Evaluating use of the SimVenture computer-based business simulation

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Abstract

Objectives
The paper evaluates the impact of one of the market-leading computer-based start-up business simulations – SimVenture – using a version of the Rugby Team Impact Framework (RTIF; e.g. Bromley et al., 2012) adapted by the authors for use within an enterprise education context. Four case studies of the use of SimVenture in non-Business School subjects in Higher Education in the UK are described and analysed using the RTIF.

Prior Work
A survey of entrepreneurship education programmes conducted in 2006 by McKeown et al. concluded that delivery methods proved to be more traditional than anticipated, with few instances of action learning or the use of technology to support learning. Serious games, including business computer-based business simulations, have the potential to support learning by doing (Williams 2011, QAA 2012, Lopes et al. 2013), and have been shown to develop a range of skills including those described as necessary for the 21st Century (Romero et al., 2015). There are, however, few examples in the literature evaluating student-focused impact of business simulations in non-Business School subjects. With increasing calls to spread enterprise and entrepreneurship education to all (Anderson et al, 2014; Young, 2014), can serious games and business simulations such as SimVenture provide an effective solution?

Approach
Four undergraduate programmes in a range of non-Business subject areas (including computing and information systems; fashion and textiles; and veterinary practice) were selected for in-depth interviews following a literature review and web-based desk exercise to identify examples of practice. Case studies were produced exploring why SimVenture was chosen for use with students; how it was used (make-up of student cohort; size of working groups; number of sessions and over what time period, etc.); how learning was assessed; evaluation of learning and process; and lessons learned by the educator. The impact of SimVenture on student behaviour, learning, and longer term outcomes was analysed using the RTIF.

Results
The RTIF proved a useful tool for assessing the impact of SimVenture. All case studies reported positive outcomes for students with evidence of increased business and finance knowledge, skills development, and a wider appreciation of career options. Improved attendance and retention rates as a direct result of using SimVenture were also reported at one institution. Suggestions for practice are presented using the case study examples.

Implications
The results of the research suggest that serious games, in this case business simulations (using SimVenture as a specific example) can have positive outcomes on the student experience and business skills development through learning by doing.

Value
The paper contributes to the literature on use of computer-based business simulations, providing specific examples of practice that can be used by academics looking to embed enterprise and entrepreneurship education in non-Business subject-specific curricular. It also introduces an adapted framework which can be used to evaluate the impact of enterprise and entrepreneurship education programmes.

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Introduction

There has been an increasing drive in recent years to promote and encourage enterprise and entrepreneurship education in all subject areas across Higher Education (HE) in the United Kingdom (UK) (Anderson et al., 2014; Young, 2014; Wilson, 2012; QAA, 2012). 'Enterprise for all' is a recurring theme, but with hundreds of thousands of HE students, how can UK educators rise to this challenge whilst still providing a quality learning experience? One potential solution is through the application of learning technologies including, and as explored here, online business simulations and games (Smith, 2007; Brawer, 1997).

Serious gaming in business and entrepreneurship education

The use of 'serious gaming' – games in which education is the primary goal, rather than entertainment (Romero et al., 2015) - grew from first use in the mid-1950s (Faria et al., 2009) and showed an escalation in the late 1990s (Thijssen et al., 2008). Research at this time showed that computer simulations offered students multiple risk-free experiences of new venture creation, providing instant feedback and helping with the development of skills in complex decision making (Solomon et al., 1994; Brawer, 1997). Despite suggestions of positive outcomes, however, the uptake of technology-supported learning activities in general, and online business simulation within business and economic subject areas was subsequently slower than might have been expected (McKeown et al., 2006; Goffe and Sosin, 2005; Salmon, 2000). Kuratko (2005, p588) issued a call to action stating: "Entrepreneurship cannot be a field that succumbs to stagnation. It must recognize and apply technologies in the educational setting. In many respects, entrepreneurship education may actually transform the educational setting."

Writing in 2008, Thijssen et al. suggested that teachers and researchers may adhere to myths that games are not a meaningful way of expression and therefore avoid learning about the use of gaming in educational settings. They argued instead that gaming can contribute to the development of the competencies required by modern business including: online skills for communication, working collectively on a project with a (virtual) team, and the creation of new business models to generate value with and for clients through the use of new social software technology. Exploring two online games in detail (Economy Class for marketing and accounting, and Innovation Game for innovation consultancy), Thijssen et al. (2008) concluded that games as a simulation of business reality allow students to gain experience in business tasks in addition to acquiring subject knowledge. Games stimulate subject-specific cognitive learning, but also 'regulative learning' such as working in teams, creativity, decision making, and communicating. It engages the student fully with all senses, providing a better learning outcome; students consider the games to be fun, which in turn can influence motivation, self-esteem, and enhance the cognitive learning that takes place (Thijssen et al., 2008; see also Hegarty, 2006). de Freitas and Liarokapis (2011) also state that serious games offer powerful 'immersive experiences' which prove more engaging and motivating than standard educational approaches.

In this paper we introduce the business simulation game, SimVenture, and present case studies that explore how it can be implemented in non-business subject areas to develop skills associated with enterprise and entrepreneurship. Research into using a business simulation game in non-business programmes is an area not well covered in the current literature. Furthermore, we outline the benefits of using an adapted training framework to evaluate the impact of the simulation activities - one that could assist others in the design of their own learning programmes.

