This full text version, available on TeesRep, is the post-print (final version prior to publication) of:


For details regarding the final published version please click on the following link: http://www.academic-conferences.org/ecei/ecei2009/ecei09-home.htm

When citing this source, please use the final published version as above.

This document was downloaded from http://tees.openrepository.com/tees/handle/10149/95315
Please do not use this version for citation purposes.

All items in TeesRep are protected by copyright, with all rights reserved, unless otherwise indicated.
Adapting 3D Virtual World technologies for real world applications: Case Study Paper
Philip McClenaghan, Nayyera Aslam
Teesside University, Middlesbrough, United Kingdom
p.a.mcclenaghan@tees.ac.uk
n.aslam@tees.ac.uk

Abstract: The 3D Web technologies known as Virtual Worlds can be characterised as combining the global reach of the internet with the ability to experience geometrically complex 3D environments in real-time simultaneously with other visitors. Visually and functionally rich virtual environments can be created which can closely approximate physical world environments and activities thus enabling innovative ways of delivering teaching and training. This provides an opportunity to fundamentally re-define user engagements and educational offerings. This paper reports on a functionally and visually rich virtual 3D landscape, ‘Financial Services Island’, designed to enable ‘accelerated learning experiences’ in the financial sector for young students. The highly interactive, immersive and multimodal virtual landscape exploits the potential for personal experiential interactions and stimulating learning experiences in financial services within the digital realm. This paper presents, in the form of a case study, the key stages of developments and associated methodology, the challenges of adapting new 3D internet technology to education and reflections on the encouraging response of teaching professionals and students.

Keywords: Financial Literacy, Virtual Worlds, Financial Services Island

1. Introduction

Low levels of financial literacy are a problem not only in the developing world but also, surprisingly, in developed economies (Lusardi and Mitchell 2009, Lusardi and Tufano 2009, Lusardi and Mitchell 2007, Economist 2008, Atkinson et al 2007). The Institute of Fiscal Studies, for example, has found that 77% of the UK population do not understand Annual Percentage Rate (APR), 40% admit they do not understand financial products such as mortgages or Individual Savings Accounts (ISAs), and 30% of people do not understand the purpose of insurance. A number of initiatives have been developed to tackle this problem (Lusard & Mitchell 2007, Miller et al 2008) including the Lord Mayor of London aiming to stimulate financial literacy and enterprise in schools and help highlight good practice in financial literacy through regional and international activity (City of London 2009).

A lack of financial literacy can have implications for personal financial wellbeing (Lusardi 2008) especially as responsible for ensuring adequate provision for old age has shifted away from the state and more to individuals expand. The financial statistics relating to young people in particular are also less than encouraging. The Financial Services Authority, for example, has reported that 29% of 16-24 year olds said they would not know how to prepare and manage a weekly budget, 19% of 22-24 year olds have short-term debts over £5,000 and 94% of 16 year olds believe it is important to know how to manage money, but only 53% have been taught how to. Poor financial literacy has furthermore been estimated to cost UK plc 2% of its GDP1.

An introduction to financial services at an early age can have implications not only for personal finances in later life but can also influence attitudes towards entrepreneurial activity and thinking. When seen in the context of entrepreneurship, financial literacy is just as important as, for example, creative thinking, self-motivation or time management skills. The need to raise capital, manage finances and plan for future developments are some of the financial skills critical to ensuring the successful launch, maintenance and growth of a venture.

Financial services are, however, often perceived as dull and uninteresting by the younger generation, which creates significant challenges for educators; especially when delivering content from an anonymous classroom. This paper reports on a pilot project to introduce 14 year old pupils to the range of financial services available and the implications of those services with a view to promoting entrepreneurship, preparing pupils for dealing with finances and financial services, preparing pupils for work experience in financial institutions and generating interest on the part of the pupils in a career in financial services.

1 http://www.fsa.gov.uk/pages/About/Media/notes/bn015.shtml
In order to make the learning experience fun, engaging and relevant and thus overcome these challenges, Virtual Worlds (VW) technology was used to engage with a target audience familiar with 3D computer games, social networking tools, instant messaging and so on. A virtual 3D 'Financial Services Island' (FSI) was developed composed of various buildings relevant to financial services such as a bank, a car showroom, a residential development, a call centre and an insurance building where exercises could be undertaken to enhance and 'accelerate' their financial experience.

