High Educ (2019) 77:455–472
https://doi.org/10.1007/s10734-018-0282-x

Online business simulations: authentic teamwork, learning outcomes, and satisfaction

Gui Lohmann[1] · **Marlene A. Pratt**[2] · **Pierre Benckendorff**[3] · **Paul Strickland**[4] · **Paul Reynolds**[5] · **Paul A Whitelaw**[6]

Published online: 3 June 2018

Abstract Educators have struggled to incorporate authentic team-based learning (TBL) into the business curriculum despite increasing evidence that collaborative learning can enhance learning outcomes. We investigate the use of online business simulations as a platform for fostering authentic TBL for undergraduate and postgraduate business students studying at seven institutions in Australia and Hong Kong. Quantitative analysis of 365 surveys is supported by focus groups with 14 students. Structural equation modeling (SEM) is used to model the relationships between teamwork, learning outcomes, and satisfaction. Qualitative results support the statistical modeling and are presented to add further insights and conceptual richness. The findings support our proposition that online business simulations provide an authentic TBL environment, which contributes to learner satisfaction by supporting the development of management-related learning outcomes through socially constructed meaning. This conceptual contribution highlights further avenues for research and leads to some practical implications for educators using simulation-based pedagogies.

Keywords Online business simulation · Teamwork · Learning outcomes · Experience · Satisfaction

✉ Gui Lohmann
g.lohmann@griffith.edu.au

[1] Griffith Aviation, Griffith University, 170 Kessels Road, Building N25, Room 1.18, Nathan, QLD 4111, Australia

[2] Department of Tourism, Sport, and Hotel Management, Griffith University, Parklands Drive, Southport, QLD 4215, Australia

[3] UQ Business School, The University of Queensland, St. Lucia, QLD 4072, Australia

[4] La Trobe University, Kingsbury Drive, Bundoora, VIC 3086, Australia

[5] University of South Australia, Adelaide 5001 SA, Australia

[6] William Angliss Institute, Melbourne 3000 VIC, Australia

Introduction

The ascendance of neoliberal ideology and the concomitant shifts in education and labor market policies have placed universities under increasing pressure to produce employable graduates (Bridgstock 2009; Giroux 2010). The focus on employability has coincided with a period of rapid growth in both business school enrolments and business degree granting colleges and universities (Pfeffer and Fong 2002). This success has created a number of challenges for business schools. Inevitably, larger class sizes have led to reduced levels of interaction and transmissive teaching and assessment approaches that favor knowledge acquisition over the teaching of employability skills (Arias and Walker 2004). Nearly three decades ago, Leavitt (1989, p. 39) lamented that the design of business programs had created "critters with lopsided brains, icy hearts, and shrunken souls." Mintzberg (1996) argued that the typical business school experience was too far removed from the context of management as a practice-based craft. Very little appears to have changed in the intervening years, with Pfeffer and Fong (2002, p. 85) observing that "students learn to talk about business but it is not clear they learn business."

The ability to identify and work towards goals, communicate ideas, identify problems and solutions, and make complex decisions are critically important employability skills for business graduates. Despite increasing evidence that these skills can be developed and enhanced through collaborative learning, instructors have struggled to effectively embed meaningful collaborative learning opportunities into the business curriculum (Hansen 2006). While team-based learning and assessment tasks are commonly used in business education, students often respond by dividing the task amongst team members who work independently to complete component parts. This tendency for students to compartmentalize team projects limits opportunities for socially constructed meaning and the development of higher order employability skills such as goal setting, strategic planning and decision making. We address this issue by proposing and testing the argument that online business simulations create opportunities for authentic team-based learning (TBL), which in turn enhances learning outcomes and satisfaction.

With this in mind, we test the following two propositions: (1) Online business simulations provide an authentic TBL environment that contributes indirectly to learner satisfaction by supporting the development of management-related learning outcomes, and (2) online business simulations provide an authentic TBL environment that contributes directly to learner satisfaction. In the following section, we explore research on teamwork factors that are relevant to the learning outcomes of online business simulations. In doing so, we consider behaviors that influence teamwork performance such as team dedication and interaction. We then review simulation-based learning as a tool for enhancing learning outcomes. Finally, we review the evidence regarding learning outcomes and learner satisfaction with the use of simulation-based pedagogies. This is followed by a description of the methodology, a presentation and analysis of the results, and a conclusion outlining contributions, limitations, as well as potential avenues for further research. While past studies have confirmed the learning benefits of business simulations, the role played by TBL has been overlooked. The key contribution of our work is to highlight that authentic TBL is an important mechanism for enhancing the learning outcomes of online business simulations across multiple cohorts of students studying in different institutional contexts.

Literature review

This study is broadly situated within a constructivist education paradigm, with a focus on the use of simulations as an instructional strategy grounded in social constructivism. Social constructivists argue that learners construct knowledge through a social process of meaning-making founded on interaction and collaboration (Vygotsky 1978; Piaget 1952; Brown et al. 1989). Collaborative learning techniques have frequently been examined as a means to develop a range of skills and knowledge through socially constructed meaning (e.g., Johnson et al. 1998; Terenzini et al. 2001; So and Brush 2008). Both high and low achievers in collaborative learning teams have been shown to outperform their counterparts in individual learning environments (Ocker and Yaverbaum 2001). Similarly, student learning outcomes were perceived to be higher in collaborative online courses than in courses where students worked individually (Arbaugh and Benbunan-Finch 2006).

The socio-affective and cognitive dimensions of collaborative learning have been examined in a number of studies (e.g., Terenzini et al. 2001; Proenca 2009; Huang et al. 2010; Chaparro-Peláez et al. 2013). Cognitive theories of collaborative learning examine the influence of collaboration and communication on individual learning (Dillenbourg et al. 2009). Social learning theories contend that collaborative learning involves social interaction with a community of learners and teachers and the acquisition and sharing of experiences or knowledge (Zhu 2012). LaPointe and Gunawardena (2004) found that these social interactions had a strong effect on the learning outcomes reported by students.

Collaborative learning methods have been shown to promote both socio-affective and cognitive learning, resulting in higher levels of learner satisfaction (Chaparro-Peláez et al. 2013; Ocker and Yaverbaum 2001). However, as Dillenbourg (1999) observed almost two decades ago, collaborative learning includes such a wide variety of approaches that any effort to agree on a shared understanding of the term would be unproductive. He observes that: "the broadest definition of 'collaborative learning' is that it is a *situation* in which *two or more* people *learn* or attempt to learn something *together*" (p.1). To move our discussion beyond this broad definition, we focus our attention to team-based learning (TBL) as a more specific collaborative learning approach.

