

Online Skills Education with 3D Simulation of Teamwork and Workflow Processes in Second Life – Distance Learning Application

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Abstract

A recent report from market research firm Strategy Analytics predicts that the adult social virtual world population will grow from 11.5 billion in 2009 to 32.5 billion in 2015. Vietnam's government has designated Application of Information and Communication Technologies (ICT) in Education as the focus of 2008-2009 academic year. Among state-of-the-art ICT technologies, 3D virtual environments are rapidly emerging as a leading focus of educational research and program development. Top universities including Harvard, and Duke, are joining corporate leaders like IBM to explore methods of using immersive, interactive worlds to revolutionize teaching and training. The most popular 3D environment they are working with is Second Life, which registers millions of users around the globe. From virtual courtrooms, and operating rooms, to simulated resorts and language schools, innovative educators are seeking to close the gap between the academy and the real world.

TOPICA E-Learning Program at Hanoi Open University is the first institution in Vietnam to enter Second Life research by launching a joint project with scholars from Duke and Ohio University. The project will focus on simulation of workflow processes, including sales management, accounts payable and software development. Through avatars, students will engage in actual workflow processes. Project researchers will track the students' experience in the virtual environment, paying particular attention to domain knowledge (e.g. reviewing accounts payable documents), attitude (professional image, customer service) and soft skills (communication and teamwork). Student learning and performance will be measured both quantitatively and qualitatively through built-in tracking software and live instructor observation. This research data from the pilot will inform the development of simulations that are subsequently integrated into HOU's degree programs and custom corporate trainings.

The paper that follows reviews research findings relevant to the field of immersive education, showcases a simulation prototype, created by the project team, and outlines plans for project development and research.

Second Life uses in Education and Workflow Simulation

Second Life, was launched in 2003 by Linden Labs in the United States. Since then it has grown to become the virtual world leader with a profitable, stable, and growing business. At the end of March 2008, approximately 13 million accounts were registered. Second life even has its own economy with Linden Dollar as its currency, which is convertible to real-world currencies (266 L\$ = 1 US\$ in 3/2008). Second Life citizens, or their avatars, can conduct business, manufacture and build things, take tours, communicate, have fun, and of course study.

Currently in 2010, eighteen million people have registered in Second Life from over 150 countries and this virtual world work solution has already been chosen by hundreds of enterprises, governments, and non profit institutions. In fact, over 700 learning organizations from around the world have integrated virtual learning into their curricula with great success in Second Life. The universities include top institutions such as Harvard, MIT, University of Texas (US), Oxford, Leicester, Open University (UK) etc. The universities usually build a replica of their campus, and develop different simulations for their courses or research projects.

Trevena (2006) provides a visually engaging summary of the uses of Second Life in K-20 education. SLCC (2006) and SLCC (2007) provides an academically comprehensive review of latest results in SL research, including case studies, proposed research methodologies, and early research results. Due to the novelty of Second Life usage for education, few in-depth research results have been published

Among those few, Vital Lab (2008) describes a simulation game in Second Life for the software engineering process at Ohio University. It is based on Navarro and Hoek (2007), a comprehensive simulation project at UC Irvine for software engineering workflow process with 2D technology. These publications provide sample concepts on how to simulate workflow processes, and how to evaluate task results and learning effectiveness.

TOPICA replica campus in Second Life

Launched in 2008, TOPICA E-Learning Program at Hanoi Open University is the first institution in Vietnam to enter Second Life research through a joint project with scholars from Duke and Ohio University. The research project is part of an effort to leverage Second Life's advantages in developing a high quality E-learning program. TOPICA is an E-learning undergraduate program developed by the E-learning Program (ELP) at HOU, with participation and support by corporations and organizations including Microsoft, Qualcomm, Hewlett Packard, USAID and Hanoi University of Technology



Image 1: TOPICA's real-life and Second-Life building

As a first step, the authors have purchased a 32,000 sq.m. parcel in Second Life, and built a replica of TOPICA's 8-story building in Thanh Tri, Hanoi. Students can login from anywhere and use their avatars to explore the virtual building. In the main hall is a reception desk with screens projecting the latest news. A display on the left wall shows professors, experts and corporate managers who oversaw the E-learning program's development. On the right wall is information on the TOPIC64 project and CRC-TOPIC business incubator, two projects that have received prominent international recognition including 2006 World Bank Infodev award (4/64 for best practice business incubators, 2007 Development Gateway Award (7/160) for best ICT application projects, and 2008 Stockholm Challenge Award (4/132) for ICT education projects. On the ground floor, there is also a conference room that can host seminars, press conferences, student meetings.



