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Strategy Theory Matters: The Effect of Strategy Coursework Before or During Simulation Play on Student Team Performance

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Many instructors include simulations in their strategy courses. This study examines the timing of strategy theory coursework in comparison to simulation play, an unexplored research area. Is student team performance better in the simulation when strategy theory coursework is fully completed before starting simulation play (TB4), or is it better to teach strategy theory while student teams play the simulation (TWP)? Results show that student team performance is significantly better when strategy theory is fully completed before simulation play. Post-hoc analysis suggests that the TWP teams spend longer in the startup phase of the simulation, are significantly behind TB4 student teams by the simulation midpoint, and never catch up in terms of team performance.TB4 teams appear to have an enhanced simulation experience, moving through startup, transition, and performance growth phases. Instructors who need to choose a timing option should consider completing strategy theory coursework before introducing simulation play.

There are many reasons why business computer games, like simulations, have become more commonly used in higher education. Simulations typically incorporate a variety of challenging problems that can provide a realistic decision-making environment where students need to learn the rules of the game, analyze situations, and make decisions. Unlike other forms of experiential learning, simulations give quick feedback on decision making and frequently allow for repetitive cycles of analysis, decision making, and feedback (Cadotte & Macquire, 2013). Research has demonstrated the positive effects of business strategy simulations on: problem-solving skills (Faisal et al., 2022), student ability to apply concepts (Hernández - Lara & Serradell-Lopez, 2018), critical thinking skills (Faisal et al., 2022), student ability to handle uncertainty (Hernández-Lara & Serradell-Lopez, 2018), decision-making skills (Faisal et al., 2022), student confidence and self-efficacy (Cadotte & Macquire, 2013; Deitz et al., 2022; Faisal et al., 2022), and student engagement and enthusiasm (Cadotte & Macquire, 2013; Faisal et al., 2022). Simulation skill building is particularly salient for undergraduates as they often lack experience with problem identification, solution search, decision making, and responding to results in a workplace setting. Simulations can thus help students prepare for the type of decision making they may need in future careers (Deitz et al., 2022).

Strategy simulations are used as problem-based learning tools in many business functional areas and business capstone classes. Strategy simulations are available in entrepreneurship (e.g., Marketplace Simulations Venture Strategy), finance (e.g., Hubro Finance Simulation, The Cool Connection), human resource management (e.g., Interpretive Solutions HRManagement), international business (e.g., CapsimGlobal), management (e.g., Maketplace Simulations Strategy and Business Policy, Capsim Capstone, The Business Strategy Game), marketing (e.g., Marketplace Simulations Strategic Marketing, Stratx Markstrat, Interpretive Simulations Stratsimmarketing), and supply chain management (e.g., The Fresh Connection, Littlefield Technologies). Examinations of effective strategy simulation pedagogical use are limited but also span the business functional domain (see Chulkov & Wang, 2020; Fox et al., 2018; Hendy, 2021; Laverie, 2020; Lujo, 2016; Yin, 2020). While there are many business simulation options for instructors to use, Ke (2011) observes that additional research is needed in how educational games can be utilized within the larger context of education.

Business strategy games are inherently complex. Business strategy simulations are designed to have face validity to encourage students to see simulations as similar to decision making that would occur in a top management team in a real business (Teach & Murff, 2009). Thus, business online simulations often have students making decisions that involve applying skills from all the functional business areas (e.g., accounting, finance, human resource management, operations management, management information systems, logistics, marketing). In addition, business strategy simulations require that students learn the context and rules of the simulation while simultaneously trying to choose strategies and apply tactics from all these fields to implement those strategies successfully. These kinds of decisions are at the top of Bloom's taxonomy (Teach & Murff, 2009) and thus may be a stretch for some students. Bitrián et al. (2020) found

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that while approximately 50% of business students did not perceive business simulations as highly challenging at the beginning of the simulation over 75% thought the simulation was highly challenging at the end. Rogmans & Abraza's (2019) research showed that students preferred case studies to business simulations because of business simulation complexity. Without appropriate strategy theory support, the complexity of a business strategy game, especially for novice learners, can quickly tax working memory, lead to cognitive overload, and reduce overall learning. Complex problem-based learning, like strategy simulation games, require significant, appropriate direct instructional guidance for students to apply strategy theory in the simulation successfully (Hmelo-Silver et al., 2007; Kirshner et al., 2006). In addition, while strategy simulations can provide a wealth of experiential learning, they often lack depth and breadth in theory (Mitchell, 2004; Parnell & Crandell 2021). Traditional teaching methods and simulations are often viewed as complementary (Scholtz & Hughes, 2018). In their review of business simulation games, Faisal et al. (2022) advocate for blending business simulation games into an existing course along with traditional teaching methods (e.g., lectures, readings, cases) as simulations alone are not sufficient for strategy student learning.

