Learning business through digital simulation: An analysis of student reflections

Sandra Barker   **Michelle Davy**
School of Management   SAIBT
University of South Australia   Navitas SA

The use of digital simulations is becoming more prominent in higher education to provide students with authentic learning environments in which they can apply their knowledge as well as develop enterprise skills. These enterprise skills are those qualities necessary for successful employment after graduation. This paper investigated ten years of data gathered through student reflective assessments that identified their perceived learning from the completion of a course which contained an embedded digital simulation. Student reflections were analysed to determine the themes which defined their key learning from the course. Content analysis was undertaken using nVivo to determine the themes from the students' individual reflection assessment. Outcomes of the study revealed that students self-reported successful achievement of three of the four course learning outcomes. In addition, students identified improvement in their enterprise skills and better understanding of business practices for their future careers.

Keywords: business simulation; authentic assessment; content analysis; enterprise skills

Introduction

This paper investigates the final reflections of students who have completed the course Business Decision Making Simulation (BDMS). It uses content analysis to determine the learning achieved from the student perspective. The interest in this area stems from a ten-year involvement with teaching the third-year course using the Capstone business simulation developed by Capsim (www.capsim.org), combined with the implementation of an authentic assessment strategy for all courses taught by the authors.

Throughout their university studies, business students are introduced to a wide range of discipline-based theories pertinent to their future careers. However, it is considered in the literature to be just as important to show to future employers that they can apply these theories in a workplace setting that they will experience as graduates (James & Casidy, 2018, p. 401-402). One of the key pedagogical approaches to ensure not only the attainment of relevant theory but also the development of employability (or enterprise) skills, is the use of authentic assessment. This assists students in the transition from university to full time employment in their chosen discipline area. Tout, Pancini & McCormack (2014 p. 597) were adamant in that, 'theory is no longer able to govern practice; practice, while drawing on theory, now lights its own path based on precedent, analogy, experience, imagination and in situ practical judgement'.

Authentic assessment has been identified as containing eight key elements pertinent to the workplace environment. These elements are 'challenge, performance or product, transfer of knowledge, metacognition, accuracy, fidelity, discussion and collaboration' (Ashford-Rowe, Herrington & Brown 2014, p. 207). Herrington & Herrington (2007, p. 73) discussed the use of authentic assessment as a necessary alternative to traditional individualised tests and essays stating that

> …to provide authentic assessment of student learning, the learning environment needs to ensure that the assessment is seamlessly integrated with the activity and provide the opportunity for students to be effective performers with acquired knowledge, and to craft products or performances in collaboration with others.

The introduction of authentic learning environments and assessment have been gathering momentum over the last twenty years. One example, the use of digital simulations, has become widespread in higher education. They are dynamic tools which represent actions and roles from the students' future fields of employment, allowing the students to engage in the 'interactive, authentic and self-driven acquisition of knowledge' (Vlachopoulos & Makri, 2017, p. 4). Researchers have identified that all students enrolled in courses that use business simulations as a teaching tool become actively engaged in the learning activities particularly when the academic instructor provides guidance and feedback at regular intervals throughout the study period (Levant, Coulmont & Sandu, 2016; Asiri, Greasley & Bocij 2017; Buil, Catalán & Martinez 2019). In addition, it has been shown through student feedback,

as well as pre- and post-simulation testing, that simulations assist students in the development of 'soft' or 'enterprise' skills (Morin, Tamberelli & Buhagiar (2019).

Literature Review

Simulation for learning

Salas, Wildman, and Piccalo (2009, p. 560) define business simulations as 'any artificial or synthetic environment that is created to manage an individual's (or team's) experiences with reality.' Business simulations provide opportunities for the 'active construction of meaning and knowledge' through pedagogies such as experiential, discovery and constructivist learning (Levant, Coulmont & Sandu, 2016, p. 371). Experiential learning is evidenced through the students engaging directly with the simulation providing experience dealing with consequences of the decisions they implement. Discovery learning is successful when students act on previous knowledge to discover new meaning of the concepts they have studied. Dellaportas and Hassall (2013) reinforce this by identifying that the creation of knowledge from experiencing a real or simulated environment is based on constructing meaning that is realistic to the learner.