21st Century Skills

Romero et al. (2015) write that there is a need to develop new skills to face future challenges and prepare students for new jobs and technologies, including those job roles that do not yet exist. They propose that serious games can help develop 21st Century skills including communication, collaboration, social and cultural skills, creativity, critical thinking, problem-solving, productivity in a globalized world, learning to learn skills, self-direction, planning, flexibility, risk taking, conflict management, and a sense of initiative and entrepreneurship (see also Voogt, J., & Roblin, 2012 and Wisniewski, 2010 for further discussion of 21st Century Skills). Romero et al. (2015) argue that these skills can be developed through games which offer complexity, action, cooperation, and decision making.

The skills listed above chime with those highlighted in the QAA (2012) guidelines for enterprise and entrepreneurship education in HE in the UK. Here, experiential learning is actively encouraged in order to stimulate deeper learning and the development of the type of skills that Romero et al, (2015) would describe as 21st Century. Simulations place students in pseudo real-life situations, helping them to learn by doing and

also to learn from their mistakes; the whole experience is more important than simply getting a right answer (Ezz et al., 2012).

The use of well-designed simulations are encouraged at various stages of students' progress, particularly at early stages of enterprise awareness where opportunities for interaction with external enterprises may be premature or challenging (QAA, 2012). The QAA (2012) authors also state that business simulations can enhance the development of an entrepreneurial mindset.

Pedagogic Issues

Although many commentators argue that serious games and business simulations can aid knowledge acquisition and skills development (see above), there are caveats. Brawer (1997), for example, is clear that simulations are 'not an answer for everything', and should augment rather than replace conventional methods of instruction. This is echoed by Tunstall and Lynch (2010) who recommend that simulations should be an integrated element in a course.

Educators need to set appropriate conditions and tasks when using simulations in order to engage attention and stimulate deep learning (QAA, 2012; Watts and Wray, 2012; Tunstall and Lynch, 2010; Washbush and Gosen, 2001; Brawer, 1997). As Lopes et al., (2013) argue, the use of a business game *per se* will not guarantee effective results for learning: business games are a potentially useful tool, but educators must invest in consistent assessment and feedback methods.

About SimVenture

The serious game chosen for this research is a business start-up simulation called SimVenture which offers a holistic view of the common processes of running a small business (Romero, 2015). Launched in 2006, it is a strategy game - delivered through Windows-based software - that teaches business, entrepreneurship and employability skills. It lets users run their own virtual company from the earliest stages of trading whilst still in separate employment. Through engagement with the simulation, students learn about entrepreneurship and business in an authentic, engaging and sustainable way (SimVenture, 2015a). Almost 200 Higher Education Institutions (HEIs) are currently listed as SimVenture clients with almost half located in the UK.

Users make decisions in four key business areas and receive feedback to see the consequences of their actions. The four areas are:

1. Organisation (including legal issues, location, training, recruitment, etc.)
2. Sales & Marketing (including market, competitor, and customer research, marketing strategy and sales strategy)
3. Finance (including raising money, banking, forecasting, and credit control).
4. Operations (product design, purchasing, production, and quality)

Williams (2011, p3) describes SimVenture as follows:

> "SimVenture requires users, working as individuals or teams, to make decisions and deal with consequences in a simple to understand and coherent manner. The game has multiple difficulty levels which ensure that students are continuously challenged at a level which suits their ability. This depth of problem solving combined with the richness of information contained within SimVenture means students must deal with a breadth of issues but can monitor and evaluate their own progress at all times."

Williams (2011) conducted a structured evaluation of the impact of SimVenture with second year undergraduate Business School students at the University of Huddersfield. A questionnaire was developed based on a list of entrepreneurial outcomes provided by the National Council for Graduate Entrepreneurship and distributed to the students at the beginning and the end of an academic year. The results indicated significant impact on the development of a range of entrepreneurial skills and attributes, both business-focused such as strategic planning and market analysis, and person-focused such as the ability to see a problem as an opportunity and having a strong orientation to achieve. Williams (2011) found SimVenture to be a stimulating and engaging vehicle of teaching and learning, allowing students to play a role and thus generating more energy among students than traditional lectures or case discussions. Learning was deeper as students were able to see the results of their decisions and could explore the impact of multiple decisions at the same time.

Two studies exploring the impact of SimVenture were highlighted by Romero et al. (2015) in a review of serious games capable of developing the 21st Century skills. The studies were discussed in relation to the development of a sense of initiative and entrepreneurship where SimVenture was assessed as an engaging environment for encouraging entrepreneurship skills. The first study reported by Romero et al. (2015) was that

of Williams (2011) described above. The second study was conducted by King and Newman (2009) and concerned the evaluation of two different business simulation solutions – SimVenture and Market Value. The authors and project team selected and compared the two games for their appropriateness for use with MEng Engineering students. Although Market Value scored higher on employability skills ratings than SimVenture overall, SimVenture was rated best for potential generation of self-reliance skills (including self-awareness/confidence, self-promotion skills, initiative and proactivity, networking skills, willing to learn and action planning). The authors suggested that the scores for SimVenture for self-reliance skills might be expected because the simulation is aimed at those who would like to start-up and run a virtual company (King and Newman, 2009). It should be noted, however, that the evaluation was conducted by a project team acting as students in order to help make a choice about what software to use, and not by students themselves.