Authentic team-based learning

There can be very little doubt that the ability to work in a team is one of the most highly sought-after skills in business. A cursory glance at the skills mentioned most frequently in business-related job advertisements clearly reveals an employer penchant for teamwork and collaboration skills. In Australia, teamwork and collaboration skills feature prominently in statements of graduate attributes for most public universities. The national *Core Skills for Work Framework* explicitly acknowledges the importance of "connecting and working with others." According to the framework, this skill area is about "building the work-related relationships needed to achieve an outcome within a workgroup, or achieve goals through team-based collaborations" (DIISRTE 2013, p.29). The *Australian Qualifications Framework* (AQF) also mandates that learners should be provided with opportunities to develop collaborative skills through participation in teams (Australian Qualifications Framework Council 2013).

Given the aforementioned benefits of collaborative learning and the importance of teamwork skills, it is not surprising to find that many business schools require students to participate in teams to accomplish learning and assessment tasks. The co-creation and co-construction of knowledge require interaction and interdependence between team members (Chaparro-Peláez et al. 2013; Gros and López 2016; Van den Bossche et al. 2006). Interaction, in this context, refers to the relationships established amongst team members and is seen as central to performance and satisfaction. Following Thibaut and Kelley (1959), interdependence means that group members must perceive some value in working together. This can be established through task or role interdependence, shared team goals, and the creation of complementary roles for each team member (Palloff and Pratt 2005). We argue that many common team learning and assessment activities designed by business educators require limited interaction to successfully perform the task. The learning design often does not require task or role interdependence and students therefore perceive little value in working collaboratively to define and achieve common goals, co-create knowledge, and share experiences. As a consequence, students respond by dividing the task amongst team members who work independently to complete component parts. This tendency for students to compartmentalize team projects limits opportunities for the development of higher order business skills.

A number of authors have argued that knowledge should be situated in the activities, context, and culture in which it is developed and applied (Brown et al. 1989). Collins et al. (1991) proposed a "cognitive apprenticeship" learning model that focusses on easily observable, real-world tasks where the skills that are developed are inherent in the task itself. More recently, Herrington and Oliver (2000) have built on this work by developing an instructional design framework for authentic learning environments that includes nine key elements. The authentic learning framework recommends that knowledge should be constructed collaboratively using learning contexts and activities that reflect the way knowledge and skills will be used in real life. This notion of authenticity is similar to discussions about context fidelity and psychological fidelity in other parts of the education literature, notably in simulation-based training (Beaubien and Baker 2004; Reeves and Okey 1996).

We build upon these ideas in this paper by focusing on "authentic team-based learning" or authentic TBL. Based on the literature discussed above, we propose that authentic TBL consists of authentic contexts and activities that require interaction and interdependence between team members to produce skills development and knowledge co-creation. We argue that online business simulations, when combined with appropriate pedagogies and assessment, provide one example of a learning environment that contains all of these elements.

Online business simulations

Simulations have become an increasingly popular teaching and learning tool in higher education. Simulations offer a number of advantages over other experiential learning methods, including greater interaction in teamwork and collaborative learning (Drake et al. 2006) and enhanced learner engagement (Fripp 1997; Feinstein et al. 2002; Edelheim and Ueda 2007). A recent Australian audit has estimated that there are over 50 commercially available online business simulations (Benckendorff et al. 2015).

Some business simulations focus on specific functional areas of business such as accounting, finance, marketing, or business ethics, while others adopt an enterprise-wide approach that emphasizes the relationships between the various functional areas of an organization. The scope of this study is limited to enterprise-wide online business simulations that encourage

learners to step outside their disciplinary focus by engaging in cross-functional decision making and problem-solving (Clarke 2009). These authentic business simulations typically require team members to take responsibility for specific functional areas while interacting with each other to obtain successful outcomes for their organization. More importantly, the cross-functional nature of enterprise-wide simulations increases interdependence between team members.

The use of teams in simulation-based training is well established in medicine and allied health education (Beaubien and Baker 2004; Shapiro et al. 2004). Many simulation-based pedagogies are designed to encourage students to actively engage in collaborative learning modes (Ocker and Yaverbaum 2001; Drake et al. 2006). Despite the fact that many online business simulations require students to collaborate in teams, only a small number of studies have examined the role of teamwork and learning outcomes (Anderson 2005; Chasteen 2016; Drake et al. 2006; Jensen 2003; Martín-Pérez et al. 2013). For example, Coffey and Anderson (2006) found that team dynamics influenced the perceived value students placed on the learning experience. Similarly, Xu and Yang (2010) found that team interaction and psychological safety within a team supported synergistic knowledge development. However, evidence of the true benefits of authentic TBL remains somewhat elusive in the context of business simulations.

Learning outcomes and satisfaction

The literature generally supports the notion that business simulations are effective at developing critical thinking, problem-solving, and cross-functional decision-making skills (Chakravorty and Franza 2005; Clarke 2009). It has been suggested that simulations have a particular pedagogical value when focused on the development of decision-making and interpersonal skills within teams (Lamont 2001; Drake et al. 2006). This is because the interactive and interdependent environment created by many simulations can foster the development of social skills required by teams to solve problems (Dimitropoulos et al. 2008; Huang et al. 2010). An exploratory qualitative study by Devitt et al. (2015) provides further support for the notion that team-based simulations enhanced interpersonal skills such as communication, negotiation, decision-making, leadership, and conflict management. The outcomes of simulation-based learning can also be evaluated by assessing how students perceive their learning experience (Schumann et al. 2001). Koh et al. (2010) tested the extent to which simulation-based learning met students' perceived satisfaction of psychological needs and motivation.

Studies of the learning outcomes of simulations have, however, produced mixed results (Anderson and Lawton 2009; van Staalduinen and de Freitas 2011; Keys and Wolfe 1990). This is primarily because the measurement of learning outcomes is complex. Some researchers have attempted to use objective measures such as student grades and simulation performance while others have measured student perceptions of acquired learning outcomes. Objective measures of student performance, such as grades for exams and assessment tasks related to the simulation have been found to be problematic because they do not account for the skills and knowledge students bring to the learning context prior to commencing the simulation. Given these challenges, many authors have relied on self-reported measures of skills and knowledge acquisition. While these measures are more subjective, they allow for individuals to reflect on their learning through a process of internal benchmarking by comparing skills and knowledge prior to the simulation with skills and knowledge acquired during the simulation. While this

approach is not without criticism (Bowman 2010; Porter 2011), several recent studies have continued to affirm the validity of self-reported learning outcomes, particularly when students are required to reflect over shorter time periods (Anaya 1999; Pike 2011; Douglass et al. 2012). Furthermore, some of the limitations of quantitative self-reported measures can be overcome by adopting a mixed methods design that includes qualitative findings (Creswell 2002).