Fearon et al. (2019) expand this concept with their discussion of heutagogic learning, which merges experiential and discovery learning pedagogies with student personal development. This type of learning is enhanced by the student's ability to critically reflect on the associations that can be made between the knowledge developed by combining the simulation, structured classroom learning and student self-development. However, due to the individuality of students, this reflective learning occurs at different stages throughout the simulation and tends to be greatly influenced by the students' level of motivation.

In addition to the ability of the students to be motivated to participate in the simulation, it must be noted, as stated by Scholtz and Hughes (2019), that the facilitator plays a large part in the success of any business simulation. Facilitator support necessary for the students to create appropriate levels of motivation to develop the soft skills includes:
1. Comprehensive support documentation and activities, which students are encouraged to complete before the simulation commences
2. Use of between one and eight practice rounds to provide students with formative feedback
3. Recap after each round of the simulation to repeat the theory behind the successes and failures (of the round)
4. Appropriate goal setting by the students, as a collective and individual, where 'students have to articulate their teams' vision, mission and goals' (Scholtz & Hughes 2019)
5. Firm understanding about the technology aspects of the simulation so appropriate support can be provided throughout.

It has been reported in recent literature that students do not engage in deep learning by sitting in lectures, memorising facts and regurgitating the answers in formats that do not relate to what their future working experience will require (eg LaDage et al, 2018; Matsushita, 2018). Experiential learning has been pushed to the forefront and challenges academic staff to reconsider their approach to teaching with comments such as "Organizing the course around exercises and mental challenges is much more effective than around lectures", says Udacity CEO Sebastian Thrun (Fowler 2013). Butler and Roediger (2011) identified that information becomes more entrenched when it is learnt through active rather than passive methods of learning. Therefore, the use of simulation exercises to replicate processes, projects or systems that students may experience in future employment situations is becoming more popular as academics work towards engaging students in a more active mode of learning (Hamzeh et al 2017).

Wolfe (2016) investigated the use of business simulations as a method of providing Assurance of Learning, one of the requirements that business schools need to include in their accreditation applications for the Association to Advance Collegiate Schools of Business (AACSB). He identified that whilst business simulations are a good method of providing this type of evidence, the simulation used and the method of embedding it into the course of study needs to be carefully managed. It is vital to ensure that all students are involved in the team activities and that every team member is given the opportunity to be hands on with the simulation, not progressing through the course on the back of other more active students. He went on to note that although some simulations provide a method of countering this by including individual exam style modules, this may not always test the acquisition of knowledge but rather an understanding of how the game works.

Evidence from the use of business simulations has shown development of enterprise or "soft" skills since they replicate actions from the workplace. Skills such as teamwork, critical thinking, problem solving, communication,

cooperation, listening, and negotiation have been developed through the intense active learning approach which is inherent in these simulations (Levant, Coulmont & Sandu, 2016, p. 372). However, this development often remains out of reach in courses engineered specifically to teach these skills in a traditional environment (Tseng, Yi & Yeh 2019). Students use a digital version of the simulation and available digital resources both in the classroom and in their practice sessions outside of the formal classes to improve their capabilities as well as their digital literacy skills. According to a student involved in research undertaken by Narayanan and Turner (2019), only internship would provide a closer link to the soft skills required by a graduate in the "real world".

Using Capsim for BDMS

BDMS is a third-year undergraduate business elective using the Capstone business simulation developed by Capsim (www.capsim.org). The course learning objectives (Figure 1) identify that students will develop skills in business analysis, decision making, identifying factors for business success and working autonomously and collaboratively.