Image 2: Main hall of TOPICA 3D building

The second, third and fourth floors are dedicated to TOPICA's three bachelor's degree programs: Applied IT, Business Administration, and Finance/Accounting. Each floor includes a lecture lab, a practice lab, student consultation areas, and other educational facilities. In the lecture labs, students can choose personal screens and plays selected videos or multimedia courseware. In the future, these lecture labs will be integrated with Sloodle, the Second Life-integrated version of the popular open source E-learning system Moodle. This will allow TOPICA to maintain a single integrated courseware database, and students will be able to access the latest updated courseware regardless whether they are logged in from Moodle (2D) or Sloodle (3D).

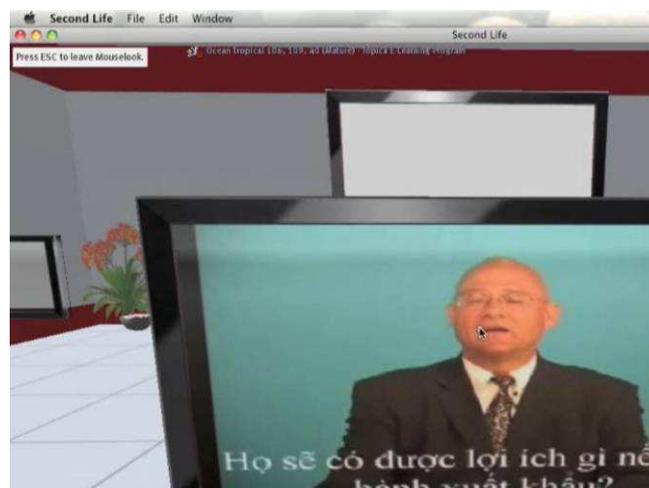


Image 3: Lecture lab with video being played

Teamwork in Second Life.

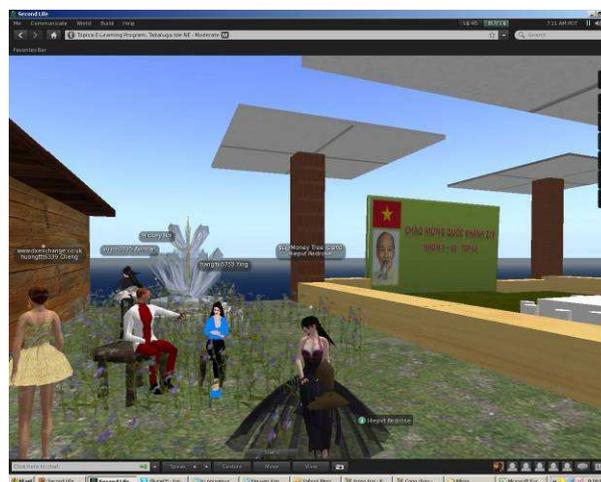
Teamwork is one of important skills that e-learning students need. In class students have a lot of extra activities such as chatting with friends in class, joining outdoor activities. E-learning students who are mostly adults, busy with work and do not come to class often do not have much time for extra activities. Thus, there should be other online activities for teamwork and strengthen community. Second Life is a useful tool for e-learning students to do teamwork. TOPICA has had some interesting teamwork activities for students in Second Life.

For instance, students can come to TOPICA zone in Second Life and do camping in special occasions such as August Revolution Day (19th August), Independent Day (2nd September). Students receive money and land from the organizers to organize a party and do camping for each class. They will have to discuss and coordinate to build an impressed camp just like they do in reality in outdoor activities. They will try their best to get the awards from the organizers. After the camping, the result students get is not only a camp, a party or awards but also teamwork and friendship built during that process.

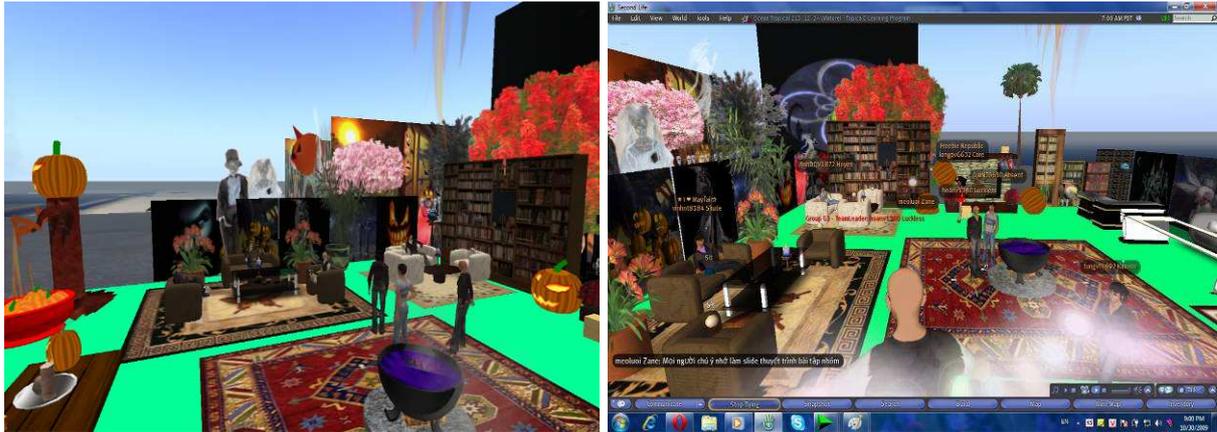
Example of one teamwork activity in Second Life:

