
A TALE OF TWO SIMULATIONS IN HIGHER EDUCATION: EXPLORING THE BENEFITS OF A BOARD GAME AND AN ONLINE SIMULATION

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Introduction

While games and simulations have been around for a long time, they are increasingly being incorporated into higher education and corporate training, and are particularly popular in the business disciplines. Blended learning allows the enrichment of lecture-based courses through physical face-to-face, computer-based and web-based games and simulations that make unique contributions to the learning processes. Developing custom simulations are time consuming and expensive, and need to be evaluated and improved in several cycles before implementation. Buying off-the-shelf simulations and games are convenient, but they can be quite expensive and cannot be customised for a local context. As with many new technologies, the hype or novelty effect sometimes eclipses the real value. In this study, students in different academic years in the same B Com degree participated in two simulations of professional practice in the Accounting sciences. The research question is: what was the learning value of two different types of simulations for students with diverse learning proficiencies?

Literature

Games

The essential attributes of educational games include the following: “player or players, conflict [or cooperation], rules, predetermined goal of the game,... artificial ... pedagogical nature” (Sauvé, Renaud, Kaufman, & Jean-Simon, 2007; p.248). Procedural simulations usually contain simulated physical objects, like virtual or token money, because the learner has to imitate the actual procedures of using them to engage in the required procedure. When the user engages with the required actions, a live facilitator or a computer program can provide feedback or further guidance. If the main objective of the model or activity is motivation, it is usually classified as a game or drill. Game motivational techniques include competition, goal setting, scoring, fantasy, surprise, uncertainty and relevance (Alessi & Trollip, 2001). Simulation games meet the definition of a simulation, as well as that of a game (competition, rules, winning and losing). Table-top board games are a good way of incorporating workplace (like accounting or tax) skills and learning the application of theory in the workplace in an undergraduate business course (Fouché, n.d.; Pelser-Carstens & Blignaut, 2018). Such learning games encompass real-world activities that enrich the classroom environment by supporting experiential and

problem-based learning activities and encouraging learner-centred approaches and motivation to learn (Pelser-Carstens & Blignaut, 2018). In many simulation games student groups function like in a real work situation rather than as competing teams. Pelser-Carstens and Blignaut (2018) found that students using a board game enjoyed the social aspect of the board game most, followed by gaining subject knowledge, soft or technical skills and group work and effective functioning the least. Carenys, Moya, and Perramon (2017) found that accounting students enjoyed playing a videogame about the content more than engaging with a comparable simulation. More important is the finding that the cognitive learning gains from the videogame and the simulation were equal (Carenys et al., 2017).

Simulations

“An educational simulation can be defined as a model of some phenomenon or activity that users learn about through interaction with the simulation” (Alessi & Trollip, 2001; p.213). Simulations are by definition based on an internal model, differing in that aspect from games. Essential attributes of simulations include a model of reality defined as a system; a dynamic model; a simplified model; and a model that has fidelity, accuracy and validity,... [to] address directly the learning objectives” (Sauvé et al., 2007; p.251). Scenario-based training can be effective to develop complex skills that are needed in the workplace (Carenys et al., 2017; Saurin, Wachs, Righi, & Henriqson, 2014). A simulation should be based on the identified skills, work challenges, activities and scenarios encountered in reality. Using instructors to play a role in monitoring and steering scenarios, can be impractical and expensive, hence the advent of interactive digital simulations. Autonomous training interventions like business simulations simulate a real environment and characters, while integrating the knowledge, skills and attitudes needed in the training method. Such simulations also facilitate the transfer of those skills to new situations (Alessi & Trollip, 2001; Asiri, Greasley, & Bocij, 2017; Saurin et al., 2014). Online simulations generate high levels of engagement (Carenys et al., 2017). Fidelity refers to how closely a simulation imitates reality, and affects the learner’s performance during the simulation as well as the application of knowledge to new situations. Novice learners initially learn better from lower fidelity simulations that are less overwhelming, avoiding excessive stimuli (Alessi & Trollip, 2001; Huang, Johnson, & Han, 2013). An experienced learner or expert learns most during a simulation with higher fidelity, or a simplified model that is perceived to be similar to the performance environment in key aspects. Such advanced learners achieve better transfer of learning if the perceived fidelity is high enough and they are suitably motivated, see Figure 1 (Alessi & Trollip, 2001). An overview of research on business simulations and gaming confirm their importance as powerful teaching tools, their flexibility to teach diverse subjects and skills, and their relationship to performance (Faria, 2001).