On completion of this course, students should be able to:

CO1. Analyse the competitive business environment
CO2. Apply complex business decision-making skills
CO3. Identify key factors in business success
CO4. Work autonomously and collaboratively

Figure 1: BUSS 3074 Course Learning Objectives

Capsim is a wholly online simulation that gives students the opportunity to run a manufacturing business in a team and compete against other businesses (student teams) for the same closed market. Student teams make decisions in the areas of Research & Development, Marketing, Production, Human Resources, Finance and Total Quality Management in order to manage a profitable and competitive business. Student teams participate in four practice and eight competition simulated years and then complete a cut-down version of the simulation as an individual. Decisions are made using results from the previous year's performance and there are numerous reports available online for the students to test the potential outcome of the decisions that they have made.

Student learning is assessed through their team performance (based on the team score in the balanced scorecard, team identified key performance indicators and a team presentation) as well as their performance in the individual simulation (based on balanced scorecard and responses to multiple choice questions, which show an understanding of their business' competitive situation at key points in the simulation). Finally, students submit an individual reflection reporting on the students' self-assessment of the learning they have achieved in the course. Self-assessment is reported as being one of four important processes to enhance the experiential learning and knowledge gain of the students (Teach & Patel, 2007). The assessment in this course asks students to reflect on the learning they have achieved in both a team and individual simulation environment as well as to consider any skills that they have developed.

Teach (2018) identified a brief, but incomplete list (Figure 2) of the cognitive and non-cognitive skills that students would be expected to learn from participating in a business simulation. Most business school undergraduate courses would include these skills and knowledge within their courses and as such it would be expected that students would be able to explain the concepts/terms. The implementation of these skills/concepts, however, is not normally taught in the curriculum (Teach 2018). It is for this reason that the use of business simulations is being incorporated into curriculum.

1. How forces outside of the firm's control may affect the firm's performance
2. How to understand marginal analysis
3. How to understand Opportunity costs
4. The importance of the many topics of forecasting and the costs of forecasting errors
5. What unintended consequences are
6. How product life cycles affect decisions
7. How variable costs turn into fixed costs as soon as commitments are made
8. The importance of product positioning
9. How to work in teams
10. How to differentiate important information from unimportant information
11. How to work under uncertainty
12. How to determine interactions among two or more decision variables
13. How to anticipate competitive responses
14. How to considering possible competitors' decisions when proposing strategies
15. How to analyze reports and financial results
16. How to assess risk
17. How to be innovative
18. How to be creative
19. How to create budgets
20. How to interpret useful statistics

Figure 2: Shortlist of what students might learn through participation in a business simulation (Teach 2018, p. 57)

Method

Ethics approval for this project was received as a result of negligible risk ethics application 034/2018. The application required independent de-identification of all student data from the reflective assignments and this was completed by two neutral staff members. This study takes a content analysis approach to analyse the individual reflections of students who have studied BDMS since 2013. 'Content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use' (Krippendorff 2013, p. 24). Content analysis not only analyses the text but also considers the context in which the text has been written. Given that all the individual reflections have answered the same assignment question, the context of the analysis will remain consistent throughout the years that the study was completed. Analysis was undertaken by having all identifying features of the 249 submissions removed so that no student could be identified in the analysis. Papers were then loaded into nVivo 12 for coding and identification of common themes. This software was selected as it was available to staff in the University, and that the literature regarding qualitative research often refers to the fact that the 'systematic and rigorous preparation and analysis of qualitative data is usually time consuming and labour intensive' (Zamawe, 2015, p.13). The software was identified as the best possible option to assist in the reporting of the data for the following reasons:
- Simple structure using nodes
- Ability of researchers to focus on underlying themes
- Easier retrieval of results through efficient coding
- Ability to easily reorganise coding and node structures (Zamawe, 2015, p.14)

Nodes (or themes) are created to aggregate the information from the source documents. As data is coded against a node the software identifies the total number of files relating to the node and the total number of references. References are considered any segment of a file coded to a node and as such a file may contribute multiple references for a node (eg team) but could also be coded across multiple nodes (eg team, decision and work). After some initial software learning and frustration in the use of nVivo, the following section reports initial results from the coding of the student reflections.

