examine the design of the My-Investment system, since we hope to use a design-based research to gain some revision cues after students' use in a practical setting. This could help us adjust the

direction of the system development. The participants were 26 fifth-grade primary school students (aged approximately eleven) in Taiwan. Every participant used the My-Investment system in a computer laboratory. During the process, students' usage logs were recorded, so that we could analyze their behaviors. Consequently, our next step is to have an examination on the My-Investment system for having a deeper understanding about students' learning behaviors in the system.

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