Smith (2007) reports an early-stage evaluation of SimVenture carried out by Dr Simon Brown who used the simulation with undergraduate students at Sheffield Hallam University. Dr Brown's students gave higher ratings for learning achieved through the simulation than through seminars or lectures (ratings of 7.2/10, 6.8/10, and 6.5/10 respectively); 94% of the students surveyed said the simulation should be used again in the future. One student reported:

> "The game felt like we were actually running our own business therefore we took it very seriously when making business decisions as we knew it could have a direct effect on our status and bank balance most importantly. This experience would help us a great deal if we eventually come to running our own business as we understand the consequences of not being up-to-date with certain parts of the business as it could mean our business failing."
>
> (Smith 2007, p659).

Further short case studies on use of SimVenture by Business School academics are provided on the SimVenture website. These include descriptions of use at Southampton Solent University (SimVenture, 2015b), Teesside University (SimVenture, 2015c), and the University of Limerick (Hynes, 2015).

SimVenture was chosen by the University of Huddersfield as a potential tool to assist in the delivery of the University's strategic aim for the provision of an enterprise education experience in all courses at all levels, mapped against the QAA (2012) guidelines. It was recognised that academics new to enterprise education would benefit from evidence of impact of SimVenture and examples of use to assess against their own students' context and needs. If enterprise and entrepreneurship education is to roll out to over 22,000 students at the University, all educators need to be engaged in delivery at some level. This research project grew out of the need to provide an evidence-base for the training and support of non-Business School educators, and case studies of practice beyond the University.

The research reported had three aims. These were:

1. To assess whether an adapted version of the Rugby Team Impact Framework (RTIF, described below) could be used to evaluate impact of undergraduate programmes of study
2. To investigate the impact of SimVenture in non-Business School subjects
3. To provide a set of case studies in non-Business School subjects as examples of practice for non-Business School educators looking to use SimVenture as a tool to embed enterprise education in subject-specific curricular.

The following sections of the paper will introduce the RTIF and the (minor) adaptations made to assess undergraduate programmes of study, and describe four case studies exploring the use and impact of SimVenture.

Methodology

The Framework for Evaluating Impact

The Rugby Team Impact Framework is an applied evaluation model for customised training and the development of researchers in Higher Education. The framework was developed to provide users with a structure to demonstrate the appropriateness of skills development of researchers, to provide feedback to funding bodies, to inform the enhancement of quality of the experience for postgraduate research students, research staff and individuals in HEIs, and to assess the impact of initiatives (Bromley et al, 2008; Bromley and Metcalfe, 2012). The 2008 version of RTIF (Bromley et al., 2008) was used in the field of enterprise education by Williams et al. (2013) when exploring the impact of enterprise skills training programmes for postgraduate research students.

Although the RTIF is primarily designed and used to assess the impact of training relating to the VITAE Researcher Development Framework (RDF) (VITAE, 2011a) and 'lenses' on the RDF such as the 'Enterprise Lens' (VITAE, 2011b), most - if not all - aspects of the RTIF would appear to be applicable to other settings. Indeed, the RTIF builds upon work by Kirkpatrick (e.g. Kirkpatrick and Kirkpatrick, 2006) for general training provision.

Five levels of impact are considered in the RTIF labelled 0 to 4 as follows (Bromley et. al., 2008; Bromley and Metcalfe, 2012).

> *Impact Level 0: Foundations*
> This level relates to an evaluation of investment in infrastructure for training and development activity. It can include elements such as strategy (vision, values, and desired outcomes), baseline assessment of participants' needs, facilities, and how the programme is delivered.
>
> *Impact Level 1: Reaction*
> This level reflects the reaction of the participants to the programme being evaluated. Reactions may be elicited by asking participants for their views at the end of a development session or series of sessions, for example.
>
> *Impact Level 2: Learning*
> This level reflects the extent to which participants change their attitudes, improve knowledge, or increase skill levels as a result of the programme.
>
> *Impact Level 3: Behaviour*
> Here, the effect of the programme on the behaviour of the participant is explored. For example, how have participants applied what they have learned?
>
> *Impact Level 4: Outcomes*
> The highest level of evaluation, outcomes, looks at the results of behaviour change on actual outcomes. This is often difficult to assess or absent in evaluations as outcomes may take many years to become apparent and are likely to have been influenced by an increasing number of other contributory factors (Bromley and Metcalfe 2012). Indeed, the evaluation of impact at the Level 4 Outcome stage is rare for enterprise and entrepreneurship education activities (c.f. BIS, 2013).

Figure illustrates the RTIF and the levels described above, adapted from Bromley and Metcalfe (2012) for analysis of undergraduate-level programmes rather than for postgraduate training. The Bromley and Metcalfe RTIF (2012, p5) includes 'Funding' under 'Foundations'. This has been removed from Figure 1 below as undergraduate programmes do not routinely require external funding for their development. 'Researchers' and 'training and developed programmes' have been replaced by 'students' and 'educational' respectively. Finally, the Level 4 Outcomes examples have been altered to provide suggestions for longer-term outcomes for undergraduates rather than researchers. Other than the changes listed above, Figure 1 is identical to that provided by Bromley and Metcalfe (2012) to illustrate the impact framework developed for the postgraduate research students and early career researchers.

