Multiplayer Online Role Playing Game for Teaching Youth Finance in Canada

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ABSTRACT

It has been stated that people need to improve their knowledge of finances and make better choices with their money. Many programs have been created to teach basic finances. These programs target people of all ages from adults all the way down to kindergarten students. The vast majority of opinions on teaching finances state that education begins with children – the younger the better. The goal of this research is to create a fun to play multiplayer online role playing game (MORPG) capable of teaching younger students how to better manage their personal finances. The game is designed as an educational tool with an attempt to balance both the entertainment and educational components. It simulates a real world where the player must make financial decisions for their avatars in an attempt to develop enough wealth to allow that avatars to retire at a specified age.

Keywords: Children, Educational Game, Finance Education, Game-Based Learning, Money Management, Multiplayer Online Role Playing Game, Youth

INTRODUCTION

Thirty years ago all a person needed to know was how to balance a chequing account and maintain a savings account. Today there are many more financial services, products and providers a person must be familiar with. When a person lacks the appropriate financial knowledge they are susceptible to making poor choices in selecting products and services. If properly educated the same person may make better financial decisions. This leads to better

consumers who are able to save and invest in their own future (Greenspan, 2005).

The vast majority of opinions on teaching finances state that education begins with children – the younger the better (Alt Powell, 2004; Calapp, 2002; McCormack, 2007; Pachner, 2008; Truong, 2010). A child is much more willing and able to learn new concepts. In addition, a person's financial affairs have as much in common with attitudes and behaviors as they do with practical skills (Personal Finance Education Group, 2009). Starting to teach children early instills the proper attitudes and behavior which will allow them to be successful later in life. When these children become adults they

are better able to handle money effectively (Alt Powell, 2004) and have better financial habits (Truong, 2010) so they are more likely to be financially successful.

Children are first exposed to financial matters through their parents. A child will often follow in their parents footsteps, making the same financial decisions. If the parents are not properly educated, their children will learn the same bad habits. In order to properly teach children about finances their parents must be money wise (Orman, 2010).

While the vast majority of opinion agrees that parents are the first to teach their children, there is disagreement on how it should be done. An allowance is the most common method. Many parents just give it (Alt Powell, 2004; Calapp, 2002; Greenspan, 2005), while others require it be earned (McCormack, 2007; Orman, 2010; Truong, 2010). Some parents require some be saved (Alt Powell, 2004; Calapp, 2002; McCormack, 2007), for others saving is optional (Truong, 2010). Parents may require their children to buy items they want themselves (Orman, 2010; Pachner, 2008) while others may help (Alt Powell, 2004; Calapp, 2002; Greenspan, 2005).

Giving an allowance exposes a child to money and purchasing, but the question of whether it scales well to financial knowledge at an older age must be asked. Their allowance is used for discretionary items only. Required items such as food, clothing, shelter, etc are still provided by their parents. The requirement to save may not be fully understood either. Short term savings (two or three weeks allowance to buy a toy) is one concept, but long term savings for a home down-payment or retirement are another.

Creating a game where the player is in control of their avatars financial future may be able to teach basic and advanced financial skills. The players will be able to try different financial tactics and see their results. These financial decisions will include most of the decisions that need to be made by today's adults living in the real world.

This paper is organized as follows: First we discuss the research and evaluation done on how financial concepts taught at various stages, from adults down through preschool students. It also looks at why using a MORPG would be a good approach for teaching finances. We discuss how the game is to be designed, financial topics included and a description of how the game would be played. We then focus on how the game is implemented. We share our experiences and outlines the evaluation plan of the game. Lastly, we provide recommendations for further work and improvements to the game.

FINANCE EDUCATION

In recent years the financial landscape has changed dramatically. There is a multitude of complex financial options choose from. Consumers may make financial decisions without any assistance and may not receive any feedback on the value of the products they purchase. In addition, they do not plan properly for retirement, borrow money at higher interest rates and do not have the ability to acquire assets (Cole & Nilesh, 2008).