On the virtual island pupils could, for example, buy a virtual car with a loan from the virtual bank or a virtual apartment with the aid of a virtual mortgage. The process of applying for a loan could be simulated and, with the aid of specially developed software which replicated a personal bank account, the results of the pupil's earning and spending activities within the virtual world could be tracked and displayed. As a result the students were introduced to money management and associated services such as insurance in addition to the implications of credit. Students not only became exposed to the real-life implications of money management but also acquired an understanding of the processes and procedures involved in acquiring financial services.

Presented here, in the form of a case study, are the key stages of development and associated methodology, the challenges of adapting the VW technology to education and reflections on the feedback gathered after implementation in the classroom. Future proposed work is then discussed based on the reported advantages of this type of learning.

1. Virtual Worlds

Virtual Worlds can be made accessible on the average home PC from anywhere in the world and have many thousands of concurrent users - each sharing the same experiences as they happen. In contrast to the 2D internet which is very much a solo experience, the Virtual Worlds of the 3D Web provide richer, more experiential environments through their ability to replicate the salient aspects of human behaviour and the physical world. Essentially the outcome of the convergence of computer games, Virtual Reality and the internet, Virtual Worlds can be defined as geometrically complex, computer-based, 3D Virtual Environments which are simulated, networked and persistent and have the ability to simultaneously connect multiple users into the same environment in real-time via on-screen representations (often humanistic in nature) known as avatars.

Virtual Worlds are used for many applications but are particularly powerful as a new medium for collaborative education enabling greater levels of student participation. Virtual worlds allow users to simulate tasks that could be difficult to carry out in the real world due to constraints such as cost, scheduling or location and also enable users with special needs to participate from home. 3D virtual worlds furthermore present new opportunities for personalised teaching and learning tailored to the individual learner’s needs as well as greater learner autonomy (de Freitas and Yapp 2005, West-Burnham 2005, Field 2007).

Various studies have documented the effective use of 3D Virtual worlds as an educational tool in a variety of fields. Virtual Worlds have been used, for example, in sports education to allow coaches to assume the players’ role in order to analyse movements from various points of view (Lopes et al 2009). A study undertaken at the Hong Kong Polytechnic University to test the feasibility and desirability of university-level teaching and learning in the subject of Media Studies within a Virtual World revealed that virtual learning in Media Studies was well received by both staff and students as it allowed for experiential and independent learning (Herold 2009). Virtual Worlds have also been reported to have enabled students to successfully meet the course learning objectives of an MBA Operations Management course (Lee 2009) and in entrepreneurship education for primary school children (Pereira et al 2009). Although not a substitute for actual face-to-face meetings Virtual Worlds nevertheless represent significant opportunities for education resulting in numerous educational establishments including Harvard Law School and The Open University in Britain making use of virtual worlds as a delivery platform.

Virtual Worlds have the potential to fundamentally alter not only our approach to education but also the way we innovate. (Evans 2007), for example, argues that there is an intimate connection between geography and innovation and, because virtual worlds benefit from spatial proximity without the costs
of spatial distance and geography, they therefore enable interesting innovation. Evans furthermore believes that virtual worlds “could become a platform for innovation as important to our century as was the opening of trade routes to sixteenth-century Europe” (Evans 2007). Ondrejka (2007) supports this proposition by asserting that virtual worlds are of vast importance for human innovation in the digital age as they combine the advantages of dramatic reductions in material costs with an increased bandwidth for social interaction and collaborative creation which allows opportunities for low cost failures and successes. Similar views are shared by Malaby (2007) who believes that Virtual Worlds will play a fundamental role in economic, political, and cultural innovation but who cautions that virtual worlds cannot eliminate all of the constraints of human collaboration and creativity and therefore the collapse of geography may not totally overcome all innovation obstacles.

2. Financial Services Island (FSI)

The principal aim of this pilot project was to support training in financial services to 14 year olds taking into account several target user characteristics such as gender, age, culture, socioeconomic status, students’ career interests and previous background knowledge in the financial sector. A series of discussions, meetings and visits were thus arranged with tutors to determine the objectives and outcomes of the training programme and to establish the learning needs and educational requirements of young pupils. It was therefore established that a virtual Financial Services Island (FSI) would be developed which was fun, engaging and appealing to young pupils and which supported a stimulating learning experience about financial services and their implications for young students. FSI was thus designed to replicate salient physical-world facilities and environments with stimulating tasks and thought-provoking role playing exercises attached to each environment. FSI featured financial assets such as a bank, a car showroom, a residential area, a call centre and an insurance building in addition to a central park area and a bus transport route with bus shelters located around the island (Fig. 1). The learning sessions involved a combination of tutor delivery, paper and virtual based exercises, peer discussion and tutor feedback. The project was implemented in 15 schools across the Tees Valley in the UK with classes of up to 25 pupils delivered by tutors trained in the use of the technology.