Desk Study – Identification of Case Study Candidates

A desk study was conducted to identify candidate programmes for case study research. A manual search of publicly available web-based information was conducted to identify current use of SimVenture. First, a web search was conducted using the term 'university' with keywords such as "SimVenture", and "business simulation". Secondly, two areas of the SimVenture website – the Learning Zone and the Forum - were explored to identify active educators in Higher Education. SimVenture were also contacted and asked for recommendations of good practice. The research here was particularly concerned with assessing the use of SimVenture in non-Business School subjects. Active Business School-based educators who were identified in the Desk Study phase were therefore excluded from case study selection.

Seven programmes were selected and invited to interview. Four programmes responded and interviews were conducted. The selected programmes provided a spread of subject, year of study, type of university, and geographical location. Further details are provided in the Analysis section below.

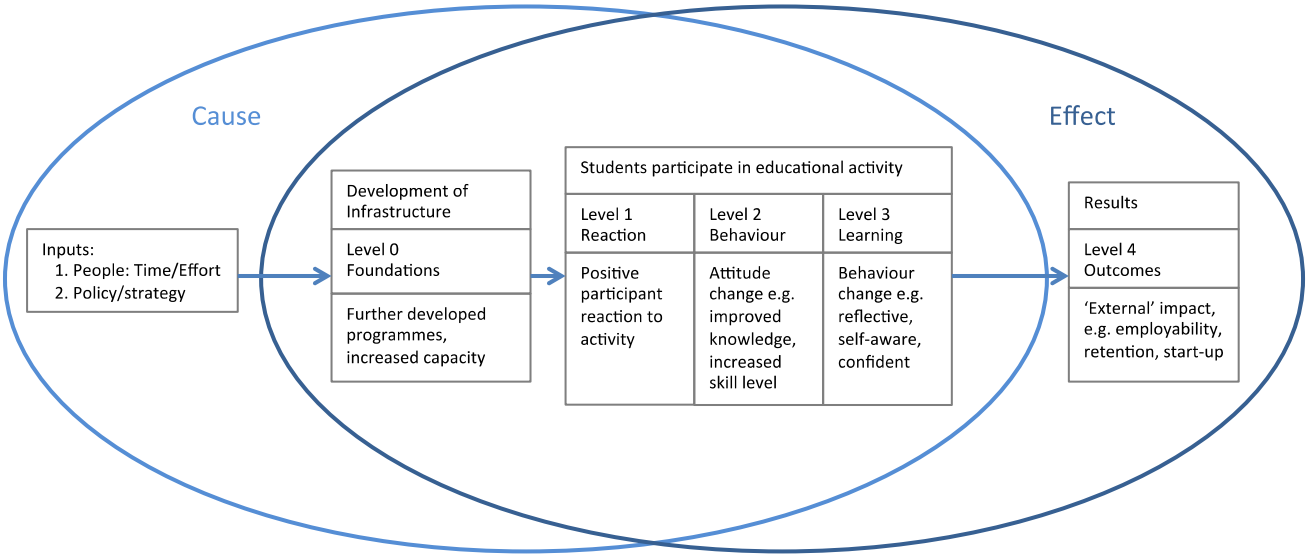

Figure 1: The Rugby Team Impact Framework adapted for use with undergraduate-level programmes

Interview Guide for Case Study Research

Case studies were constructed following an in-depth semi-structured interview and collection of supporting literature. Interview questions were informed by Williams (2011) and were designed gain an insight into the choices, activities and techniques used by the lead educators. The questions can be aligned with the Rugby Team Impact Framework as follows:

Foundations:

1. Rationale behind choice of e-learning approach
   - Choice of this particular software
   - Fit of the approach with any institutional strategies
   - Awareness of any other colleagues using of SimVenture
2. Support and training required by the educator
3. Context in which SimVenture was used
   - Subject, year of study and cohort size
   - Details of how it was used including size of teams, duration and style of delivery
   - Assessment protocols

Level One – Reaction:

4. Evaluation of the programme
5. Feedback from students
6. Levels of student engagement
7. Initial reaction of staff and including benefits, drawbacks, and unintended outcomes/surprising results

Levels Two and Three – Learning and Behaviour:

8. How students have been able to articulate, apply and/or transfer the skills learned through the programme

Level Four – Outcomes:

9. Longer term benefits of using the simulation for the educator and students (if captured)
10. Changes in educator understanding of enterprise as a result of using the simulation
11. Responses of colleagues to educator's work with SimVenture
12. Future plans for using SimVenture

Interviews were conducted in the summer of 2014. Transcripts of the interviews were compressed into case study reports; these were approved by the lead interviewee before publication.

Analysis

Four case studies were developed through interviews with lead educators responsible for use of SimVenture in non-Business School-based enterprise education programmes. Table 1 presents a summary of the student-focused aspects of impact for each programme broken down by Rugby Team Impact Framework levels.

A description of each programme, educator-focused impact, and identified learning points are provided below.