Data and Analysis

Although one of the authors had marked all the reflections from 2013-2018 giving some idea of the types of codes to be expected, using the software for the first time led to a lengthy decision-making process regarding the codes to be considered for this research. Finally, two coding methods were trialed in nVivo: manual coding in the first file and automatic coding of nodes in the second one. The manual coding process completed the coding of 12% of the source files (31 of the 249). This process took over five hours of continuous work. The autocoding process completed coding of 100% of the source files in three (3) minutes. Tables 1 and 2 show the first order codes created in the initial process.

Table 1: First order codes created through manual coding

Name	Files	Reference
Ambition	1	1
Business operations	12	13
Communication	6	6
Competitors	6	6
Conflict resolution	2	2
Decision making	13	19
Department connectedness	13	17
Diversity	1	1
Future career	8	9
Leadership	1	1
Learn from mistakes	5	5
Link to real world	1	1
New knowledge	14	20
Personal attributes	6	7
Problem solving	3	3
Risks	1	1
Strategic management	10	10
Teamwork	25	46
Using prior knowledge	15	17
Working in business	2	3

Table 2: First order codes created through auto coding

Name	Files	References	Number of subcodes
Business	142	289	155
Decision	215	809	203
Group	168	432	151
Individual	153	287	67
Making	158	335	59
Market	103	191	118
Members	193	416	115
Product	115	206	117
Rounds	153	347	85
Simulation	112	219	81
Team	233	945	262
Team members	143	251	53
Work	135	236	101

Each of the primary first order codes created through auto coding contained numerous subcodes as can be seen in Table 2 above. Most of the subcodes were created from identifying a key word either before or after the main code and therefore there was generally only one file and one reference for each of these subcodes. From the codes developed through the auto coding process, a second pass was made to clearly identify those codes that were directly relevant to this study, ie what students learnt through taking the simulation-based course. A series of second-order themes (Table 3) were developed based on the original manual codes as these better reflected the understanding of the author in terms of the data contributing to this study. This was undertaken using the approach suggested by a colleague based on research from Gioia, Corley & Hamilton (2013). At this point data coding was concentrated in the second file based on the auto coded data to achieve the best possible set of data for reporting.

Table 3: Second order themes created from the auto coded data

Name	Files	References	Number of Subcodes
Business operations	71	114	6
Commitment	10	10	0
Competitors	10	10	1
Decision making	41	58	4
Engagement	1	1	0
Enterprise skills	87	172	8
Future career	23	23	0
Knowledge	67	99	5
Mistakes	13	14	2

The themes were finally interrogated to identify the key achievements in student learning through the simulation course and to reflect on how these themes can inform future teaching methods for the author.

Discussion

The themes generated from the coding of the papers have identified eight main areas the students saw as key learnings from taking BDMS. Reviewing the course learning objectives, the themes generated from the student identified learning match with three of these objectives. Although there is no apparent thematic match to course learning objective 3 (Identify key factors in business success), there were comments in the student papers which discussed the success of the simulation. This however was not considered by the students as something that they learnt and as such was not included in the coding at this time.

Table 4: Comparison of Course learning objectives with generated themes

Course Learning Objectives	Student Learning Themes
Analyse the competitive business environment	Competitors
Apply complex business decision-making skills	Decision Making
Identify key factors in business success	*No match after second order coding*
Work autonomously and collaboratively	Enterprise Skills (subtheme Teamwork)

Students identified these learning areas with comments such as:

The use of a competitor analysis as an assignment felt real and was a great way to practically demonstrate our understanding of the course content and theory without regurgitating slabs of text. (Student 209)

I found that individually, decision making are (sic) more effective and quick to make, while in a team it can take up time to come to a conclusion and stick to that decision… Sometimes making decision individually can be overwhelming due to only one person making the decisions, this could increase the stress levels of them and accidently make the wrong decisions or decisions which are not useful. (Student 003)

With working in teams in future I think that if I have an issue about something I should put more effort into coming up with logical reasoning for why I think there is an issue and try harder to explain this to my team members. (Student 012)

I have worked in many teams before, both academically and professionally, and walked away from this group assignment both a better team member and a better leader of people. (Student 016)

In addition to the themes that matched the expected course learning for the student there were other themes which the students saw as significant to the university learning and for their future career.