While many authors have examined learning outcomes and student satisfaction, these concepts are usually treated separately as dependent variables. Few studies have examined the notion that the accomplishment of learning outcomes may mediate the relationship between teaching and learning approaches such as TBL and student satisfaction.

Methodology

The methodological design consisted of a mixed methods approach using a sequential explanatory design (Creswell 2002). The first phase of the data collection consisted of a self-administered questionnaire designed to measure student perceptions of teamwork, learning outcomes, and satisfaction. Following this quantitative phase, focus groups were conducted to further explore students' understanding of teamwork and its impact on student learning.

Quantitative sample and data collection

The quantitative data collection consisted of two stages: (1) a pilot study to refine the questionnaire and (2) primary data collection. Data for the pilot study were collected in early 2014 from 166 students studying at a tertiary institution in Australia. Following this, primary data were collected in 2014 and 2015 from seven tertiary education institutions in Australia and one in Hong Kong. The sampling strategy was designed to increase the diversity of students and simulations to allow for the results to be more generalized. The sample included courses covering topics such as strategy, service operations, corporate social responsibility, human resource management, aviation management, and managerial decision making. Self-administered questionnaires were distributed to undergraduate and postgraduate students either in hard copy provided in class or through an online link. The survey was administered at the end of the teaching period once students had already finished their interaction with the simulation. A total of 400 surveys were completed, with the final sample consisting of 365 valid surveys. A profile of the sample is presented in Table 1.

The majority of respondents were full time students (92.9%) in the final year of their undergraduate studies (63.7%). Sixty-seven percent were female students, and 51.2% were between 22 and 24 years of age. Despite most of the data collection taking place in Australia, the majority of students were from Hong Kong (24.1%) and China (22.2%), followed by Australia (19.7%). More than half of the students (54.5%) came from a non-English speaking background (NESB) and almost half of the students (42.2%) were in part-time/casual employment while studying.

All simulations included in the sample were total enterprise business simulations requiring students to work in teams to set up a business and to achieve various business goals. All of the simulations were run over a number of weeks to allow students to experience several business cycles. In all cases, teams competed against each other in a virtual marketplace. Teams were required to make decisions about operations, strategy, marketing, human resources, finance, and sustainability within each cycle. Students had to work together in teams because the

Table 1 Profile of respondents

Characteristics	No.	Percentage (%)
Gender ($n = 356$)		
Female	238	66.9
Male	118	33.1
Age groups ($n = 346$; mean = 23.9)		
19 to 21 years	76	22.0
22 to 24 years	177	51.2
25 to 30 years	77	22.3
Over 30 years	16	4.6
Nationality ($n = 365$)		
Hong Kong	88	24.1
China	81	22.2
Australia	72	19.7
South Korea	27	7.4
Japan	10	2.7
Malaysia	10	2.7
Vietnam	10	2.7
Other	67	18.4
Student characteristics[a] ($n = 365$)		
Studying part-time	26	7.1
Studying externally	27	7.4
Non-English-speaking background	199	54.5
Working part-time	154	42.2
Working full-time	32	8.8
Year level ($n = 350$)		
First year	50	14.3
Second year	26	7.4
Final year	223	63.7
Postgraduate	51	14.6
Simulation used ($n = 365$)		
HOTS	237	64.9
IDLE	60	16.4
Airline Online	28	7.7
Ramsden	25	6.8
RevSim	15	4.1
Institution ($n = 363$)		
Griffith University	231	63.6
The University of Wollongong	60	16.5
The University of South Australia	25	6.9
The University of Queensland	20	5.5
William Angliss Institute	15	4.1
International College of Management Sydney	11	3.0
La Trobe University	1	0.3

[a] Multiple response items

success of their business was predicated in a high level of task interdependence. Decisions and actions undertaken in one area of the simulated business impacted on other aspects of the business. The courses within which the simulations were undertaken were typically advanced final year or postgraduate courses where the learning outcomes required learners to work in a team to integrate and apply business knowledge and skills. In order to achieve these outcomes, students completed a number of teamwork learning and assessment activities, including developing a business plan or proposal, setting up the online business, analyzing and reporting on business performance, and making decisions about the business and its operations.

Measures

The questionnaire consisted of statements measuring the key constructs of interest within the model including perceptions about teamwork (independent variable), perceptions about acquired learning outcomes (mediator/dependent variable), and student satisfaction (dependent variable). Respondents were asked to indicate their level of agreement with each statement using a seven-point Likert scale (1 = Strongly Disagree … 7 = Strongly Agree). The questionnaire included 17 statements about teamwork adapted from Chaparro-Peláez et al. (2013), Coffey and Anderson (2006), Huang et al. (2010), Hurme (2010), and Ocker and Yaverbaum (2001). Perceived learning outcomes included a mix of 14 statements about business knowledge and skills adapted from Kendall and Harrington (2003), Martin and McEvoy (2003), and Vos and Brennan (2010). Learner satisfaction was measured by evaluating satisfaction with the simulation itself, the use of the simulation as a learning tool and whether the simulation met expectations. Eleven items were adapted from Chaparro-Peláez et al. (2013), Martin and McEvoy (2003), Lo (2010), and Teo and Wong (2013). Respondents in the pilot study indicated that the survey was easy to follow but identified several issues with wording, and some statements were adjusted to ensure face validity. The full set of statements used in the final questionnaire is included in Appendix Table 6 at the end of this paper.

Qualitative sample and data collection

In order to complement the data collected through the survey, focus groups were conducted with students who used one of the simulations. The purpose of the focus groups was twofold. Firstly, we were interested in hearing the team members discussing team dynamics and their satisfaction with the simulation as part of their learning experience. Secondly, it was also an opportunity for the research team to gain further insight into the responses obtained in the survey. Three focus groups, comprising a total of 14 students, were conducted across two institutions in Australia. One of the focus groups consisted of five postgraduate students using *Airline Online*, while the other two groups consisted of two teams with four and five undergraduate students using *HOTS*. Groups were chosen based on their performance, two very successful groups and one that struggled to succeed in terms of profitability of their online business. The focus group sessions lasted for approximately 30 min each. Saturation of opinions was detected following the transcription of the three focus groups, and it was determined that additional focus groups would not provide further insights.