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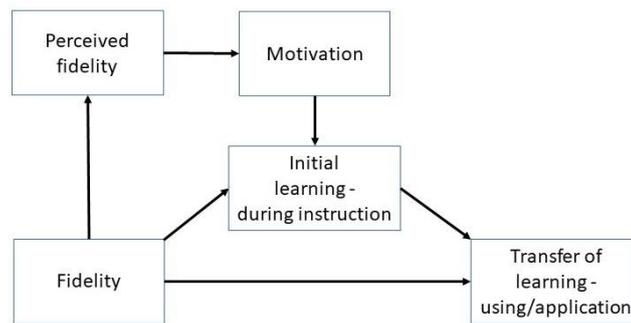


Figure 1. Transfer of learning: from Alessi and Trollip (2001; p.235)

Context of study

The simulations were deployed in the Economic and Management sciences faculty at the University of Pretoria, a large contact university that encourages blended learning. Both the first and third-year students were in the more challenging chartered accountancy/auditing stream of the bachelor of commerce. The table-top board game, *Commercium*tm (Fouché, n.d.) was developed in this country and simulated the roles and transactions a professional accountant would do. The game aimed to familiarise first-year students with the practical context of the accounting profession, and was strongly recommended for the 165 students those who did not take accounting at school. Most of them participated voluntarily in this annual event on a Saturday two months into the academic year. Students played 24 rounds in their teams, competing with other teams to make profit. They had to complete and submit the concomitant documentation afterwards for bonus marks.

The web-based audit simulation was a compulsory component of blended learning for the 601 third-year auditing students with a duration of several weeks. The simulation was developed and hosted overseas, and used per licence. Students worked in groups with a virtual client, interacting with avatars and providing auditing services to a simulated firm. More information is available on the AuditSim website. The simulation continued over several weeks, and students got marks for completing key documents. Only 20% of these students indicated that they play computer games, which does not echo student profiles elsewhere in the world (Huang et al., 2013). Figure 2 shows the spread of students across academic performance in the two groups.

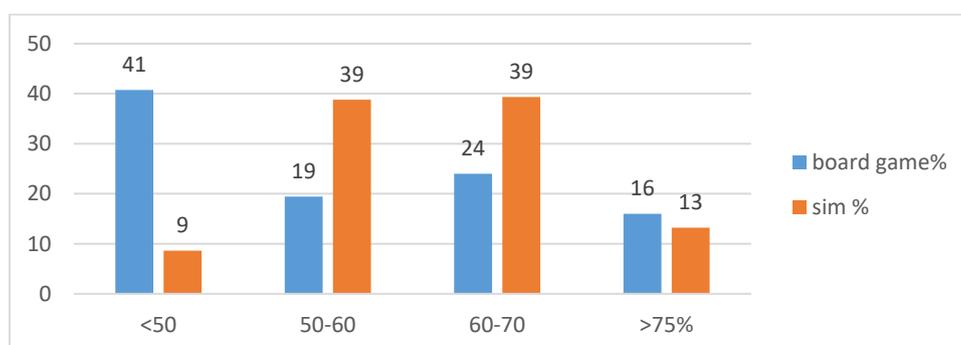


Figure 2. Distribution of student academic performance in the two classes

Methodology

A mixed methods study was performed on data collected using two electronic surveys hosted in Qualtrics™ and linked in the students' online classroom. A hundred and eight first-year students who participated in the board game completed the survey in the year of the study, containing two questions that were analysed. In the first question they could select any one or more of five given statements. An open-ended question also invited them to describe the single most important benefit of the game. Responses were grouped into self-reported performance brackets. Content analysis using Atlas.ti™ was applied to the anonymous qualitative board game feedback, coding and grouping codes according to themes. From the 601 third-year students, 371 of completed the questions in this study. Responses were grouped according to student grades in the subject prior to doing the simulation. Descriptive statistics are presented of the responses that were weighted according to the 5-point Likert scale (1 = *strongly disagree* – 5 = *strongly agree*). Ethics clearance to use the data for research was obtained by the respective lecturers of the courses.