Case Study 1 - University of Bristol

SimVenture was chosen by the educator who was looking for a tool that could support her teaching of business management (specifically veterinary practice management) to veterinary students, including veterinary nurses. The educator was particularly looking for an interactive tool with both a business and a teaching and learning focus that could provide a serious learning opportunity rather than a game.

At the time of interview, SimVenture had been used for 3-4 years with undergraduate students studying on a four-year BSc Veterinary Nursing and Bioveterinary Science course. The simulation is implemented in the third year of study in between placements. The students receive 3-day intensive management teaching in September of each year which includes 'getting started with SimVenture'. Once all the students have had an opportunity to work through 'getting started with SimVenture' there is a debriefing session in class. The September event is followed by another 3 days in January that includes a further session on moving on with SimVenture.

The class is divided into two with the students working in pairs. Occasionally a group of three may occur, but the educator prefers pairs in order to facilitate student engagement. The students are given a manual each that outlines the workings of the simulation. The default settings are applied when using the game, to give the experience an organic feel and to allow the students to explore the simulation.

The simulation performance is not assessed at the end of the year, but the learning contributes to some aspects of a separate assignment. There is also no formal evaluation of SimVenture, but students are asked to compare their experience of tool with that of a paper based business model generation tool. No longer-term impact is measured.

Although the educator expected students to question why the simulation was not replicating a veterinary practice, the students did not query this; it gave them a holistic view of the building blocks of business that could be applied to their own subject area. The type of business did not matter, as the students understood that the fundamentals of business are the same across all areas. Interestingly, although the students were not concerned about the business type, the educator still expressed the view that a subject specific simulation would have been better.

Overall, the educator felt positive about the simulation and how she implemented it with students. She thought the particular make-up of the students - having experience of the real world and being out in practice - meant they understood the relevance of the simulation.

> “To some extent you can leave the students to it and they'll get on with it and this is down to how engaging the simulation is, and that the students like a challenge.”

The educator’s future plans are primarily related to the technical aspects of the simulation: she is planning to explore the issue of the different scenarios available, particularly with respect to the random effects option, and develop more directed activities using some of the advanced scenarios that are available in SimVenture. The education also plans to run a formal evaluation of student learning, measuring how they have learned from the simulation.

Learning Points

- The number of licenses can limit student usage.
- It is recommended that students work in pairs.
- Educators do need to devote time to exploring the game and, if possible, undertake training

Text of the case study can be found at Jensen and Yip (2015a).

Table 1: Impact at Case Study Universities against RTIF criteria

Programme and Year of Study	Foundations			Impact Level 1	Impact Level 2-3	Impact Level 4
	Duration of Use	Rationale	Number of Students	Reaction	Learning & Behaviour	Outcomes for students
University of Bristol						
Veterinary Practice 3rd Year nursing undergraduate students who are studying a four-year Veterinary Nursing and Bio Veterinary Science BSc courses	Used by the educator for four years at time of interview	The educator wanted a tool that could support teaching of business management. An internet search for an interactive tool with both a business and a teaching and learning focus - which constituted a 'serious package' rather than a game - led to SimVenture.	Around 25 students per year	The simulation initially engaged students due to its 'game' like appearance. There was some resistance at the start from a few students who found the simulation was more serious than the game that they had envisaged. This group came to realise the potential of the simulation due to the valuable business knowledge gained.	Students recognised that they were learning the underpinnings of business theory and practice. It gave them a holistic view of the building blocks of business that they could apply to knowledge in their own subject area.	No formal framework to assess short- mid- and long-term impact of the programme reported.
University of Chester						
Computer Science & Information Systems Management Final Year Undergraduate Students. Part of a range of Computer Science and Information Systems degree courses.	Used by the educator for three years at time of interview.	The educator took over the module from a retiring colleague who had been using SimVenture	Around 30 per year	Students appreciated the realism of the simulation straight away. Their eyes were opened to the many procedures and amount of effort that are needed to run a business. Students particularly enjoyed the team working aspect, and taking different roles within the team.	Evidence of applying theory into practice was noted. Students realised that there were more job opportunities available to them in a small/early start-up business.	No formal framework to assess short- mid- and long-term impact of the programme reported.

Programme and Year of Study	Foundations			Impact Level 1	Impact Level 2-3	Impact Level 4
	Duration of Use	Rationale	Number of Students	Reaction	Learning & Behaviour	Outcomes for students
Edinburgh Napier University						
Information Systems 1st Year Undergraduate Students across a range of courses within the School of Computing.	Used by the educator for four years at time of interview	The educator used an internet search to discover a total enterprise simulation looking at the business as a whole. Wanted to develop teamwork and friendship groups through a subject relevant activity. Also wanted a way to develop key employability skills aligned to the general area of business systems.	100-150 per year	Module feedback from students is very positive, a clear majority citing 'learning presentation skills' as the best thing about the module. Attendance at labs is near universal. They are improving their vocabulary around business as well as their confidence in using it. However some students found the simulation a bit repetitive.	Teams and individual students make "astonishing and heart-warming" improvements in their presentation skills as the module progresses. Employability skills are developed including teamwork, reflecting on decision-making, synthesising and presenting data, designing presentations and verbal communication.	SimVenture has contributed to a marked improvement in retention rates amongst first years in the School of Computing. No formal framework to assess mid- and long-term impact of the programme reported.
University of Huddersfield						
Fashion and Textiles 2nd Year Undergraduate Students.	Used by the educator for three years at time of interview	The educator was looking for something that would fit with the finance aspect of the course and discovered SimVenture during the University's Teaching and Learning Conference in 2010	Around 30 per year	Some issues with complexity of software at first. This complexity, however, allows students to see the 'ripple effect' of one decision on multiple areas of business activity. The students see the benefit of having done the simulation when they come into their final year.	Financial confidence has improved, soft skills are developed and business knowledge increased. Students are exposed to and develop an understanding of the financial aspects of fashion and textiles. The simulation helped students realise the difficulty of working life, such as time management, marketing of their product, and market research.	No formal framework to assess short- mid- and long-term impact of the programme reported.