Results

Quantitative results

Before analyzing the data, the dataset was cleaned by removing invalid responses. The analysis included two stages. The first stage was designed to evaluate the measurement model through the use of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The second stage included the development, testing and analysis of the structural model. The proposed model was tested to determine simultaneous relationships between the latent variables and the overall fit of the model to the data. Exploratory factor analysis was conducted using the *Statistical Package for the Social Sciences* (*SPSS* 25.0), while confirmatory factor

analysis was computed using *AMOS* 25.0. Structural equation modeling (SEM) was used to analyze the proposed relationships.

Exploratory factor analysis was conducted on the pilot study data and was conducted on all items within the proposed model. This step was taken since some elements of the measurement model were previously untested. The final solution resulted in three factors: labeled *teamwork*, *learning*, and *satisfaction*. The total variance explained by the three factors was 71%. The maximum likelihood extraction method was used due to the skewness of the data, with Kaiser-Meyer-Olkin measure of sampling adequacy = 0.96. Bartlett's test of sphericity results were $\chi^2 = 9922.8$ $df = 351$, $p < 0.000$.

Teamwork in the context of online business simulations consisted of 12 items, as presented in the Appendix Table 6. These items were a combination of socially shared metacognition, interaction, and interdependence. The perceived *learning outcomes* factor comprised seven items, and the student *satisfaction* factor contained eight items (see Appendix Table 6). To confirm the measurement model, a subsequent confirmatory analysis was conducted on the primary dataset to evaluate and refine the resulting scales (Gerbing and Anderson 1988). Confirmatory factor analysis was conducted to confirm the structure found in the exploratory factor analysis (EFA). The CFA model with all the scale items from the EFA resulted in a good fit to the data ($\chi^2 = 906.5$ ($df = 321$, $p < .00$), $\chi^2/df = 2.8$, CFI = 0.94, RMSEA = 0.07 (0.06, 0.07) and SRMR = 0.04.) The chi-square was significant, but this result was expected due to sample size (Anderson and Gerbing 1988; Hair et al. 2014). The normed chi-square was just above the recommended cutoff of 2.0 but less than 3.0. The CFI was under 0.95, and the RMSEA value was just slightly above the recommended good fit of 0.05. The SRMR was well below the marginal acceptance level of 0.08 (Hair et al. 2014).

Although the fit indicators suggest an adequate fit, a few standardized residuals were greater than 4.0, which is an indication of problems or misfit (Hair et al. 2014). One item used to measure *teamwork* was of concern and was deleted from the model, as it did not represent a unique attribute. Further evaluation identified a similar problem with *learning outcomes*, with two items deleted from the model. The removed statements referred to understanding specific business functions such as planning and marketing. These items may be less reliable across multiple cohorts because student responses are likely to vary based on the features of particular simulations as well as comfort, familiarity, and competence across three significantly different disciplines. The final constructs and items are shown in Table 2. This revised CFA model resulted in a better fitting model ($\chi^2 = 437.4$ ($df = 225$, $p < .000$), $\chi^2/df = 1.9$, CFI = 0.97, RMSEA = 0.05 (0.04, 0.06) and SRMR = 0.03). The chi-square was significant; however, the normed chi-square was below the recommended cutoff of 2.0. Both the CFI and RMSEA values were below the recommended good fit of 0.05. SRMR was well below the marginal acceptance level of 0.08. As teamwork was originally expected to be a multivariate construct, two indicator errors were found to be correlated and were freed due to the theoretical nature of the constructs: "my team was dedicated to the task" an "my team worked well together." In order to cross validate the model, a random set of responses were drawn from the sample and subsequent analysis resulted in a good fitting model ($\chi^2 = 454.9$ ($df = 225$, $p < .000$), $\chi^2/df = 2.0$, CFI = 0.95, RMSEA = 0.07 (0.06, 0.07) and SRMR = 0.04).

The construct reliability of all factors was assessed using Cronbach's alpha. Reliability for all factors was above 0.89, indicating that these measures consistently represent the same latent construct (Hair et al. 2014). For convergent validity, the average variance extracted (AVE) for each latent construct was calculated and found to be greater than 0.5, as shown in Table 2. This confirms convergent validity for the model. As the AVE is sensitive to a lack of convergent

Table 2 Factors and reliability measures

Constructs	Standardized regression weights	Construct reliability	Average variance extracted[b]
Teamwork			
My team interactions helped me to understand other points of view	0.910	0.967	0.726
My team worked well together	0.896		
I was able to learn new skills and knowledge from other members in my team	0.877		
The unique skills and talents of each team member was fully valued and utilized	0.872		
My team actively exchanged ideas using online tools	0.849		
Most of the time, members of my team asked each other for feedback on their work	0.845		
My team was dedicated to the task	0.838		
Key decisions about our company were made by the entire team	0.832		
Team members acknowledged the points of view of others	0.823		
Working as a team allowed me to work smarter, not harder	0.814		
The contributions of other team members assisted my understanding of the simulation	0.813		
Learning outcomes			
Understanding of operations	0.877	0.898	0.638
Understanding of strategic management	0.820		
Problem-solving skills	0.788		
Understanding of staffing	0.766		
Understanding of finance	0.736		
Satisfaction			
Overall, I am satisfied with the simulation as a learning tool	0.904	0.956	0.755
Overall, I learned a lot from the simulation	0.897		
Overall, the simulation has met my expectations	0.887		
I am satisfied with the online software application used for the simulation	0.867		
The skills and knowledge learnt during the simulation will be useful for my future career	0.849		
I enjoyed learning with the simulation	0.840		
The simulation made the course more interesting	0.835		

[a] Construct validity was computed for each factor using Cronbach's alpha (Hair et al. 2014)

[b] The average variance extracted was computed as an indicator of convergent validity (Hair et al. 2014)

validity, it can be used to assess discriminant validity. For discriminant validity to be confirmed, the AVE must exceed the squared correlation between the two factors, as shown in Table 3.

The final step in the analysis process involved investigation of the relationships amongst the latent variables through the structural model using maximum likelihood estimation. The

Table 3 Means, standard deviations, and construct correlations

Variables	*M*	SD	TW	LO	SAT
Teamwork (TW)	5.649	1.103	1.000		
Learning outcomes (LO)	5.412	0.981	0.404	1.000	
Satisfaction (SAT)	5.371	1.198	0.504	0.798	1.000

structural model contains one exogenous latent variable of *teamwork* and two endogenous latent variables of student *learning outcomes* and student *satisfaction*. See Appendix Table 6 for final constructs and items.