Findings and discussion

Board game played by first-year accounting students

Board game itemised question

The question was the following: Please tick all the boxes that describe your experience of the Accounting Board game – (you can tick more than one). Responses were grouped according to the student grades they reported at the time. Figure 3 shows the percentage of students in these groups who selected each statement.

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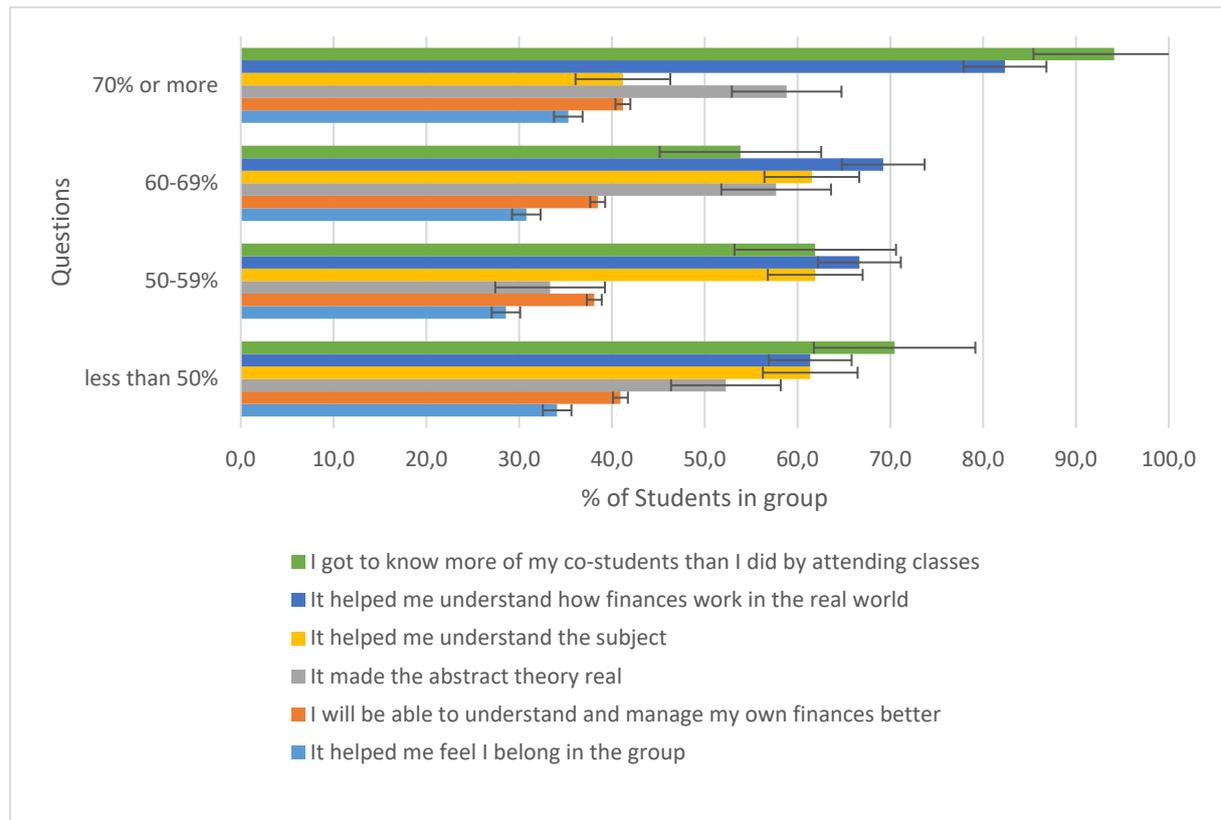


Figure 3. Experience of the Accounting Board game by academic performance: statements chosen.