Several studies prove that a lack of financial literacy contributes to poor financial decisions. In one study that included questions on personal finance and economics, adults obtained an average of C while students fared much worse with a mark of F (Lusardi & Mitchell, 2007). Saving is not given enough importance - only 68.5% of high school students had a savings account (Lusardi, Mitchell, & Curto, 2010), while less than half of students in senior high and college regularly saved and only half admitted saving was important (American Savings Education Council, 1999). Much of the problem is knowledge perception - many believe they are making wise decisions. In a 2003 study, 80% of the participants had confidence in the financial decisions they made, however only 42% of the participants answered financial questions correctly (Lusardi & Mitchell, 2007).

Much of the problem with a lack of ability is an absence of appropriate training. In the

United States only a small number of states encourage or require finances to be integrated into core subjects in schools (Johnson & Sherraden, 2007). In Canada it has been stated that a model curriculum should be created (Orton, 2007). Many European countries show a lack of consistency in financial education (Holden, Kalish, Scheinholtz, Dietrich, & Bovak, 2009), while in New Zealand financial education is not required at all (Feslier, 2006).

While there is currently a lack of training programs, there is a realization that there is a problem. Many countries have been and are still making strides to improve financial education at all levels from adults to kindergarten students. The United States (Fox, Bartholomae, & Lee, 2005), Canada (Orton, 2007), Australia (Holden, Kalish, Scheinholtz, Dietrich, & Bovak, 2009), and Hong Kong (Holden, Kalish, Scheinholtz, Dietrich, & Bovak, 2009) have all started working on educational programs. Research at the international level has also begun (Holden, Kalish, Scheinholtz, Dietrich, & Bovak, 2009).

This issue is when to deliver the programs. Adults can be difficult to reach (Toussaint-Comeau & Rhine, 2002). In addition, it may be too late since the financial damage is already done (Lusardi, Mitchell, & Curto, 2010). Colleges are typically not targeted since not everyone attends or takes financial courses (Mandell, 2009).

The majority of programs currently seem to be targeted at high school students. These students are on the verge becoming adults, so they need the education to help make proper choices with regards to insurance, credit cards and student loans. In addition, high school is the last opportunity for society to mandate financial education. However, the effectiveness of these programs are in question since many students are no more financially literate than those that did not participate (Mandell, 2009; Mandell & Klein, 2009). This is believed to be linked to motivation (Mandell & Klein, 2009). Students do not see the importance, so are not motivated to learn (Mandell & Klein, 2007).

There has been some success with a program targeted at grades 7-8. This program only taught a subset of financial concepts, but students were motivated to learn since they could apply the lessons to their personal lives [50].

A particularly successful study occurred in Chicago in 2005-2006. In this study, grade 6-8 students watched a play on financial matters then answered a series of questions based on the play. While all students showed improvement, the students in grade 6 improved the most (Mandell, 2006). Students in this grade are highly motivated to learn financial literacy. They have the skills necessary to learn the material and have generally not started making large financial decisions, so it is early enough in their life they can use the education to enhance their financial future. This study tends to indicate that teaching children at a younger age is better.

Many programs exist for students prior to grade 4, however they are very inconsistent. In addition, this group has special challenges which may include the students' inability to understand numbers, basic arithmetic, the ability to read, and understanding cause-and-effect relationships (Holden, Kalish, Scheinholtz, Dietrich, & Bovak, 2009). What is important is that they are exposed to simple financial concepts like coins, allowance, purchasing, etc. from their parents. This early exposure can help develop positive attitudes and behaviors.

Currently, most commercial digital games are entertainment based; educational aspects are not considered (Virvou & Katsionis, 2008). Much of this has to do with marketability. Edutainment games (those designed to be both entertaining and educational) tend to focus on the educational components and leave the entertainment component as a secondary. This often results in much of the game play being taken away from the player. As a result, game buyers tend to avoid these types of games (Egenfeldt-Nielsen, 2007). Educational games strike a balance between the entertainment and education components. They require players to use strategies, test hypothesis, problem solve and use higher order thinking skills (Paraskeva, Mysirlaki, & Papagianni, 2010).