The overall fit of the structural model to the data was good ($\chi^2 = 437.4$ ($df = 225$, $p < .000$), $\chi^2/df = 1.94$, CFI = 0.97, RMSEA = 0.05 (0.04, 0.05), and SRMR = 0.03). There was a significant relationship between *teamwork* and perceived *learning outcomes* ($b = 0.403$, $p < .05$). There was also a strong relationship between perceived *learning outcomes* and *student satisfaction* ($b = 0.708$, $p < .05$), thus supporting the direct effect of the mediator on the outcome variable. *Teamwork* had a significant direct influence on student *satisfaction* ($b = 0.218$, $p < .05$). However, perceived *learning outcomes* mediated student *satisfaction*, as shown in Table 4. An alternative model was tested to determine if there was only an indirect effect from teamwork to student satisfaction. The results were significantly worse ($\chi^2 = 467.57$ ($df = 226$, $p < .000$), $\chi^2/df = 2.07$, CFI = 0.97, RMSEA = 0.05 (0.04, 0.06), and SRMR = 0.07), so the direct path was retained in the model. The full results of the model are shown in Fig. 1.

Qualitative results

The qualitative results from the student focus groups add further insight to the structural model. The focus groups were recorded and comments were transcribed and subjected to a thematic analysis. Key themes and concepts were coded manually by reading the transcripts and creating a list of recurring concepts (Braun and Clarke 2006). These concepts were then combined into themes. This process was undertaken independently by three researchers who then compared and combined their coding schemes and findings. This process was used to reduce the inherent subjectivity associated with coding qualitative data. Key themes included (1) the importance of communication, (2) interdependence of team roles, (3) limited opportunities to learn from other teams, (4) the skills developed through team interactions that were perceived to be authentic, and (5) the impact of teamwork on student satisfaction. These themes and the respective notes and direct quotes provided during the focus groups are presented at Table 5.

Overwhelmingly, students found that the teamwork enhanced their learning and problem-solving. In addition, the simulation provided an authentic learning experience. One negative aspect identified by all participants was the amount of time they spent on the simulation, constantly checking their performance and improving their decisions as required since business cycles occurred on a weekly or bi-weekly schedule. Hence, time management skills were identified as paramount to successfully juggling the extra load required by the simulation with other teaching, work, or personal commitments.

Overall, students appreciated the opportunity offered to learn from the simulation, with some statements to support this claim including “apply the knowledge in a more

Table 4 Structural model: direct and indirect effects of teamwork on learning outcomes and satisfaction

Constructs	Direct effects	Indirect effects	Total effects	Hypothesis
Teamwork → learning outcomes	0.403*		0.403*	Supported
Teamwork → satisfaction	0.218*	0.286*	0.504*	Supported
Learning outcomes → satisfaction	0.708*		0.708*	Supported

$N = 365$. Standardized effects provided

*$p < 0.05$

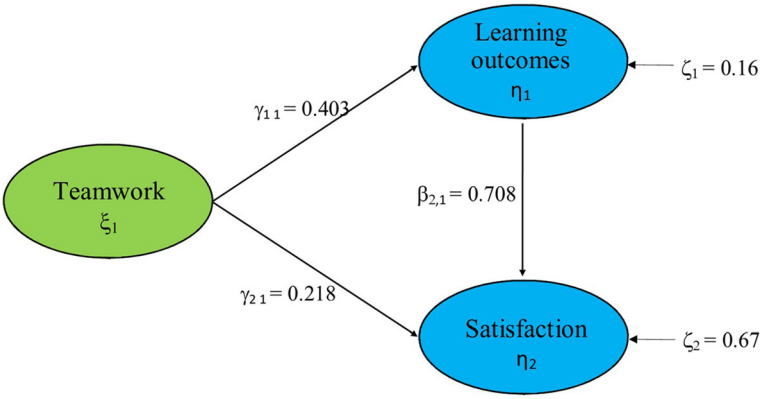

Fig. 1 Teamwork, learning outcomes, and satisfaction results

practical way", having the opportunity to make mistakes that "probably people won't forgive" in the real world, viewing the simulation as "something special that you will always remember," and acknowledging that "hands-on experience is important."

Discussion and conclusion

Our findings indicate that authentic TBL can encourage students to cooperate, exchange ideas, and share experiences to develop knowledge and skills. We have also identified that online business simulations provide an authentic learning context for students to develop and apply management knowledge and problem-solving skills. Both the quantitative and qualitative analyses indicate that online business simulations create opportunities for authentic TBL that enhance self-reported learning outcomes. Furthermore, our quantitative modeling has demonstrated that these synergies enhance student enjoyment and satisfaction with the learning experience.

The data collected from the survey and focus groups identify the important role of authentic TBL in enhancing the learning outcomes and satisfaction reported by students after using a business simulation. The dynamic and cross-functional nature of the simulations included in this study created interdependencies and encouraged frequent and meaningful interactions between team members. The need to engage with other team members and to understand their points of view was critical to maintaining a competitive business and developing vital teamwork skills. Rather than synthesizing parts of an assignment as most team-based activities require, individuals adopted specific functional roles resulting in divergent opinions about how to advance the virtual organization. This context allowed for disagreements to flourish and forced individuals to consider and learn from the perspectives of other team members, thereby creating an interdependent learning community grounded in practice.

The authentic nature of the simulation, mirroring a number of managerial and operational decisions made in real world organizations, also provided opportunities to acquire or improve problem-solving skills and understand operations and strategic management. Students indicated that the simulation provided the opportunity to understand "real-world" problems faced by organizations. Students also stated their satisfaction with the