Requirements:

1. To celebrate the August Revolution Day and Independent Day, you and your team will organize a party in your land in TOPICA zone (in 3D – Second Life).
2. Time table.
 - a. Time to receive money from the organizers: From 9.00 am, 16th August 2010 to 6.00 pm, 18th August 2010.
 - b. Time to receive land from the organizers: From 9.00 am, 16th August 2010 to 6.00 pm, 18th August 2010.



Organized a party to celebrate the August Revolution Day and Independent Day



Organized a Halloween party in Second Life



Camping in TOPICA zone in Second Life in Vietnamese Teacher Day



Camping in Southern Revolution Day

Objectives of workflow simulation

The most important areas, where Second Life's has unique advantages over traditional E-learning environments, are the "practice" labs. In these areas, the authors are developing simulations of workflow processes, initially including sales management, accounts payable and software development. Through avatars, students will engage in actual workflow

processes, thus practicing different business skills. Not simply a novel and fun way for students to study, TOPICA's Second Life initiative provides a solution to some of Vietnam's most urgent higher education challenges. Most significantly, as active participants in life like simulations, students will gain the real world experience thus far lacking in lecture-centered classes where students are passive recipients of information delivered by professors. Nearly as important, the virtual facilities created by TOPICA provide a cost-effective way to expand classroom space and better use the time of the most highly qualified instructors, who are in short supply in Vietnamese universities.

Lack of practice driven subjects is a notorious problem currently in higher education. Many universities are still using decades-old curriculum and textbooks. Others have updated their courseware, but find it too expensive to organize small-group practice exercises, case study sessions for students, as opposed to large-lecture style delivery. Organizing small-group, that would require unavailable classroom and lab space as well as expensive equipment and furniture beyond the budgets of even the best funded Vietnamese universities. . In addition, more teacher time and skills would be required to organize, supervise and evaluate student activities. Although the solutions to this problem look obvious, they are beyond the reach of public universities in Vietnam, which are funded from low tuition fees and modest government subsidies.

Second Life technology offers a surprisingly efficient solution to these challenges. The number of students enrolled could be enlarged beyond the "seat capacity" of classrooms and computer labs. Increasing numbers of university students own their own computers and have access – at home – or through Internet cafes – to high-speed connections capable of running graphics-intensive programs like Second Life. This would enable universities to reserve places in their labs for those students without such outside access, allowing other students to join the class remotely. Thus many of the practice activities could be organized in Second Life, where students log in decentrally, join others in the common practice areas, and engage in the simulated workflow processes. Teachers can also join in to supervise and evaluate students from computers and locations convenient to them. This is especially critical given the financial necessity for university teachers to seek additional employment to supplement their university salaries

The authors have selected three workflow processes, each representing a TOPICA program, to simulate in Second Life. : sales management, accounts payable and software development. In the case of software development, the simulation will be informed by the findings of the Vital Lab project. make use of findings published in connection with the Vital Lab project. Development will require more extensive conceptual design in the cases of sales management and accounts payable. As the most straightforward workflow process, accounts payable has been chosen for the first pilot simulation.

Prototype simulation of Accounts Payable workflow process

To ensure project effectiveness, the authors first identified the following measurable student outcomes:

- Attitude
 - Focus on customer satisfaction
 - Professional image and demeanor
- Soft skills
 - Teamwork skills
 - Telephone and face to face communication
- Domain knowledge
 - Understanding of contracts and payment documents
 - Knowledge of workflow process, i.e. next steps in given situation

Next, the authors determined methods of assessment. Although teachers can observe as avatars and evaluate all activities, it is not an efficient use of teacher time and skills to make teachers responsible for all aspects of student assessment. Fortunately, many student skills can be assessed by automated simulation software. Areas not requiring time-consuming teacher observation include: reviewing documents (through spotting errors and answering multiple-choice questions), knowledge of workflow process (through monitoring whether the student takes the right step, e.g. go to the right desk, in a given situation), overall team performance (e.g. how many customers does the team serve in an hour, how long in the average wait time for customers etc), professional image (does the student pick the right outfit for a given role played). Other skills such as oral and written communication (phone or face to face) can only be evaluated qualitatively but Second Life's ability to record certain interactions should allow instructors to optimize their use of assessment time.