Case Study 2 - University of Chester

The educator ‘inherited’ use of SimVenture from a retiring colleague but has since developed the materials and delivery. She had been using the simulation with final year undergraduate students for three years at the time of interview within a range of Computer Science and Information Systems degree courses.

The module containing the simulation is split into two parts, focusing on business management and project management. SimVenture is used in the business management section as a more engaging alternative to getting students to create business plans. Initially, the project management material was taught in the first half of the year and then SimVenture was introduced in the second half. The educator noticed how the students 'woke up' in the second half of the module when they used SimVenture and changed the order around. The impact was that this helped students realise that what they may consider boring and uninteresting minor project management tasks are actually crucial. Students’ attitudes and work rates for project management tasks have improved, as well as their skills in estimation and planning, because they realise their relevance.

Students work with SimVenture in groups of at least three and no more than five over a seven-week period. Each team required a Chair, with other roles responsible for finance, HR, marketing and operations. One person could take on more than one role, or a role could be shared between several people. They are introduced to how to use the simulation in week one, and then work through a three-year start-up scenario over the following six weeks. The educator stipulates a £20,000 business start-up budget and that the business must be run for the full three years of the simulation. Outside of these fixed conditions, students are free to change any other variables they choose. Due to the elements of randomness built into the game, the student groups have diverse outcomes almost from the outset; they learn that you cannot simply copy another group's work and decisions.

The students are not marked on how much profit they generate, but on two written assignments with screenshots to evidence their work. The assignments consist of one individual report to demonstrate learning about business ideas and practices (this accounts for a higher proportion of the mark), and one group assignment focusing on teamwork issues and reflection on the progress of the team’s simulated business.

No formal evaluation was reported, but informal feedback and educator observations have been used to enhance delivery as described above. The educator reported that the detail of the software was impressive and the students appreciated the realism of the simulation straight away. She described how ‘their eyes were opened’ to the many procedures and amount of effort that is needed to run a business. The simulation broadened the students’ horizons as they realised that there were more job opportunities available to them in a start-up businesses than they had previously considered.

Most of the work within Computer Science degree courses tends to be individual, so students’ appreciated the learning experience afforded them by group work. Initially, a few students disengaged from the simulation as they were not used experiential learning using a computer ‘game’. Other students were reluctant to take risks within the simulation. This was mitigated to an extent in they had team members to cooperate with, and if one of the members of a group was not confident in making a decisive action, then the other group members were able to step in and take the responsibility. Over time, the realism of the simulation gave students confidence in running their own business, and some became so immersed that they worried about the levels of income they were generating.

> “It’s a game; it’s a simulation; it’s something that forces you to be involved that you actually care a bit whether it works or not.”

From the educator’s perspective, using SimVenture allows her students to gain an idea of the different sides of business. It throws everything at them all at once, exposing them to aspects such as budgeting, cash flow, legal regulations, health and safety issues, and so on. They begin to have an appreciation of why they need to fill in forms and comply with regulations; the simulation teaches them that there are consequences to non-compliance of this aspect of business. Although her first impressions were that the simulation was a great idea, the help function in the game was not that good and it took the first year to work out what the simulation’s strengths and weaknesses were. The educator has no immediate plans to change how SimVenture is used within the current module, but is interested in exploring it’s use with first year students in a new engineering department.

Learning Points

- Keep group sizes small, but take into consideration that students can drop out of the group.

- SimVenture is a great way to get students involved in something that they might not otherwise find interesting, teaching students that aspects that appear less interesting may actually be of crucial importance.

Text of the case study can be found at Jensen and Yip (2015b).

Case Study 3 - Edinburgh Napier University
The educator chose SimVenture after an internet search looking for a simulation that would expose students to all aspects of business. She wanted a way to develop key employability skills, and promote small group interaction aligned to the general area of business systems. As retention of first year computing students was a issue at the time, the educator was particularly interested in a vehicle that could be used to get students to work together purposefully with a subject-relevant activity, developing teamwork and facilitating the creation of friendship groups.

SimVenture is used within an Information Systems in Organisations module – a compulsory module for almost all School of Computing first year students. In Week 2 of the module, on entering their first laboratory session, students are quickly put into teams of two or three. During the first few sessions, exercises help them become familiar with the simulation software. Teams assign themselves names and set up their simulated business, identifying markets, deciding strategies and creating a company identity. SimVenture is used to reinforce and amplify concepts introduced in lectures. It is primarily used within the module as a means of embedding key employability skills, including teamwork, reflecting on decision making, synthesising and presenting data, designing presentations and verbal communication. Friendly competition between teams is encouraged.