Table 5 Key themes and indicative quotes from the focus groups

Key themes	Notes from focus groups or students' quotes
Importance of communication	Communication between the team members was mentioned as a very important skill for the overall performance of the team: *I don't think I've ever communicated so much with my team members in a group before. Ten o'clock at night I'd be messaging [another student]. It was just constant.* The ability to listen to other points of view and resolve conflict was a key learning outcome: *The marketing manager would always argue with the finance manager. Since the finance manager would always say 'keep your eyes on your budget or your forecasting allowance for a year you're spending'. But the marketing manager would say 'how am I supposed to increase my productivity or advertising efficiency if I can't spend any money'? So … they actually have to compromise and find other alternatives.*
Interdependence of team roles	The interdependence of organizational roles and competitive nature of the simulation required then to work more closely with their team members: *This is one of those team assignments where if you did have one member that wasn't as involved as the rest it would really let down the whole team. […] This is one of those assignments where everybody really does have to contribute equally.*
Limited opportunities to learn from other teams	It was difficult to learn from peers outside their team as they perceived that any help would hinder their final performance in the simulation: *We didn't have any communication with other teams because our class was extremely competitive. It seemed like nobody wanted to share their secrets with anybody else […] So, we would have loved to have been able to talk to other groups to see what they were doing.*
Skills developed through authentic team interactions	The simulation provided authentic opportunities to solve problems collaboratively, manage conflict, and make decisions: *I learned that every single decision being made by every team member could potentially affect my role… You can't really separate everything… accountability is really spread across the team.* *The results of the weekly batches allowed students to develop problem-solving skills that really help us to make decisions or come up with solutions in a short time.*
Impact on student satisfaction	Unlike other forms of group work, the simulation provided a sense of meaningful teamwork. *I'm the first person to say I absolutely hate teamwork…I hate teamwork with a passion. It's probably because I've never had a good team but this time I've had a good team.* *Yeah, overall, I do think the simulation was beneficial to my learning and it helps working in a team, it was great.*

use of simulations as a learning tool and the enjoyment of learning with the use of simulation.

These findings make several conceptual and practical contributions. Conceptually, this paper provides evidence that TBL plays an important role in enhancing the learning outcomes reported by students after using an online business simulation. This finding conforms with the social constructivist perspective of learning, which argues that knowledge and skills acquisition is enhanced by interactions with peers. The practical implication of this finding is that educators need to consider how opportunities for socially constructed meaning can be supported and embedded into the curriculum. Non-traditional pedagogies that incorporate authentic TBL can support collaboration and provide learners with opportunities to experience multiple perspectives. Innovations such

as flipped classrooms provide opportunities for teams to interact during class time, allowing the instructor to become a facilitator of learning. Team interaction can also be encouraged outside the classroom by guiding students to use readily available online collaborative tools such as wikis, Facebook pages, and Skype. The qualitative analysis highlights that learning activities should not only support and encourage interaction within teams but also foster an understanding of the dynamics of competition between teams.

This study presented both quantitative and qualitative results based on self-reported measures of learning outcomes. A cross-sectional mixed methods design was adopted to add further insight as recommended by Creswell (2002). However, this approaches also a number of limitations that highlight opportunities for future research. First, while the qualitative results confirmed the quantitative analysis, future studies may benefit from including objective measures of learning gains alongside self-reported measures. Second, the study was based on a large sample of students consisting of several cohorts using different business simulations. Our key argument is that authentic TBL is an important mechanism for enhancing the learning outcomes of online business simulations across multiple cohorts of students studying in different institutional contexts. The cross-sectional methodological approach was therefore not designed to analyze or control for differences between cohorts, but rather to identify consistent patterns and relationships that can be generalized across all cohorts. The model that emerged from our analysis was robust and stable and further reinforced by the qualitative data. Nevertheless, we acknowledge that differences in student characteristics, teaching approaches, and pedagogical may influence learning outcomes. It would therefore be useful to conduct further research on the influence of teamwork on simulation learning outcomes in other cultural settings and learning contexts, as identified by Stepanyan et al. (2014). The understanding, expectations, interactions, and outcomes of TBL are likely to be influenced by the cultural and anthropological backgrounds of learners. A comparison of differences between collectivist and individualistic cultures or Confucian and Western learners would be instructive. In addition, it would be interesting to measure how simulations could enhance learning outcomes by tracking and analyzing the progress of one cohort of students using simulations across several years of study. Likewise, it would be useful to compare the use of authentic TBL in simulations with situations where students were required to use simulations on their own.

This study focused on the student perspective. Including graduates and alumni in future studies would provide additional insight into whether participation in online business simulations resulted in improved employment or promotion outcomes. It would also be beneficial to explore instructors' views about the value of teamwork in facilitating the acquisition and development of learning outcomes when using online business simulations. This line of inquiry might focus on the pedagogies, assessment, and support mechanisms instructors used to encourage meaningful team interactions that optimize learning outcomes.

Acknowledgements Support for this project has been provided by the Australian Government Office for Learning and Teaching (OLT). The views in this project/activity do not necessarily reflect the views of the OLT. The project team would like to acknowledge the assistance of Dr. Char-Lee McLennan, Dr. Jakob Trischler, Wendy London, and Lainie Groundwater and the contributions of the reference panel consisting of A/Prof Mark Freeman, Prof Janne Liburd, Prof Ulrike Gretzel, Dr. Trish Andrews, and Dr. Sandra Barker. Any errors are the authors' responsibilities.

Appendix

Table 6 Key quantitative measures

Construct	Item name	Statement	Retained items
Teamwork	Teamwork1	It was easy for the team to agree on important decisions	
	Teamwork2	Key decisions about our company were made by the entire team	E, C
	Teamwork3	I was comfortable sharing my ideas with my team	
	Teamwork4	Most of the time, members of my team asked each other for feedback on their work	E, C
	Teamwork5	Team members acknowledged the points of view of others	E, C
	Teamwork6	There was a team leader who guided the simulation	
	Teamwork7	The contributions of other team members assisted my understanding of the simulation	E, C
	Teamwork8	My team had regular meetings to evaluate our performance	E
	Teamwork9	My team performed well in the simulation	
	Teamwork10	My team was dedicated to the task	E, C
	Teamwork11	My team worked well together	E, C
	Teamwork12	My team actively exchanged ideas using online tools	E, C
	Teamwork13	The unique skills and talents of each team member was fully valued and utilized	E, C
	Teamwork14	My team interactions helped me to understand other points of view	E, C
	Teamwork15	Working as a team allowed me to work smarter, not harder	E, C
	Teamwork16	I was able to learn new skills and knowledge from other members in my team	E, C
	Teamwork17	Competition between teams motivated me to spend more time on the simulation	
Learning	Outcomes1	Problem-solving skills	E, C
	Outcomes2	Planning skills	E
	Outcomes3	Understanding of finance	E, C
	Outcomes4	Understanding of marketing	E
	Outcomes5	Understanding of staffing	E, C
	Outcomes6	Understanding of operations	E, C
	Outcomes7	Understanding of strategic management	E, C
	Outcomes8	Understanding of how the different departments of an organization interact with each other	
	Outcomes9	Understanding of 'real world' problems faced by organizations	
	Outcomes10	Knowledge of key business terms, concepts and conventions	
	Outcomes11	Ability to apply my knowledge to a business	
	Outcomes12	Ability to analyze data	
	Outcomes13	Ability to evaluate problems and make decisions	
	Outcomes14	Ability to create new ideas or plans	
Satisfaction	Enjoy1	The simulation was challenging	
	Enjoy2	I enjoyed learning with the simulation	E, C
	Enjoy3	The simulation made the course more interesting	E, C
	Enjoy4	The simulation allowed me to build on knowledge gained from previous courses	
	Enjoy5	The simulation allowed me to learn from my mistakes through trial and error	
	Enjoy6	I feel I am more 'work ready' after using the simulation	E
	Enjoy7	The skills and knowledge learnt during the simulation will be useful for my future career	E, C
	Enjoy8	I am satisfied with the online software application used for the simulation	E, C
	Enjoy9	Overall, I learned a lot from the simulation	E, C
	Enjoy10	Overall, I am satisfied with the simulation as a learning tool	E, C
	Enjoy11	Overall, the simulation has met my expectations	E, C