One area that appears to be unexplored is the timing of direct instruction strategy theory in relation to simulation performance. While many business courses employ simulations, most of the research on problem solving and simulation studies has been conducted in medical education (Chernikova et al., 2020), and of those, two studies in particular, looked at whether medical student learning is enhanced when lectures occur before or after the simulation (Hong & Kang, 2018; Zendejas et al. 2010). These studies had equivocal results. Faisal et al. (2022) state that teaching theory first is the scenario most frequently chosen by business educators, but to our knowledge there is no research exploring this topic with regard to business simulations.

Typically, strategy simulations encourage instructors to spread their theory coursework over the length of the simulation play. Learning strategy theory while playing the simulation (TWP) follows a scaffolding approach advocated by problem-based learning research (Hmelo-Silver et al., 2007). Another approach is to have students complete theory coursework before starting simulation play (TB4) (Chernikova et al., 2020). This approach is supported by cognitive load research which suggests that complex problem-based learning requires significant prior knowledge and schema development. Without this prior knowledge and guidance, students may exhaust working memory with the complexity of the new knowledge generated by the simulation experience. This paper fills in the gap in management education studies by examining the effects of the two different strategy theory learning approaches on student simulation performance.

Literature Review

Simulations are a form of an educational computer game used in a wide variety of fields (e.g. science, technology, education, teacher education, management) as an expertise development tool (Chernikova et al., 2020). Simulations have been found to be particularly adept in development of higher order problem solving skills (Ke, 2011), and simulations utilize gamification of a relatively realistic, active learning experience to drive student cognitive engagement and learning (Davis et al., 2024).

Kolb's experiential learning theory and constructivism support simulation use as a way to motivate students, contextualize problems, and provide opportunities for students to build their own knowledge schemas and reflect on that learning (Davis et al., 2024; Faisal et al., 2022). Simulation active learning and gamification provides extrinsic motivation and feedback loops that can be particularly engaging to students who find direct instruction alone uninspiring (Scholtz and Hughes, 2018). Self-efficacy theory, intrinsic and extrinsic motivation theory, goal orientation theory, and attribution theory help explain how educational games motivate students to learn (Davis et al., 2024; Mayer, 2019). When used successfully, simulations encourage students to set goals, allow for decision-making autonomy, provide actionable feedback, and build student knowledge schemas, competence, and self-efficacy. In business strategy simulations, student self-efficacy, competence, and autonomy have strong, positive relationships with student simulation engagement, success, and learning (Buil et al., 2020; Dietz et al., 2022).

Erhel and Jamet (2019) suggest that meaningful learning in educational games results when students select relevant knowledge, organize it into reasoned cognitive structures, and then integrate it into existing knowledge. Similarly, Mayer's (2019) cognitive theory of multimedia learning states that learning from educational computer games is a challenge among three types of student information processing: (1) essential processing which is needed to comprehend the material, (2), extraneous processing that occurs when learning focus is placed on insignificant distractions, and (3) generative processing that is caused by organizing the new learning and integrating the new learning into previous knowledge structures. Essential processing, extraneous processing, and generative processing added together can put a strain on the limits of working memory (Van Merriënboer & Sweller, 2010). The goal, therefore, for optimal learning in educational games is to allow for necessary essential processing while minimizing extraneous processing. When these two do not exhaust working memory capacity, generative learning can result (Van Merriënboer & Sweller, 2010). Under the cognitive theory of multimedia learning, strategy theory direct instruction lessens simulation cognitive complexity by giving students a framework and road map for making strategy decisions in the simulation.