A digital game may be an ideal approach to teach financial concepts. In a study released

in 2010, an experiment to teach math using a digital game was done. Two groups of students participated. One group used the game to learn the math concepts while another used traditional techniques. In district testing both groups showed improvement in math skills with the game playing group showing significant improvement over the traditionally taught students (Kebritchi, Hirumi, & Bai, 2010). Commercial games can also be used to teach. Age of Empires is used to teach Social Science and mathematics (Gros & Garrido, 2008) while Civilization 3 was used to teach history (Martin, 2008). Whether games are designed specifically for education or not they may offer educational opportunities.

A digital game can also be written as a simulation. Most entertainment and educational games have some components in common with a true simulation. The similarities are that they are artificially constructed, competitive, and follow a set of rules within a particular context. The difference is that a simulation attempts to accurately represent something real (Wilson et al., 2009). The result is the player experiences a lack of control within a simulation. Since it is attempting to simulate the real world, the player is bound by the real world environment (DiPietro, Ferdig, Boyer, & Black, 2007).

Many multiplayer online role-playing games (MORPGs) that have emerged in past several years, for examples, World of Warcraft, Guild War, and Ever Quest. These MORPGs have significantly influenced the current generation (Prudy, 2007). A number of research efforts in designing games for educational purposes or applying game concepts in learning activities. For examples, Chang et al. (2008) used the stage concept in games where the learners were allowed to learn and to have breaks among different learning topics; Olazar (2007) used an online game for business education; and, Bueno et al. (2008) taught sports to handicapped people by using games. There have been very few attempts of using MORPGs for teaching financial concepts and knowledge.

Digital games can also be designed to provide students opportunities to learn specific knowledge by doing case study. A case study is a long term, in depth study of an individual or event, referred to as a case. Its main intent is to collect, analyze, and report on information obtained through the process. As we know that digital games can provide students a virtual world and doing case study which they can't do in the real world, for example, you will not be allowed to followed a man/woman all day long and observe and record every action as well as choice he/she made to learn why a choice is good and why another is bad. The digital games can make the students have such opportunity to learn while having fun.

THE GAME DESIGN

The game was developed as an educational tool with an attempt to balance both the entertainment and educational components. It is similar to a game in that it was developed in an artificially constructed world. It also contains simulation components as it tries to simulate the real situations a student will eventually find themselves in. Like both a game and a simulation there are rules and constraints that must be followed, plus there is a goal to be reached to 'win' the game.

The game will attempt to teach basic financial concepts in a fun way. While playing a game in a constructed world, it will simulate real financial conditions that the player may eventually experience in their actual lives. The concepts to be taught include the following:

1. The importance of a higher education and its effect on earning potential;
2. Getting a job and paying taxes;
3. The costs associated with living including rent, utilities, food, clothing, transportation and entertainment;
4. Obtaining and handling credit (loans, mortgages, credit cards) properly;
5. Protecting possessions with insurance;
6. Creating a budget and balancing a chequebook;

7.   Saving for big purchases (house, car) and for retirement.

The game is a simulation game, which means the game is not 'telling' or 'teaching' students knowledge directly, the game is making the students learn the knowledge by themselves through a series of decision making. Just like the real life we have, sometimes we made bad decision and at the end we always ask ourselves 'what if' question, however, we never have chance to fix it and it may make our life worse. In the game, students may have similar situation while making financial decisions for their avatars, and sometimes, they made wrong decisions or made decisions without fully understand the policies, regulations, and consequences. It would be a valuable experience to the students and they can fix it in the afterlife of their avatars as well as their real life. So there is no explicit so-called task existed in the game, all concepts are existed in the game and associated with something (e.g., banking accounts, mortgage, and insurance policies), the students will learn relevant knowledge by experiencing and decision making for their avatars.