Table 5: Additional Learning Themes – Student identified

Theme	Subtheme	Sub-subtheme
Business operations	Business decision making	
	Business departments	Department interconnectedness
		Effects of decisions
	Investment	
	Planning	
	Strategy	
Commitment		
Competitors	Competitor analysis	
Engagement		
Enterprise Skills	Communication	
	Conflict resolution	
	Leadership	
	Personal attributes	
	Problem solving	
	Time management	
	Working in diverse context	
Future Career		
Knowledge	Apply existing knowledge	
	Lack of knowledge	
	New knowledge	
	Relying on knowledge	
	Theory not always the best	
Mistakes	Impact of mistakes	
	Learning from mistakes	

The theme of knowledge is an interesting one with many students identifying the ability to apply existing knowledge as a key learning in their taking of this course.

> *Lastly the use of balance sheets and income statements finally became tangible and useful for the first time in my accounting course, to see the projected outcomes and how they would affect each statement was a little exciting and gave a great summary as to our teams decisions regarding things like material, marketing and production of a product and whether that product would produce a profit or loss and how much it was adding to or taking away from our company. (Student 176)*

The ability to learn new knowledge without the actual inclusion of any specific new theory in this course was to the author a very interesting outcome. Students identified that the new knowledge came from working in teams and having their teammates provide them assistance in the areas which were not their discipline specialty. This is particularly true of students who reflected that they were not studying a finance or accounting degree but were able to learn significant amounts around the financial areas and the understanding of financial statements and ratios in this course. This, to the author, is an excellent outcome as in other courses it is not often the case that students help co-create the knowledge for themselves; it is normally disseminated from the lecturer or course coordinator. This outcome is supported by the research undertaken by Lohmann et al (2018, p. 11) who commented that 'overwhelmingly, students found that the teamwork enhanced their learning and problem-solving'.

> *I learned a lot about the business world, including: competitor analysis, demand, forecasting and finance (I know about stocks now!). (Student 230)*

> *But overall, I think we have nice performance on the team, and I am not good at finance part which I got help by the teammate a lot, so I know more about the way to manage a company in a unique way. (Student 062)*

Fearon et al (2019) identified a clear link between student involvement in business simulations and the development of employability or enterprise skills coinciding with the outcomes reported by the students from this study. The theme of enterprise skills, which was derived through the nVivo analysis, matches with the UniSA Business School's recently developed Enterprise Skills program (UniSA 2018). UniSA is a leader in the field of graduate quality development being the first University in Australia to embed these qualities into their programs back in 1991. The Enterprise Skills program is a step forward from UniSA's graduate qualities with considerable

research and collaboration being undertaken with industry partners to determine the skills that are needed by today's graduates. The fact that students acknowledged that these learnings were being achieved from within this course and that they relate to their future career (another theme identified) are an excellent outcome from this study.

In a face-to-face environment, even though the simulation is undertaken using digital resources, communication became a key for students key learning for students and this was an unintended outcome as it is not part of the key learning outcomes for the course. It is obvious from their reflections that students found the ability to work together helped with the improvement in their communication skills particularly those skills of listening and patience.

> *We have been taught how to communicate, listen and incorporate others ideas and in business decision making simulation course we got the opportunity to work and make decision within groups. (Student 234)*

> *I think that listening to others ideas is something that I need to work on because I know at times I can be controlling and like to have things done my way, but when working in a team it is important to consider and listen to everyone's ideas. (Student 004)*

Appendix 1 presents the major themes identified through the research with primary statements from the study that support the themes.