As a delivery vehicle for this pilot project Teen Second Life, a version of Second Life reserved for 13-17 year olds, was chosen from the 30 plus 3D Virtual World platforms currently available. Second Life is one of the most popular Virtual Worlds attracting users called ‘residents’ who pursue a diverse range of activities including socialising in virtual clubs, shopping in virtual shops, political campaigning and teaching. Although being challenged by a new breed of Virtual Worlds which have emerged as a result of the perceived future potential of the industry and which are vastly superior from a technological, visual and functional standpoint, Second Life maintains significant brand identity within the Virtual Worlds industry. The popularity and flexibility of the Second Life platform coupled with the strict access regulations of the Teen Second Life variant; applicants are required to provide proof of identity and adults must pass a criminal background check, where deciding factors in the choice of this platform for the 14 year old target audience.

2 www.meta-mole.com
2.1 FSI environments and activities

Each building or asset offered a range of tasks or activities that were designed to accelerate students learning and exposure to the finance sector. The virtual exercises enabled pupils to perform real-life financial activities such as buying a car with a loan from the bank or purchasing an apartment by applying for a mortgage.

2.2 Bank

The bank was designed with a main reception, a cashier counter, a service desk, a bureau de change counter, private meeting rooms and an information desk. The virtual bank contained ATM machines located inside and outside of the building, where students could access their account details with transactions being updated in real time. Job vacancies within banking, containing description of the role and salaries, were displayed in prominent positions as were posters relating to mortgages, savings accounts, investments, loans, credit cards and insurance.

Students could apply to open a virtual bank account by completing the appropriate forms and presenting relevant identification documents (Fig 2). Once the bank account was opened a sum of £200 was allocated to each student. Students were also allocated a budget planner which they could use to monitor and track their finances thus enabling them to analyse their earning, spending and saving activities in real-time. Students could also assume the role of bank manager, cashier, customer service advisor and customer thus gaining insights into various roles and responsibilities within a banking environment.

Figure 1: Financial Services Island (FSI)

Figure 2: ID Documents and Application Forms
2.3 Call centre

The call centre represented an open plan call centre environment with audio sound of typical call centre playing in the background. In this environment students were able to play the role of an insurance advisor by listening to pre-recorded sample calls. Shift patterns and job advertisements were also displayed on the walls in order to provide students with a further insight into the career options associated with this type of job.

2.4 Car showroom

The car showroom displayed cars of various models (Fig. 3) with their relevant specifications, prices and monthly interest payment plans displayed for each car (Fig. 4). Students could opt to ‘buy’ a car which encouraged them to consider the financial implications of buying a car. Information relative to the purchase of the car such as loan APR rates, monthly repayment amounts and total amounts payable were displayed together with information regarding the running costs of the car such as the tax band, average fuel consumption and insurance rating. Students thus gained insights into the additional running costs which come on top of the purchase price.

Figure 3: Car Showroom

Figure 4: Car details

2.5 Residential site

The residential site (Fig. 5) consisted of a number of studio apartments, penthouses and two-bedroom detached houses which students could view inside. As with the car purchase, students were encouraged to consider not only the purchase implications of property ownership such as mortgage interest rates, deposit percentages and total amounts but also the additional on-going costs such as
buildings and content insurance as well as life insurance, accident, sickness and redundancy insurance.

Figure 5: Residential area

2.6 Insurance building

Insurance forms a significant portion of the financial services sector. As such, various forms of insurance were included in many of the ‘transactions’ in which the students were involved. In order to aid comprehension of insurance and insurance products, an insurance building was developed composed of a reception, information point, customer advice desk and insurance advisors represented by avatars. Students could ‘purchase’ insurance after liaising with insurance sales advisors who explained insurance and helped to determine the cheapest insurance quotes for each item. Students could also either play the role of a customer or adopt the role of an insurance sales advisor. The building also contained a display of job vacancies for insurance advisors and managers.