The game is called 'Pecunia'. This word was chosen as it is a Latin term for 'Money', plus it sounds like a far away, mystical place. Students play as residents of Pecunia, living out their daily lives. The purpose of the game is for the players to amass wealth and belongings as they play. As the students play their avatars grow and age. Upon reaching retirement age a check is made on the player's amassed wealth. If they have amassed enough wealth to retire they 'win'. If they do not they 'lose'. Regardless of whether they win or lose, once a player's avatar retires, that avatar can no longer be played. The game runs in real time. Once the players sign on to the game software the first time their avatars begin to age and experience 'life' and all its ups and downs no matter the players are online or offline. Currently the avatars get retired age in approximately 30 days (29 days, 23 hours, 53 minutes - 7 minutes short of a full 30 days to be exact).

Should the student or the teacher want the student to play the game a second or subsequent time, the teacher will be able to reset the students account. This will delete the students existing avatar, requiring the student to start the game from the beginning.

The game is designed to be used as a learning tool in an elementary school program. Before students can enroll, their teacher must register the class and provide a list of the students that will be participating from that class. Once the teacher has enrolled students, they can sign up using the interface to be provided. They need to choose an in-game name (different from their real name), the class they belong to and a password for their account. A student can only play a single avatar at any one time. This avatar is loaded automatically when the player signs on. Each student will only have a single account as well. This is controlled by the teacher who identifies the number of students in the class.

Student's avatars start the game as young adults with the same possessions - the clothes on their backs and $1,000 as Figure 1 shows.

Their first task is to locate a Non-Player Character (NPC) player named 'Salus Alio'. Salus will have a discussion with them and give them some direction. He will advise them that they need to find a place to live and either get a job or go to school as Figure 2 shows.

There are several jobs available to the players from basic labour up to professional careers. Basic jobs are available to any player. Professional careers require advanced education - trade school, a diploma, bachelor, masters or PhD. These degrees are available from one of the educational institutions in the game. A player can also receive promotions based on job experience. These jobs are available at the company they work for, but require a certain level of experience.

Obtaining an education requires making financial decisions. Most players will not be able to pay cash for their education; they will need to obtain a student loan as Figure 3 shows. While going to school the payments must be made, but they may not be working. They may need to make the decision to work part time
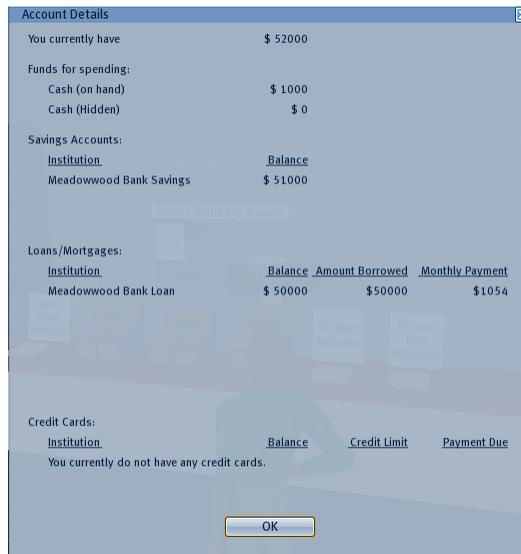
Figure 1. Account details of player's avatar at the beginning of the game

Figure 2. Player's avatar (in green) talking to Salus Alio in front of Pecunia Welcome Center

Figure 3. Player's avatar needs to obtain a student loan for his/her education

(they will not be able to work full time and go to school).

After this initial discussion with Salus, students are on their own. They can explore the game world as they wish. While exploring they will encounter other NPCs. These NPCs will give them more options for playing the game. Decisions made by the students set the direction of their avatars.