Interestingly, personal attitude, on the surface a skill measured qualitatively, also lends itself to more efficient quantitative measures. Inappropriate body language is a subconscious habit: students in real life often inadvertently fold arms, exhibit wrong facial expressions etc. Knowing the right behaviors is not the same thing as practicing them. ” It would be meaningless to ask students to consciously pick the right body language in a simulated situation: they will find the right answers obvious. However, if the simulation randomly produces inappropriate body language in the student's avatar, while the student is focusing on other tasks (subconscious behavior), then the software can evaluate whether and how quickly the student notices and corrects his avatar's non-verbal communication.. The ability to detect and correct inappropriate subconscious behavior is a skill of vital importance in the workplace and one that should transfer from the virtual to the real world.

The following table describes the different skills, how they are simulated, and how they are evaluated (quantitatively or qualitatively).

Table 1: Skills and training scenarios – Accounts payable process (Accounting)

Factors	Skills	Scenario on Secondlife
Attitude	Customer and service quality focus	In-world lectures with interactive case exercises
	Professional ethics	Difficult to present in Secondlife
	Professional image	Provide some choices on office costumes (casual costumes which are used in schools, sport activities; office costumes)
Soft Skills	Teamwork skills	Measured through teamwork performance indicators: - Customers served/hour - Average waiting time/customer - Longest waiting time (top 10% percentile) etc.
	Telephone and face to face communication	Choose effective communication ways (spot wrong behavior subconsciously expressed by avatar): - Fold arms, laugh when customers come in. - Answer the phone and use curt expressions such as Yes, No etc. - Anxious, bewildered expressions. - Failure to welcome customers
Domain Knowledge	Guide customers through procedures and paperwork	- Spot customer mistakes in writing contract (date, payment terms, amount paid, transportation terms, etc. Eg. choose 1 incorrectly contract out of 4, then spot mistakes. - Procedures to cooperate between accountant and cashier, chief accountant, procurement officer, etc Eg: to identify whether the accountant follow correct procedures or not.

We have built a simulation prototype of the accounts payable process. Students can adopt the roles of accountant, account supervisor, procurement officer, cashier, and the supplier. As preparation for the role play, students read a written case study describing a procurement transaction, with detailed corporate information, transaction information, and description of the situation. The role-play starts with the supplier coming into the bank and asking for payment. The accountant and the supplier discuss the request, review documents, and then the supplier is escorted the next desk to address further issues, and complete the transaction. Each desk represents a unique problem that must be resolved , e.g. a supervisor signature is missing, a procurement officer's signature is missing, a bank account detail on the contract is wrong.

There are also scenario for other subjects such as Fundamentals of Law, Business Law, Micro Economics.

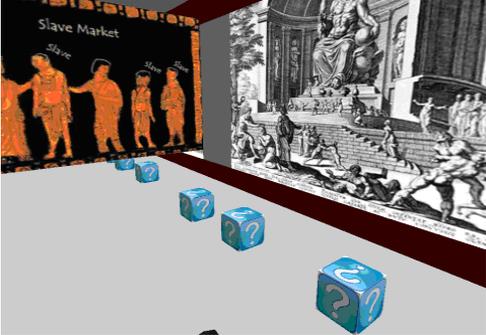
No	Factors	Description	Scenario in Secondlife
1	Attitude	Happy, team building	<ul style="list-style-type: none"> - Good attitude when visiting the museum, active in teamwork
		Professional image	<ul style="list-style-type: none"> - Students have to choose among 4 costume options: outdoor costumes, uniform costumes, polite office costumes, impolite office costumes
2	Skills	Teamwork skill	<ul style="list-style-type: none"> - There are 4 groups visiting the museum. Each team have a team leader, who gather opinions from members to give the answers for questions given during the museum visit
		Communication skill	<ul style="list-style-type: none"> - Communicate among team members during the museum visit
3	Knowledge	Government and Law	<p>This game based on the knowledge of Fundamental of Law</p> <ul style="list-style-type: none"> - Each group visit 4 periods: Slavery Period, Feudal Period, Capitalism Government, Socialist Government - During the visit, students can see pictures about each periods and answer questions related to each period <p>Students can gain knowledge of law in interesting format</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center; margin: 10px;">  <p>Slavery Period</p> </div> <div style="text-align: center; margin: 10px;">  <p>Feudal Period</p> </div> <div style="text-align: center; margin: 10px;">  <p>Capitalism Government</p> </div> <div style="text-align: center; margin: 10px;">  <p>Socialist Government</p> </div> </div>