The SimVenture activity accounts for 40% of the module marks and is assessed through a series of group presentations in Weeks 5, 8 and 11. Assessment criteria are notified beforehand and require teams to collate data and justifying decisions. Feedback is given at the presentation itself in order to stimulate discussion and reflection and to facilitate improvement and increased in confidence. A video of each presentation is recorded. Students report real benefits from being able to go over written feedback whilst looking back over their performance

The educator and a colleague who runs the laboratory sessions review the use of the simulation on an on-going basis. Students can be seen to be improving their vocabulary around business as well as their confidence in using it, however, some students found the simulation a bit repetitive. Exercises have been tweaked in response to the on-going feedback, for example, by looking beyond the basic scenarios initially used. More structured sessions have been developed over time where the first half of the session is whole class teaching, and second half is facilitated group work. Formally collected module feedback from students is very positive with a clear majority citing ‘learning presentation skills’ as the best thing about the module.

The educator feels it is helpful for students to be assigned teams early on and at random, as it precludes disputes over team membership and encourages new relationships, rather than placing pressure on existing or newly forming friendships. Most teams are self-regulating and work well, demonstrating evidence of good teamwork. As an example, students have set up of, publicised and attended an out-of-hours social event. Activity such as this is assessed and marks can be given. Although teamwork is generally good, staff do have to advise, encourage and, in exceptional cases, take action when team dynamics go wrong or a member is not participating fully.

As described above, the educator chose SimVenture to help address a particular issue with first year student retention rates. A formal evaluation explored the impact of using the simulation on these rates and concluded that SimVenture contributed to a marked improvement in retention rates amongst first years in the School of Computing.

The educator is considering embedding SimVenture in Week 1 in a new IT Management degree programme in the shape of a one-day competition to work as an icebreaker activity.

Learning Points

- Keep groups small. Team of four are not practical and can lead to students not being properly involved.
- Need to ensure that students have opportunities to get formative feedback on their presentations in order to develop key skills.
- A degree of creativity, experience and good planning is called for when designing a meaningful and challenging overall experience.

- Starting with SimVenture in the first semester provides a means of getting newly arrived students into small and class-wide friendship and informal support networks.

See Bhardwaj (2014), for a podcast exploring Edinburgh Napier University's use of SimVenture to enhance employability skills and improve retention; text of the case study can be found at Jensen and Yip (2015c).

Case Study 4 - University of Huddersfield
The educator was looking for something that would fit with teaching the finance aspects of a second year undergraduate course on Fashion and Textiles (Buying or Management) in the School of Art, Design and Architecture. She discovered SimVenture during a showcase event at the University of Huddersfield Teaching and Learning Conference in 2010 where Dr Dina Williams presented the results of a University-funded teaching and learning project using the simulation with Business students (c.f. Williams, 2011).

SimVenture has been used for three years at the time of interview. The students are introduced to the assignment and the mechanics of simulation at the end of Term One. This takes place in a computer laboratory with the educator as a facilitator. The class is split into groups of between two and four students. Students within the groups are asked to concentrate on one of the four quadrants that make up the main categories on the SimVenture dashboard. The completed assignment is handed in at the end of Term Two.

The simulation activity is worth 50% of a 40-credit module and is assessed by two components: a group presentation and a reflective log. The group presentation requires students to demonstrate their progress through the game and describe the final net profit that the group earned. The presentation is given in front of the whole class for both peer and academic review at the end of the module. The presentation is accompanied with an written individual reflective log, in which each student has to describe thei decisions they made throughout the simulation activity, giving reasons for the options they have chosen. The reflective log also includes reflections on the team performance and an evaluation of the simulation software.

The educator reviews how the SimVenture activity is planned, how much it needs 'scaffolding' and how it fits with other modules on an on-going basis. Students fed back that they preferred to be in pairs rather than groups of four because it was difficult to keep the entire team engaged around the PC due to only one keyboard per group (necessitated by a limited number of concurrent licences available at the time of interview). One student said:

> "I think SimVenture is a very useful tool, it really helps to explain the stages you need to run a successful company and encourages users to think holistically about a business rather than just its profit and bank balance. I shall definitely take what I have learnt from this game and apply it to real life situations both in my internships and final year modules."

The educator initially assumed that the software would be easy to implement, but underestimated how uncomfortable some students felt at being expected to just jump into the simulation. This has been mitigated by the introduction to SimVenture described above. SimVenture provides a main-menu screen with four quadrants showing how the four key parts of the business fit together (see About SimVenture above). Understanding the ripple effect of making a decision in one quadrant on the other three is extremely important. The educator feels that students would not have understood the complex interactions between actions in any other way than by using SimVenture.

There are some issues with students leaving completion of the simulation activity too close to their assessment deadline, however learning is evident. The educator reports that financial confidence has improved, soft skills are developed and business knowledge is increased. Students are exposed to and develop an understanding of the financial aspects of fashion and textiles in particular. The simulation helped students realise the difficulty of working life, such as time management, marketing of their product, and market research. The students particularly see the benefit of the simulation exercise when they come into their final year.