Their first task is to locate a place to live. There are apartments to rent and houses to buy as Figure 4 shows. Apartments are cheaper, therefore more affordable. Houses can be purchased, but require the player to obtain a

Figure 4. Player's avatar is thinking about rent an apartment at Rental Property Office

Figure 5. Player's avatar wants to rent a house with cash but the application has been refused

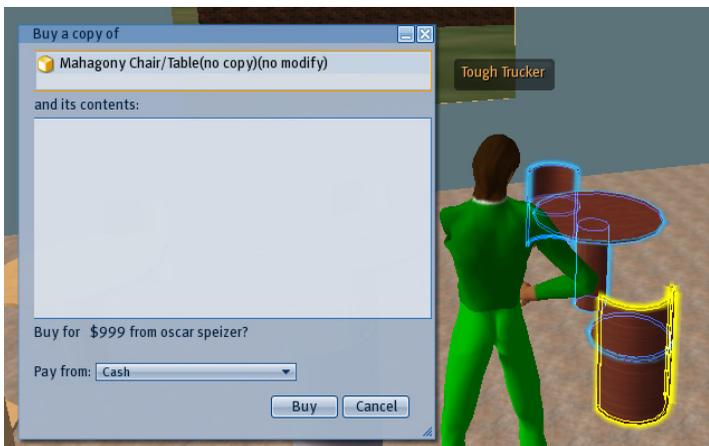*Figure 6. Player's avatar is purchasing furniture for her home*

Figure 7. Player's avatar is making decision at a bank

Figure 8. Avatar's account details include personal loan and credit card

*Figure 9. The Pecunian retirement home - the heaven of player's avatar after age 65*

mortgage. In order to get a mortgage the player must have a job.

The player may encounter different situation when s/he makes a decision for his/her avatar and learns the financial knowledge in the real world, for instance, Figure 5 shows the application of renting a basic housing has been refused by the landlord due to the landlord doesn't accept the avatar paying rent with cash.

Avatars must make a wealth of financial decisions as the game is played. These decisions include going to school, getting a job, finding a place to live, paying for daily living expenses (food, clothing) and utility bills. Avatars

Figure 10. The system architecture
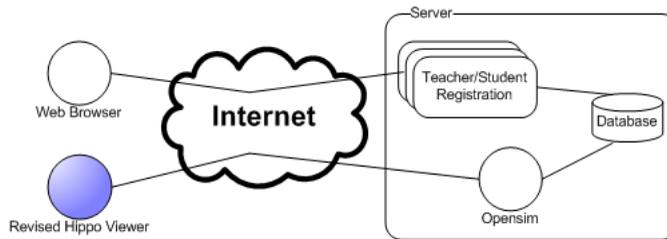
will also need to purchase furniture for their living quarters as Figure 6 shows.

Since players cannot purchase items they do not have money for, they can arrange to get personal loan from a bank or to get a credit card. Depending on the loan or credit card used, different interest rates will be charged. Using this credit wisely will allow the avatar to prosper financially. Figure 7 shows a player's avatar making financial decision at a bank and Figure 8 shows the monthly payment of avatar's personal loan as well as credit limit and balance.

Players will also be able and expected to interact with other players in the game. Students will be able to work together, assisting each other when necessary through loaning of funds, sale of items, etc. Presently players can give each other money. However, there are no controls on giving vs. lending. If Player A verbally agrees to lend another Player B money with the understanding that they will be paid back at some point there is nothing in the software that enforces it. When you lend someone money there is no real guarantee that you would get it back anyway, so it is not really that unrealistic and it is also a sort of knowledge that we usually learned from our bad experiences in the life. Now, players can learn it safely and have nothing to lose in Pecunia.

Upon the avatar reaching retirement age the items and money saved by the avatar will be checked. The avatar must have the equivalent of $200,000. This represents the amount necessary for the avatar to live 30 years in the retirement home. If the avatar has enough to retire, then the player 'wins' and the avatar will move into the Pecunian retirement home as Figure 9 shows.

If the avatar does not have enough to retire, the avatar will be seen returning to his/her job. In both cases the avatar can no longer be played.

In order to simulate a real world with financial constraints, several rules will be put in place.