E retained after exploratory factor analysis, *C* retained after confirmatory factor analysis

References

Anaya, G. (1999). College impact on student learning: comparing the use of self-reported gains, standardized test scores, and college grades. *Research in Higher Education, 40*(5), 499–526.

Anderson, J. R. (2005). The relationship between student perceptions of team dynamics and simulation game outcomes: an individual-level analysis. *Journal of Education for Business, 81*(2), 85–90.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411–423.

Anderson, P. H., & Lawton, L. (2009). Business simulations and cognitive learning: developments, desires, and future directions. *Simulation & Gaming, 40*(2), 193–216.

Arbaugh, J. B., & Benbunan-Finch, R. (2006). An investigation of epistemological and social dimensions of teaching in online learning environments. *Academy of Management Learning & Education, 5*(4), 435–447.

Arias, J. J., & Walker, D. M. (2004). Additional evidence on the relationship between class size and student performance. *The Journal of Economic Education, 35*(4), 311–329.

Australian Qualifications Framework Council (2013) *Australian Qualifications Framework* (Second Edition). Adelaide: Australian Qualifications Framework Council.

Beaubien, J. M., & Baker, D. P. (2004). The use of simulation for training teamwork skills in health care: how low can you go? *Quality and Safety in Health Care, 13*(suppl 1), i51–i56.

Benckendorff, P., Lohmann, G., Pratt, M., Reynolds, P., Strickland, P., & Whitelaw, P. (2015). *Enhancing student learning outcomes with simulation-based pedagogies: final report 2015*. Sydney: Australian Government Office for Learning and Teaching.

Bowman, N. A. (2010). Can 1st-year college students accurately report their learning and development? *American Educational Research Journal, 47*(2), 466–496.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Bridgstock, R. (2009). The graduate attributes we've overlooked: enhancing graduate employability through career management skills. *Higher Education Research & Development, 28*(1), 31–44.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32–42.

Chakravorty, S. S., & Franza, R. M. (2005). Enhancing cross-functional decision making: a simulation approach. *Decision Sciences Journal of Innovative Education, 3*(2), 331–337.

Chaparro-Peláez, J., Iglesias-Pradas, S., Pascual-Miguel, F. J., & Hernández-García, Á. (2013). Factors affecting perceived learning of engineering students in problem based learning supported by business simulation. *Interactive Learning Environments, 21*(3), 244–262.

Chasteen, L. (2016). Simulations for strategy courses: measuring teamwork. *Developments in Business Simulation and Experiential Learning, 43*(1), 141–146.

Clarke, E. (2009). Learning outcomes from business simulation exercises: challenges for the implementation of learning technologies. *Education & Training, 51*(5/6), 448–459.

Coffey, B. S., & Anderson, S. E. (2006). The students' view of a business simulation: perceived value of the learning experience. *Journal of Strategic Management Education, 3*, 151–168.

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: making thinking visible. *American Educator, 15*(3), 6–11.

Creswell, J. W. (2002). *Research design: qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Devitt, A., Brady, M., Lamest, M., Dalton, G., Newman, N., & Gomez, S. (2015). Serious games in marketing education: developing higher order cognitive skills through collaboration in a simulation game. *INTED2015 Proceedings*, 6340–6349.

DIISRTE. (2013). *Core skills for Work Developmental Framework*. Canberra: Commonwealth of Australia.

Dillenbourg, P. (1999). Introduction: what do you mean by "collaborative learning"? In P. Dillenbourg (Ed.), *Collaborative learning: cognitive and computational approaches* (pp. 1–19). Oxford: Elsevier.

Dillenbourg, P., Järvelä, S., & Fischer, F. (2009). The evolution of research on computer-supported collaborative learning. In N. Balacheff, S. Ludvigsen, T. Jong, A. Lazonder, & S. Barnes (Eds.), *Technology-enhanced learning* (pp. 3–19). New York: Springer.

Dimitropoulos, K., Manitsaris, A., & Mavridis, I. (2008). Building virtual reality environments for distance education on the web: a case study in medical education. *International Journal of Social Sciences, 2*(1), 62–70.

Douglass, J. A., Thomson, G., & Zhao, C. M. (2012). The learning outcomes race: the value of self-reported gains in large research universities. *Higher Education, 64*(3), 317–335.

Drake, R., Goldsmith, G., & Strachan, R. (2006). A novel approach to teaching teamwork. *Teaching in Higher Education, 11*(1), 33–46.