Although financial literacy for fashion and textiles has increased, the educator feels that more can be done. Future plans include recruiting an accountancy lecturer to consult for technical terms, financial advice for students to understand terminology and financial mathematics within the simulation and the course. The educator is considering incorporating a warm-up session in the first year to get students used to the software and prepare them for the second year where use of SimVenture assessed. The aim is of this would be to relax the students and make them comfortable before it becomes a high-stakes situation, and give them the confidence to explore the software to its full extent.

Learning Points

- Keep groups small.
- Recommend that students keep a written log to document their learning experience. This should include the creation of a personal glossary of financial terms that they could pick up when they came back into their final year. This is particularly useful for students who return to their final year after a year out on placement.

Text of the case study can be found at Jensen and Yip (2015d).

Discussion

All of the educators in this study had been using SimVenture for at least three years at the time of interview and intended to continue. All considered that the use of SimVenture had positive outcomes at the RTIF Levels 1, 2 and 3 for Reaction, Learning and Behaviour and reported enhanced skills analogous to the 21st Century skills described by Romero et al. (2015).

Students reported that their team-work and presentation skills had improved alongside increased business and financial knowledge. Deeper learning was evident such as the linking of theory and practice, the ability to reflect on decision-making, the ability to synthesise and present meaningful data, and to relate abstract business principles to their own subject area. Key outcomes around employability were reported, not just around the development of skills for employment, but also through the recognition of previously unconsidered career routes, and an enhanced understanding of the difficulties of working life. One case study in particular was looking for a solution to retention issues and considers SimVenture to have been instrumental in increasing student retention.

Although there was some resistance from some students at the beginning of the learning opportunity, this tended to be short-lived or was seen by the student and/or educator as part of the necessary learning experience when confronted by a complex system with multiple interacting elements. It must be remembered that these are non-Business School students who have not necessarily chosen their subject expecting a business or enterprise education element to be included within it. More resistance to engagement may perhaps have been expected than was seen here. Interestingly, one educator expected their students to question why the simulation was not replicating a business in their particular subject area – a veterinary practice simulation for example – but this did not happen. There was no indication that any students felt that starting up a business making computers was detrimental to their learning – quite the contrary. Indeed it may be the case that exploring a business sector so far removed from their own experience enhanced the learning experience by allowing abstract connections to form.

The case studies provide information on the mechanisms of delivery that can assist others in the design of their own learning programmes. The number and timing of the SimVenture sessions vary, but some key points are consistent. First, small groups of students are considered optimum; most of the educators and/or their students preferred working in pairs. Secondly, SimVenture was only a part – a key part perhaps, but still only a part – of the whole module experience. This reflects the recommendations of commentators such as Brawer (1997) and Tunstall and Lynch (2010) that simulations should augment conventional methods of instruction. A final consistent recommendation was that an orientation session should be included to introduce students to the mechanics of using the software.

Other than the one case study that explored retention, there was no evaluation of RTIF Level 4 impact reported. No case study had formal processes in place to look at the mid- and long-term impact of the use of SimVenture. This is not surprising given the BIS (2013) report that struggled to find long term impact of enterprise and entrepreneurship education and reflects Bromley and Metcalfe (2012)'s own observations that Level 4 impact is difficult to assess.

Conclusion

The research conducted here had three aims: 1) to assess the use of RTIF as a framework for assessment undergraduate programmes in general and enterprise and entrepreneurship programmes in particular; 2) to investigate the impact of using SimVenture in non-Business School subjects; and 3) to produce case study examples of practice.

In relation to the first aim, the researchers consider that the RTIF developed by Bromley and colleagues is an appropriate and useful framework from which to assess impact; it is a tool that will be of value to those evaluating enterprise education interventions and activity. Foundations Level 0 provides information that provides the context, details of delivery, and rationales behind the choices made. Levels 2 and 3, Behaviour and Learning, facilitates reflection on impact and structured evaluation. Level 4 Outcomes, may be difficult to

achieve, but knowledge of the framework may encourage consideration of how longer-term impact can be measured and potentially increase the likelihood of collecting more useful data if processes can be built into a programme when it is being designed.

For the second aim, the study provides evidence of the positive impact of business simulations in the development of 21st Century skills (Romero et al., 2015; Voogt, J., & Roblin, 2012 and Wisniewski, 2010), and those relating to enterprise and entrepreneurship education (QAA, 2012), specifically for students of non-Business School subjects. The results are consistent with those reported by Williams (2011) and King and Newman (2009), providing further evidence of the immersive power of serious games (de Frietas and Liarokapis, 2011). All case studies reported positive outcomes for students with evidence of increased business and finance knowledge, skills development, and a wider appreciation of career options. Improved attendance and retention rates as a direct result of using SimVenture were also reported at one institution.

The final aim was to produce a set of non-Business School subject case studies that could also be used to support and train educators new to enterprise and entrepreneurship education, providing them with examples of practice. Four such examples are described here. SimVenture will not be the best solution for all circumstances and, as reported above, may be best used in collaboration with other learning opportunities if used at all. It is hoped, however, that the case studies developed (see also Jensen and Yip, 2015 a,b,c, and d) will be a useful starting point for educators exploring the potential of SimVenture in each new context.

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