2.7 Transport

As bus travel is a method of transport often used by the students in their everyday lives, exercises to help students in determining the most cost effective fare type were incorporated into the island via interactive bus stops (Fig. 6). Students were presented with five different fare options; a single fare costing £1.10, a return fare costing £2.10, a day fare costing £3.50, a weekly fare costing £13.00 and a monthly fare costing £44.00. Students were thus not only able to calculate the savings they would make if they purchased a monthly pass instead of a day or weekly pass but also to compare the cost of public transport with buying and running a car.

Figure 6: Travel Costs
2.8 Fuel station

In line with the aim of encouraging students to consider the on-going implications of purchases, a petrol station (Fig. 7) was designed to expose students the expenses incurred in running a car. Fuel and oil purchases were replicated and students were required to calculate the fuel efficiency of their particular car.

![Fuel station image](image)

**Figure 7**: Fuel station

3. Feedback from schools

When presented with the plan to utilise a virtual world to support the teaching of Financial Services the students were reported to be very excited and keen to start lessons despite the fact that the subject was perceived as ‘dry’. Once the lessons began, the students were described as being immediately ‘hooked’ by the opportunity to play around with the avatars, explore FSI and complete the exercises that had been planned to accompany it. Feedback gathered from the students at the end of the pilot programme was overwhelmingly positive with many students reported as being disappointed that the programme had ended.

As it can be difficult to hold the attention of the students when teaching finance in a classroom the virtual world was reported as being engaging for the students and thus extremely effective. Students were documented as wanting to continue the exercises through their breaks and even students with behaviour issues were keen to engage with the lessons as the virtual world allowed them to learn in a fun and interactive way. It was noted however that classroom input was still required as some students needed a lot of assistance and the virtual world lessons needed to be backed up with ‘standard’ lessons once the virtual sessions had finished.

The tutors felt that students took in a lot more information when using the virtual world compared to more traditional approaches and that behaviour and attention was easier to manage as the learning came from the fun and exploration of the island. Improved student concentration, memory recall and knowledge retention was reported when using the virtual world with few operating difficulties as most students instinctively knew how to operate the (game) standard keyboard and mouse controls.

From the experience of delivering the pilot sessions, tutors believe that virtual worlds have enormous potential to deliver teaching and training modules over a wide range of subject areas. Given a choice of delivery mode, one tutor stated that virtual world technology would be their choice of preference.
4. Conclusion and further work

Low levels of financial literacy are a global problem particularly amongst young people. As financial literacy is a fundamental entrepreneurial skill targeted, effective financial literacy education at an early age can have positive implications not only for future financial wellbeing but also for entrepreneurial attitudes and competency.

Financial Services Island is a 3D Virtual World designed to engage students in a subject traditionally perceived as dull in order to introduce 14 year old pupils to the range of financial services available and the implications of those services with a view to promoting entrepreneurship, preparing pupils for dealing with finances and financial services, preparing pupils for work experience in financial institutions and generating interest on the part of the pupils in a career in financial services.

Designed to replicate salient physical-world facilities and environments with stimulating tasks and thought-provoking role playing exercises attached to each environment, the virtual island featured various financial assets such as a bank, a car showroom, a residential area, a call centre and an insurance building. Financial Services Island was implemented as a pilot project in 15 schools across the Tees Valley in the UK with learning sessions composed of a combination of tutor delivery, paper and virtual based exercises, peer discussion and tutor feedback.

Feedback at the end of the project was extremely positive with students reported to have displayed increased levels of concentration, memory recall and knowledge retention. Tutors were also documented as positively assessing the virtual island in terms of effectiveness of delivery and scope for future development.

The positive impact on the student motivation and willingness to learn, even continuing to study through their break times, was interpreted as a successful outcome and highlighted the potential of virtual world technology in education. As a result, Financial Services Island has been further developed to include more facilities relating to a greater range of sectors such as retailing and engineering and is currently receiving significant interest from schools, colleges and training organisations.

References


www.ifc.org/ifcext/economics.nsf/AttachmentsByTitle/CON_FinLitSeminar_2008_GodfreyLevesqueMiller/$FILE/Godfrey-Levesque-Miller-Stark_CaseForFinLiteracy_SeminarDRAFT.pdf