Conclusion

This paper has identified that the inclusion of authentic learning environments, in this instance the use of a business simulation, has achieved significant learning for the students from their perspective. One of the key outcomes is the success of the development of enterprise skills such as communication, teamwork, decision making, problem solving, conflict management and leadership. This supports claims from research, for example Ornellas, Falkner & Stalbrandt (2019, p. 118) who report that authentic learning tasks and assessments enhance the development of transferrable skills.

Students self-reported achievement of three of the four course learning objectives whilst additionally noting learning in several other areas, notably applying existing knowledge, new knowledge from peers and learning about business practices for their future careers.

This paper will now lead to further analysis of the complete data set with additional themes to be identified, not purely around student learning, as well as conducting research into any links between student self-reported learning and the results ahieved in the group and individual simulations.

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Appendix 1 – Student statements supporting themes

Table 6: Summary of major themes and student supporting statements

Theme	Supporting statements
Business Operations	*This course is a good real-life subject to teach you a lot of things to be aware of when it comes to making real-life decisions in the workplace, even though I do not want to start a business myself, I would like to work as a business analyst and this subject has taught me a lot of things to be aware of as to what matters, analysing competitors and the products to work, focus on, the age and reliability.(Student 066)*
Department Interconnectedness	I learnt a lot from this course, even though I am already in a managerial position I gained more knowledge regarding how certain decisions can affect the other parts of the business and not just the manufacturing business unit. (Student 016) *I would definitely say most of my learning centred around the functions of a business, and how different decisions affected different areas of the profitability of the business in different ways. (Student 017)*
Business decision making	I believe this course has prepared me for what the business world will be like outside of university, including all of the decisions that come with running your own business. (Student 208)
Competitor analysis	*I also learnt how important it is to survey what the competitors are doing and form strategies based on likely decisions made by them. (Student 008)*
Communication	By participating in this class and being put in a group for this project, I have learned how to communicate effectively with other team members under business situations. (Student 144)
Conflict resolution	*Conflict resolution is another useful skill that I have learnt when working as a team. (Student 172)*
Leadership	…as a management student I need to learn to work and deal with all colleagues and students and what I have learnt by doing this course is that leadership skills needs to be applied across all situations. (Student 185)
Personal attributes	*You have an advantage by participating in capsim, because you could learn if you are a risk-taker, team player, if you like the business setting, and if you can handle the pressure that comes with running a business. (Student 151)*
Problem solving	Moving forward, I have taken from this course the ability to develop my analytical skills, forecasting skills and enhanced my strategic planning understanding. (Student 237)
Time management	*Due to the course being intensive and all rounds running to a time schedule I also learned how to make quick informed decisions and improve my current time management skills. (Student 213)*
Working in diverse context	I believe that the success of the group largely was dependent on diversity; I enjoyed working in my team because there was a researcher that had a realist point of view a HR/marketing person who had an optimist point of view and me a figures person who has a reasonable/conservative point of view. (Student 007)
Apply existing knowledge	*From this course I was able to use the marketing theories that I have learnt, such as; always targeting a broader market, not targeting a particular market as it will exclude potential buyers. (Student 005)* There were a lot of terms that I knew from previous courses but did not really understand in a business setting. (Student 024)
Lack of knowledge	*It was remiss of me to exclude myself in some decision making processes on the ground that I do not have the necessary knowledge in the relevant area such as finance. (Student 002)*
New knowledge	Outside of theories and academic learning, I learnt a lot about conducting business with others, the importance of individual team members strengths as well as the need for individual motivation along with team motivation to succeed. (Student 136)
Impact of mistakes	*The key area I learned the most in is how a small mistake or rushed decision can cause a huge impact across a whole business. (Student 032)*
Learning from mistakes	In some situations I decided to take a step back from decision making and allow mistakes to be made, this then meant that the other team members were able to learn from the mistakes. (Student 008)