In the table-top board game, getting to know their co-students obtained the highest mean rating by the class, selected by 68% of all participant students. Understanding how finances worked in the real world, was the second most popular statement of how students experienced the board game. Chosen by 94% and 82% of the 70+ students, those two were by far their top statements. Between 54% and 70% of the rest of the class chose the first item and 61% – 69% the second one. With 58% of the whole class selecting *better understanding* of the subject as overall third, it only attracted 41% of the 70+ students, while around 60% of the other students ticked this box. The simulation made abstract theory real, according to 51% of students. There was likewise no great variation among groups (mean 39.8%) in how they learnt to understand and manage their own finances. The lowest rating was found in how the games *helped them feel they belonged in their groups*, varying between 28% and 35%. Considering the diversity of the class, not choosing their own team mates, and competitiveness between teams could contribute to this lower rating, in spite of students getting to know everybody.

Board game open-ended question

The responses of students with different levels of academic performance were coded qualitatively into 25 codes, and grouped into five themes, as shown in Figure 4. Some of the general comments made by students about the game day include: interesting, extremely fun, exciting, informative, a summary or overview of how enterprises operate. They “got experience of actual transactions. It made accounting seem real”. About working in groups: “since we were competing with the other group one had to always be on point by strategising, learning from

the other group and assisting each other where needed. Since we had never spoken to each other it has increased our network of friends” They mentioned competition, team spirit, rewards. Unintended outcomes included: “now I am assured that I chose the right course”. The open question was: In one sentence, what was the most important thing that the Accounting board game helped you with?

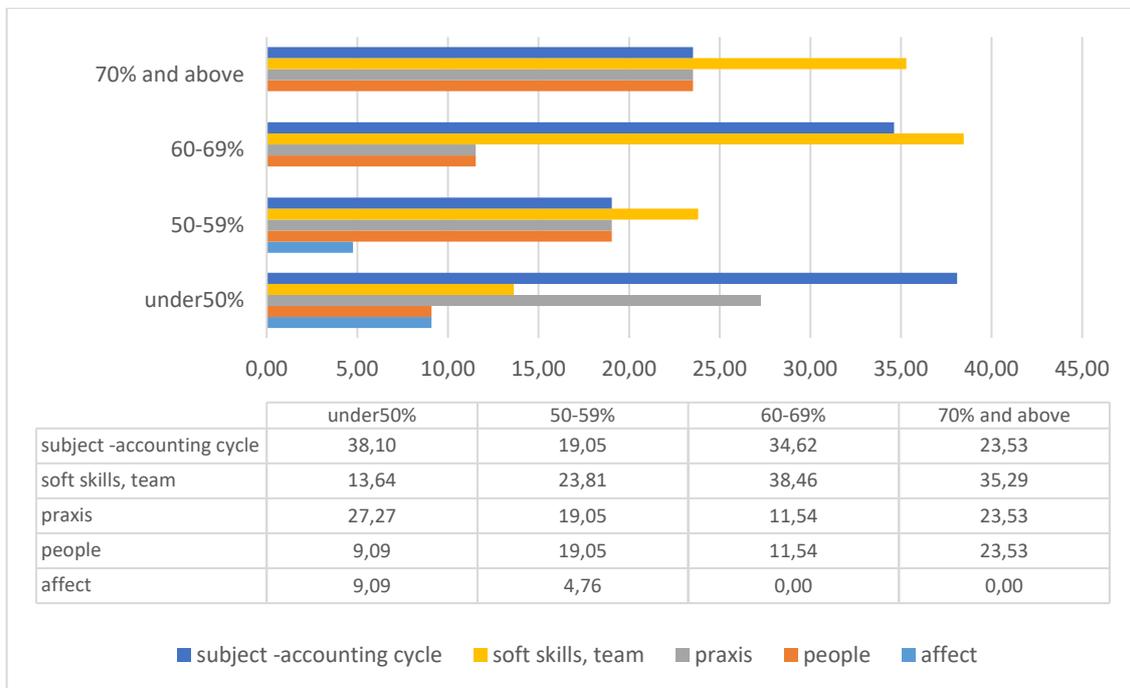


Figure 4. Describing the most beneficial outcome of the board game: Themes from content analysis in performance layers represented as percentages