Table 2: Skills and training scenarios – Discover Law Priods (Fundamental of Law)

Table 3: Skill training and scenario – Micro Economics

No	Factors	Description	Scenario in Secondlife
1	Attitude	Attitude	<ul style="list-style-type: none"> - Impression (dance, loud speak...) - Polite
		Professional image	Behaviors of buyers and sellers
2	Skills	Communication skill	- Choose effective communication between buyers and sellers
		Selling skill	<ul style="list-style-type: none"> - Advertise for goods sold - Find buyers who have enough money and need goods - Sell at high price to get high profit - Choose the right time to sell goods: if selling too early, the profit may be low; if selling to late, the selling time may be over
		Buying skill	<ul style="list-style-type: none"> - Get information before buying - Find the sellers - Check the goods and bargain - Choose the right time to buy goods
3	Knowle dge	Supply – Demand and Price Relationship	<p>Supply – Demand Game is conducted in the Market in Second Life. There are 5 kiosts in the market. If students are sellers, they receive goods from the organizers to sell. If students are buyers, they receive money from the organizers to buy.</p> <p>Through trading transactions, students will withdraw conclusions about supply and demand rules, profit maximization and conditions for perfect market. Students can realize the difference between real market and the lecture.</p> <div style="display: flex; justify-content: space-around;">   </div>

			<i>Market in Supply – Demand Game</i>
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No	Factors	Description	Scenario in Secondlife
1	Attitude	Attitude to partners	Provide images expressed attitude to partners for students to choose: <ul style="list-style-type: none"> - Polite, cooperated - Disappointed
		Professional image	Students choose costumes suitable with the scenario
2	Skills	Problem solving and decision making skills	<ul style="list-style-type: none"> - Choose type of company for establishment - Register for company establishment - Conduct business activities, sign business contracts - Competition in business - Problems raised in doing business - Solve problems

Table 4: Skill training and scenario – Business Law

		<p>Communication and negotiation skills</p>	<p>Process of dealing, communicating and conducting business activities: negotiate, sign contract and solve problems</p>
<p>3</p>	<p>Knowledge</p>	<ul style="list-style-type: none"> - Establishment and business conduct of company - Legal procedures 	<p>There are 6 rooms for 6 groups of questions related to establishment and business conduct of a company</p> <ol style="list-style-type: none"> 1. Stage 1: Students choose 1 of 3 types of company and answer questions related to each type of company <ul style="list-style-type: none"> - Limited company - Joint stock company - Unlimited company 2. Stage 2. Students come to Plan and Investment Department for company registration and communicate with the officer: <p>Officer: Ask about the tasks</p> <p>Students: Apply for company establishment registration</p> <p>Officer: Show multiple choice questions about 3 types of company</p> <p>If the students choose the right answer, the officer will agree to give them permission for company establishment</p> 3. Stage 3. Conduct business activities: negotiate and sign contract with partners <p>Create different places with images of goods and services that companies provide. Show the multiple choice questions for students to answer at those places</p> <ol style="list-style-type: none"> 4. Stage 4. Competition in doing business <p>Show the market images and multiple choice question</p> <ol style="list-style-type: none"> 5. Stage 5. Problems arise and solved. Which legal options company choose to solve problems? <ul style="list-style-type: none"> - Option 1: Referee - Option 2: Court 6. Stage 6. Bankruptcy <p>In this stage, students have to answer questions about legal procedures for bankruptcy.</p>  <p>Simulation room – Business Law</p>



Image 4: Practice session with role playing

We have also developed an objective evaluation for the “document reviewing” task. On the procurement contract, we created a list of 20 different possible mistakes. The student is given a contract that includes a number of mistakes, and asked to pick from a 20-choice list the mistakes they have found in the contract.

Conclusion

To date, we have completed the “bricks and mortar” phase of the project through the purchase of property and well-furnished TOPICA building. Now that we have a visible presence in Second Life, we will undertake the more ambitious challenge of developing powerful educational simulations. Along the way, we will be developing student assessment and project evaluation instruments to enable us to evaluate the effectiveness of this innovative initiative and fine-tune our approach. The result of this multi-year process will be educational programs capable of preparing Vietnamese university students to prosper in the complex global economy of the 21st century. . .

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