Edelheim, J., & Ueda, D. (2007). Effective use of simulations in hospitality management education—a case study. *Journal of Hospitality, Leisure, Sport and Tourism Education, 6*(1), 18–28.
Feinstein, A. H., Mann, S., & Corsun, D. L. (2002). Charting the experiential territory: clarifying definitions and uses of computer simulation, games, and role play. *Journal of Management Development, 21*(10), 732–744.
Fripp, J. (1997). A future for business simulations? *Journal of European Industrial Training, 21*(4), 138–142.
Gerbing, D. W., & Anderson, J. C. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research, 25*, 186–192.
Giroux, H. A. (2010). Bare pedagogy and the scourge of neoliberalism: rethinking higher education as a democratic public sphere. *The Educational Forum, 74*(3), 184–196.
Gros, B., & López, M. (2016). Students as co-creators of technology-rich learning activities in higher education. *International Journal of Educational Technology in Higher Education, 13*(1), 28.
Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). London: Pearson.
Hansen, R. S. (2006). Benefits and problems with student teams: suggestions for improving team projects. *Journal of Education for Business, 82*(1), 11–19.
Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development, 48*(3), 23–48.
Huang, H.-M., Rauch, U., & Liaw, S.-S. (2010). Investigating learners' attitudes toward virtual reality learning environments: based on a constructivist approach. *Computers & Education, 55*(3), 1171–1182.
Hurme, T.-R. (2010). *Metacognition in group problem solving—a quest for socially shared metacognition*. Doctoral dissertation, Oulu: University of Oulu.
Jensen, K. O. (2003). Business games as strategic team-learning environments in telecommunications. *BT Technology Journal, 21*(2), 133–144.
Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). Cooperative learning returns to college what evidence is there that it works? *Change: The Magazine of Higher Learning, 30*(4), 26–35.
Kendall, K. W., & Harrington, R. J. (2003). Strategic management education incorporating written or simulation cases: an empirical test. *Journal of Hospitality & Tourism Research, 27*(2), 143–165.
Keys, B., & Wolfe, J. (1990). The role of management games and simulations in education and research. *Journal of Management, 16*(2), 307–336.
Koh, C., Tan, H. S., Tan, K. C., Fang, L., Fong, F. M., Kan, D., Lye, S. L., & Wee, M. L. (2010). Investigating the effect of 3D simulation based learning on the motivation and performance of engineering students. *Journal of Engineering Education, 99*(3), 237–251.
Lamont, L. M. (2001). Enhancing student and team learning with interactive marketing simulations. *Marketing Education Review, 11*(1), 45–55.
LaPointe, D. K., & Gunawardena, C. N. (2004). Developing, testing and refining of a model to understand the relationship between peer interaction and learning outcomes in computer-mediated conferencing. *Distance Education, 25*(1), 83–106.
Leavitt, H. J. (1989). Educating our MBAs: on teaching what we haven't taught. *California Management Review, 31*(3), 38–50.
Lo, C. C. (2010). Student learning and student satisfaction in an interactive classroom. *The Journal of General Education, 59*(4), 238–263.
Martin, D., & McEvoy, B. (2003). Business simulations: a balanced approach to tourism education. *International Journal of Contemporary Hospitality Management, 15*(6), 336–339.
Martín-Pérez, V., Martín-Cruz, N., & Pérez-Santana, M. P. (2013). Learning teamwork knowledge, skills and abilities: business simulation vs. case studies. *International Journal of Management in Education, 7*(4), 376–392.
Mintzberg, H. (1996). Ten ideas designed to rile everyone who cares about management. *Harvard Business Review, 74*(4), 61–67.
Ocker, R. J., & Yaverbaum, G. J. (2001). Collaborative learning environments: Exploring student attitudes and satisfaction in face-to-face and asynchronous computer conferencing settings. *Journal of Interactive Learning Research, 12*(4), 427–448.
Palloff, R. M., & Pratt, K. (2005). *Collaborating online: learning together in community*. San Francisco: Josey-Bass.
Pfeffer, J., & Fong, C. T. (2002). The end of business schools? Less success than meets the eye. *Academy of Management Learning & Education, 1*(1), 78–95.
Piaget, J. (1952). *The origins of intelligence in children*. New York: International Universities Press.
Pike, G. R. (2011). Using college students' self-reported learning outcomes in scholarly research. *New Directions for Institutional Research*, (150), 41–58.
Porter, S. R. (2011). Do college student surveys have any validity? *The Review of Higher Education, 35*(1), 45–76.

Proenca, T. (2009). Self-managed work teams: a lean or an autonomous teamwork model? *International Journal of Human Resources Development and Management, 9*(1), 59–80.

Reeves, T. C., & Okey, J. R. (1996). Alternative assessment for constructivist learning environments. In B. G. Wilson (Ed.), *Constructivist learning environments: case studies in instructional design* (pp. 191–202). Englewood Cliffs, NJ: Educational Technology Publications.

Schumann, P. L., Anderson, P. H., Scott, T. W., & Lawton, L. (2001). A framework for evaluating simulations as educational tools. *Developments in Business Simulation and Experiential Learning, 28*, 215–220.

Shapiro, M. J., Morey, J. C., Small, S. D., Langford, V., Kaylor, C. J., Jagminas, L., Suner, S., Salisbury, M. L., Simon, R., & Jay, G. D. (2004). Simulation based teamwork training for emergency department staff: does it improve clinical team performance when added to an existing didactic teamwork curriculum? *Quality and Safety in Health Care, 13*(6), 417–421.

So, H.-J., & Brush, T. A. (2008). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: relationships and critical factors. *Computers & Education, 51*(1), 318–336.

Stepanyan, K., Mather, R., & Dalrymple, R. (2014). Culture, role and group work: a social network analysis perspective on an online collaborative course. *British Journal of Educational Technology, 45*(4), 676–693.

Teo, T., & Wong, S. L. (2013). Modeling key drivers of e-learning satisfaction among student teachers. *Journal of Educational Computing Research, 48*(1), 71–95.

Terenzini, P. T., Cabrera, A. F., Colbeck, C. L., Parente, J. M., & Bjorklund, S. A. (2001). Collaborative learning vs. lecture/discussion: students' reported learning gains. *Journal of Engineering Education, 90*(1), 123–130.

Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. New York: John Wiley & Sons, Inc..

Van den Bossche, P., Gijselaers, W. H., Segers, M., & Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments: team learning beliefs and behaviors. *Small Group Research, 37*(5), 490–521.

van Staalduinen, J. P., & de Freitas, S. (2011). A game-based learning framework: linking game design and learning. In M. S. Khyne (Ed.), *Learning to play: exploring the future of education with video games* (pp. 1–37). New York: Peter Lang.

Vos, L., & Brennan, R. (2010). Marketing simulation games: student and lecturer perspectives. *Marketing Intelligence & Planning, 28*(7), 882–897.

Vygotsky, L. S. (1978). In A. R. Luria, M. M. Lopez-Morillas, M. Cole, & J. Wertsch (Eds.), *Mind in Society: the development of higher psychological processes*. Translated by. Cambridge, MA: Harvard University Press.

Xu, Y., & Yang, Y. (2010). Student learning in business simulation: an empirical investigation. *Journal of Education for Business, 85*(4), 223–228.

Zhu, C. (2012). Student satisfaction, performance, and knowledge construction in online collaborative learning. *Journal of Educational Technology & Society, 15*(1), 127–136.