Figure 4 shows the performance segments on the vertical axis and the % of first-year students nominating benefits of the board game on the horizontal axis. Those codes were grouped into the five themes as shown in Figure 4. There was great variation in how students experienced the benefit of the accounting content or how it related to the real world in the board game. The under 50% students (the largest group) found the content-related aspects most beneficial, and more so than any other group. The importance of application in practice varied greatly between groups, but its salience was either similar to subject content, or lower. The combined soft skills, that encompassed workplace related skills, teamwork, understanding people and affect for the subject, shows an increasing trend as marks increased, with nearly 60% of the top-performing students describing one of those skills as the greatest value gained from the board game.

Comparing the findings from the quantitative and qualitative questions, confirmed the social and subject content constructs in the groups. While the lower performing students found all aspects of the board game valuable in the quantitative items, they singled out understanding content as the most beneficial to them in the qualitative feedback. Conversely, the highest performing students did not find the content related facets (*understanding*) particularly valuable, signifying a better pre-knowledge of the subject. The social and soft-skills aspects of the board game that was unique to the delivery mode, overall contribution to the whole class,

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and this became more pronounced the higher the students' previous marks were, strongly evident in qualitative and also suggested in the quantitative question about learning to know their peer students. Notably, group and team-related activities were seldom rated as the most beneficial aspect of the game.

Audit simulation – findings by knowledge levels

Simulation – responses to scaled questions grouped by five themes, compared by academic performance

After the online audit simulation, students completed the questionnaire containing thirteen questions that directly related to the online simulation. The questions were grouped into five themes and the average rating for each calculated (maximum rating being 5), broken out into the same performance categories used for analysis of the board game data. The *subject* knowledge theme had a high average rating that increased among the lower performing students. Figure 5 shows that most elements of the simulation were perceived more positively by lower-performing students than particularly the highest performing ones, particularly affect (enjoyment of the simulation) and subject understanding, increasing with lower grades. The lower performers were also more positive about *Sim*, a multifaceted theme unique to the online delivery mode (online feedback, clear presentations, appropriate media and learning more than in traditional classes). Contributing to the *Sim* theme, students rated the use of media as highly appropriate. *Praxis* (learning about the audit process, insight into real life audit, putting classroom theory into practice) was overall the most beneficial contribution of the simulation, as was the intended objective of the simulation. *Soft skills* referred to professional skills, discussions with the group, decision making and open discussion, and were well and uniformly represented. The *praxis* and *soft skills* themes represent transfer of learning, that could have been affected by perceived fidelity of the simulation and resulting motivation (Alessi & Trollip, 2001; Huang et al., 2013).