1. Avatars must eat and drink. If they do not get enough food and water they will become sick and will wind up in the hospital. This results in a loss of wages.
2. All avatars require a home. Living on the street will result in the avatar either becoming sick or ending up in hospital or being thrown in jail (and fined). In both cases a loss of wages can occur.
3. Avatars can be robbed of all cash they are carrying around. Money deposited in a bank cannot be stolen.
4. Banking errors can occur - bank accounts need to be checked to ensure there is no mistake.
5. Avatars cannot spend money they do not have (unless they use some sort of credit).
6. If a payment is missed then overdue interest will be charged.

SYSTEM ARCHITECTURE

The system was developed by using a tiered approach, using existing 3D software. There are two main tiers in the game, a tier running on a server and a tier running on a client.

The server tier runs the software 'Opensim'. This software is used to create virtual worlds similar to 'Second Life'. This software is re-

leased under the BSD software license, so source code is available. It can be used for a variety of purposes, from creating more open source software to commercial products. Opensim can be easily extended by using loadable modules. These modules can be created from scratch to perform a new, required function, or they can be downloaded from the OpenSim web site. Many of these modules also offer source code.

While the environment provided by Opensim and Second Life are nearly identical, Opensim was chosen. The current set-up for Second Life uses 'real' money. Players wanting to purchase items in the virtual world must purchase in-world currency using real money. In addition, many of the financial transactions to be implemented in the game (borrowing, renting, credit) are not supported by Second Life. These transactions require changes to the back-end database, which are not possible in Second Life.

In addition to the 3D software used by the server, a website was designed. This website is used by the teachers to register students and by the students to enable their account and create the avatars in the game. The website also allows teachers and students to retrieve a lost userid or password.

The client portion of the system uses modified version of the Hippo Opensim Viewer. This browser is fully supported by Opensim and the source code is readily available. The viewer was modified to remove some interface options that are too complex for the target audience (i.e., elementary school students) or would allow them to circumvent game rules. Figure 10 shows the system architecture.

The 3D server software is designed and developed to run on Microsoft Windows Server 2003 software only. While the OpenSim server software does run on multiple operating systems (O/S), only the Server 2003 O/S will be developed. This is being done for two primary reasons: First, the development team has a lot of familiarity and access to Microsoft Windows Server 2003. Second, an attempt must be made to reduce to scope of developing the server side 3D engine. Attempting to develop across multiple O/S's using multiple development tools would be very difficult.

The server also needs a variety of web pages for registration, database connection, etc. The server uses the Apache HTTP Web Server, PHP for server side scripting and a MySQL database engine. The advantage to using these products is they are all open-source and free. The modified viewer client was also designed and developed to run on Microsoft Windows XP only. While the software might work on other Windows versions it is not be guaranteed.

The server and client changes work together. The client program initiates some sort of financial activity, this activity is actually recorded on the server. The client can open a variety of accounts (savings, personal loans, mortgages and credit cards), deposit to savings, withdrawal from savings or a credit card, make payments on loans, mortgages and credit cards, hide cash for safekeeping, rent or move out of an apartment and buy or sell a home.

For testing purposes the developed 3D server software is running on a stand-alone server. The client (the modified viewer) is packaged as a distributable that can be installed on a Windows XP computer. The game therefore can be played from any client directly to the 3D server.

DISCUSSIONS AND EXPERIMENT PLAN

The game is being created using two pieces of software, a client portion and a server portion. While preparing the server software a significant problem getting it to work correctly was encountered - the server was not sending data properly, causing 3D rendering errors. The only resolution was to upgrade to a newer version.

The initial design specified the use of the SnowGlobe client viewer software provided by Second Life. When an attempt was made to obtain the software, it became apparent that support for it had been discontinued as a new version of the software had been released. An attempt was made to use this new release however it did not work correctly with the version

of OpenSim being used. An attempt was made to use the SnowGlobe viewer, even though there would be no support. This attempt failed as all download attempts were not successful. Several sites were tried, all were missing the same component required of this version. Eventually a third-party viewer (Hippo) was located that worked quite well. This product is what was used throughout and is now part of the final game.