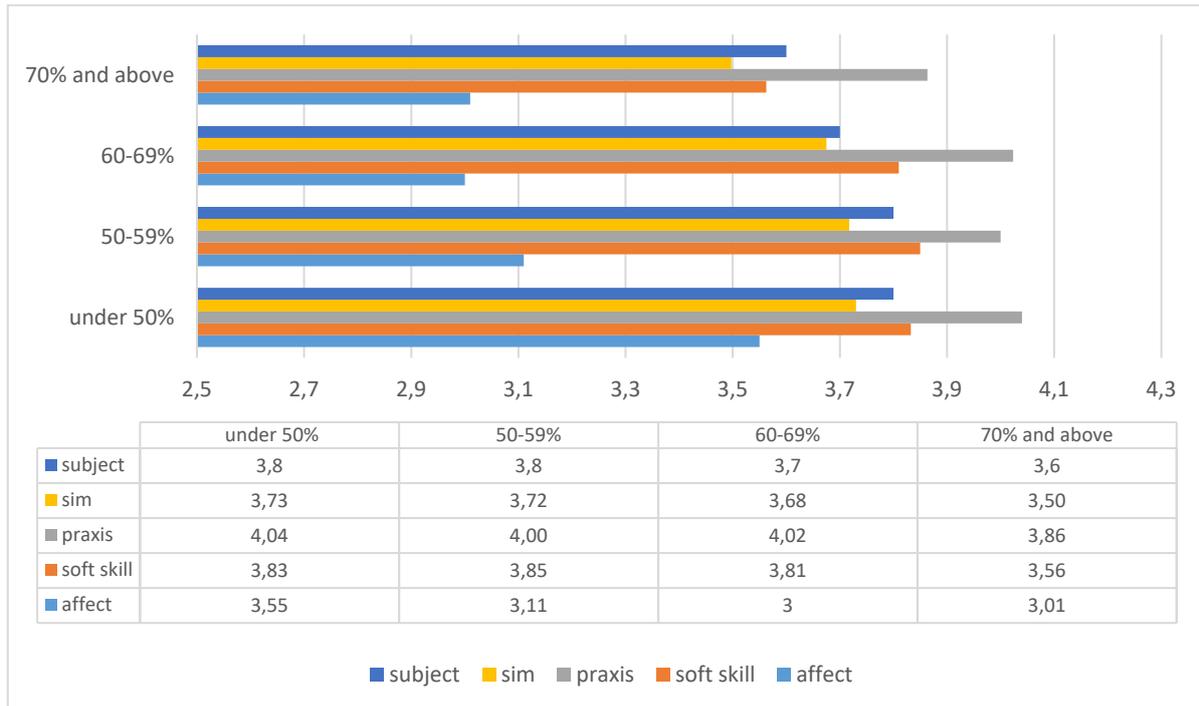


Figure 5. Themes grouped from scaled items on simulation in performance layers

Comparing themes across simulations

The board game in a face-to-face setting was above all successful in allowing students to know each other and developing soft skills and teamwork, particularly among the top-performers. Transfer of knowledge to be used in a real practice was second for all students, with better understanding of the subject important for lower performing students. In the web-based simulation the subject knowledge component was generally only third in importance. The transfer of knowledge to workplace practice was the top affordance of the simulation for all students, falling in line with research by Carenys et al. (2017) finding that online simulations are more effective than games in transferring skills to the professional world. This is not surprising, considering the higher fidelity perceived in the online environment, that could increase motivation to participate and increase learning during the simulation, that could lead to higher transfer of learning (Alessi & Trollip, 2001). The affect increased in lower performance groups in both the board game and the online simulation, and was more prominent in the online simulation (Figure 5) than in the board game (Figure 4). Affect could have had a positive effect on motivation and hence transfer of knowledge, making this an important component of an online simulation, as suggested in Figure 1.

Conclusions

In a holistic picture of two simulations in the same field, some tentative generalisations can be made. For students on the lower performing layer of a class, it seems that both the board game simulation as the online simulation was valuable in understanding the subject better, more so than for students who were performing well. The higher performing students gained valuable acquaintance with peer students in the board game, a unique affordance of the face-to-face

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mode of interaction. The lower performing students enjoyed the online simulation more than the high-performers, and evaluated the web-components more positively than the higher performers. The third year students as a group found the most value in the theory-praxis aspect and learning about the professional process. The praxis in the board game was not perceived as vividly, having a lower fidelity, but was more enjoyable. Transferring learning to the workplace, was achieved equally well for lower performing, *novice* as expert, high performing students, signifying that the simulation's fidelity was pitched at an appropriate level.

Incorporating simulations have benefits for educators. "The majority of students, irrespective of ICT adoption profiles, their gender or population groups agreed that the learning value of an online simulation was more beneficial than traditional teaching methods" (Beukes, Kirstein, Kunz, & Nagel, 2017). Both simulations, one containing game elements, and an online simulation of practice, successfully achieved their respective aims regarding the subject and theory-praxis bridge, while also achieving extra-curricular outcomes emanating from their delivery mode (contact or online), and were suitable for the respective academic stage of the students. Both simulations particularly supported the lower-performing students with understanding subject concepts and motivation.

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