Early in development it was determined that not all source code for the client and server software is available. While the source code is advertised as 'Open', not all source code components are included. This required making some trade-offs to complete programming. Due to the inability to obtain all source code, several concessions had to be made on how the system works. These decisions significantly limit the future development potential of the game.

There are two types of evaluation the game will need to go through. The first approach which this research considers as the preliminary evaluation - the pilot has no plan to involve human subjects. The pilot will focus on a ensuring the game is a stable and workable 3D MORPG. Instead of using human subjects, add-ons will simulate human player's game-play actions to ensure that the game is stable and has acceptable performance when multiple players are online. The add-ons will contain game-play actions, just like a sequence of actions that may be performed by a human subject. A variety of add-ons will represent different virtual player's behaviour. Activating many add-ons at the same time will test the stability and performance of this game. After the simulation tests, we should have an idea of the limits of this game and the minimal computer specification to run the game server, we can then design a more appropriate and doable experiment with human subjects.

The second approach is whether the game is fun to play and educational. The approach being developed is to test knowledge on the game subject matter before game exposure (pretest), then test on the same subject matter after playing (posttest) (Danes, Huddleston-Casas, & Boyce, 1999; Wilson et al., 2009). According to Nielson

(1993) - a system with good usability should "be easy to learn", "be efficient to use", "be easy to remember", "has few errors", and "be subjectively pleasing" (Nielson, 1993), in our previous research a usability questionnaire has been designed and its validity and reliability have been proved (Lu et al., 2011). In addition to the posttest, the small group will be given a usability questionnaire to determine how the game plays and whether it is fun. While this approach is being developed, the actual tests being done for this research project will focus on software itself.

Basically, the player can play the game as many times as they wish within the pilot study. When they register on the web page they take the financial pre-test and then their avatar is created. Once they reach retirement age the character is not playable. They go through the web page again and take the post-test. If they want, they can take another pre-test (different from the first one), which recreates their avatar as brand new. Nothing from the previous game will remain - they start fresh. They can play the game 4 times and get a different pre-test each time. After the 4th game the pre-test questions start to repeat, however they can continue to play. Of course playing 4 times means they have played for almost 4 months - not all that reasonable for the pilot study.

By considering the game needs 29 days to simulate an avatar's whole life, the 2nd stage of experiment may need to have more than two months in order to give students enough time to try making different decision for their avatars in "this life" and "afterlife" as well as to take different pre- and post-test.

FUTURE WORK

The game is a new approach to teaching finances. As a result, there are not a lot of other games to compare to. Possible ways to improve the game could include doing more research to ensure all financial topics are covered. In subsequent game releases more research may need to be done into what financial items are considered more important than others. In the

first release all financial concepts are treated equally. This is likely not the case, so more research into identifying the most important concepts should be done.

The planned game flow depends heavily on user choice. It is possible that a player could go through the game without ever experiencing a particular financial event (getting a credit card for example). Subsequent releases should have some process in place that requires certain financial choices to be made without taking the control away from the player.

The game's financial world is based on stability and lacks inflation and recession factors. Introducing these factors would help students better understand how their financial decisions are affected by forces outside their control.

Also, the game lacks activities happened among multiple players, for instance, in the real world, an employee's work may not be able to be done independently. This kind of activities hasn't been implemented yet. One component in Second Life is the ability to create 'Groups' and have group members work together towards common goals. However, this component is not available in OpenSim. There is some documentation that states that it can be added, but we've checked a few times to locate the software necessary and it no longer seems to be available. In the future, we need to develop relevant modules and to design multiplayer activities to make the game world more real to students learning finance concepts. Also, the game can be further extended to other disciplines, e.g., social relation and collective rights.

The pretest and posttest used to measure learning by the teacher in the planned experiment are based on the basic finance concepts and policies that may only exist in Canada. These concepts and knowledge may not apply in other regions of the world. Giving the teacher the opportunity to revise these tests for their classes may improve their students learning experience.

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