Simulations can also be viewed through the framework of problem-based learning. In problem-based learning, students learn content and develop skills through data analysis and collaborative problem solving (Hmelo-Silver et al., 2007). A strategy simulation uses data analysis and decision making to meet the goals of the simulation, which are typically a combination of key performance indicators (KPIs). Thus, the problem that students in strategy simulations are trying to solve is the maximization of KPIs. In problem-based learning, the active experience enhances student motivation for learning the theory, especially for students who lack intrinsic motivation for the topic (Davis et al., 2024). The goal in problem-based learning is for the instructor to be the "guide on the side" and allow students to build mastery themselves (Hmelo-Silver et al., 2007). Instructors may employ a scaffolding structure to guide and support students as they move towards their goal of solving the problem. Thus, in strategy simulation problem-based learning, strategy theory direct instruction would be implemented in a just-in-time scaffolding structure to support and guide student learning through the simulation play.

Problem-based learning and cognitive load theory are both supportive of the use of strategy theory direct instruction. The following details the theoretical support of the TWP and TB4 approaches.

TWP, Problem-based Learning, and Extraneous Load

TWP utilizes the scaffolding technique from problem-based learning. In simulation play, this manifests as providing direct instruction in a just-in-time manner when students realize that they need to know the information (Hmelo-Silver et al., 2007). Problem-based learning stresses the motivation students feel because they can make an immediate link between the strategy theory and how they can apply that theory. The active learning simulation experience should incentivize students to learn strategic theory because they see the value in it (Capon & Kuhn, 2024).

Cadotte and Macquire (2013) found that simulation student teams typically go through 3 phases in playing the simulation: a startup phase, a transition phase, and a growth phase. The startup phase (approximately half the simulation play) involves learning to work together as a team and developing the initial strategy choice. Following problem-based learning theory, direct instruction in the startup phase would focus on possible strategy choices. The transition phase (about ¼ of the simulation) is where teams develop a more comprehensive strategy emphasizing growth and profitability. Here direct instruction would emphasize marketing growth theory, hiring, and supply chain analysis. Finally, in the growth phase (approximately 1/3 of the simulation), student teams focus on applying their strategy with tactics designed to implement their chosen strategy and adjust to unforeseen events. Strategy evaluation, cost structure, and governance issues would be added here. In this way, TWP interleaves strategy theory along the student team simulation experience that is in keeping with where student teams are in the simulation. The TWP process may focus student attention on key elements and guide student teams toward an effective application of the strategy theory.

Cognitive load theory also supports TWP. Following this theory, students may be protected from being overwhelmed as they learn theory and the simulation bit by bit. The direct instruction scaffolding technique is a reduction in extraneous processing and working memory load (Van Merriënboer & Sweller, 2010). Students would not be required to look for the information needed. Instead, the information would be provided to them when they need it. Hmelo et al. (2007, p. 100) states that "[s]uch just-in-time direct instruction promotes knowledge construction in a way that makes knowledge available for future use" and promotes the generative learning process. Based on this theory, TWP could encourage student simulation self-efficacy and gently guide students to building effective strategy decision-making schema for use in later, more difficult rounds. Supported with direct strategy theory instruction at appropriate times in the simulation, student simulation success should result and build with each simulation decision round (Snider & Balakrishnan, 2013). Thus, the TWP simulation approach should lead to higher simulation KPI scores.

TB4, Essential Processing Load, Long-term Memory, and Strategic Consistency

Mayer's (2019) application of cognitive load theory says that essential processing load increases with higher element interactivity of the task. Business strategy choice, implementation, and evaluation involve multiple functional areas and are highly interactive tasks. Thus, a business strategy simulation runs the risk of overwhelming students' ability to process information and make well-informed decisions. If working memory gets overloaded from a high essential processing load, student generative learning stops (Kirshner et al., 2006).

TB4 may reduce essential processing load memory by separating the theory learning from the application experience. This makes it a multistep learning process. First, by serially sequencing the learning from a low interactivity level (e.g., understanding individual strategy choices) finally to a higher one (e.g. implementing, evaluating, and fine-tuning strategy in a simulation firm), the drain on essential processing could be lessened. Students can learn strategy theory in isolated sequences with examples of how it works in direct instruction before being asked to apply the theory to a situation by themselves in the simulation. Secondly, the strategy theory direct instruction is typically in a lower fidelity environment (e.g., text, cases) before being moved to a much higher one (i.e., the simulation which is designed to mimic a real-world firm). This again may reduce essential processing load (Van Merriënboer & Sweller, 2010).

In addition, because the TB4 direct instruction occurs before the simulation, almost all the theory information and learning are moved out of working memory and into long term memory. Long term memory has no known limit (Kirshner et al., 2006). If the TB4 direct instruction has been successful, students are likely to have generated long term memory schemas that outline the strategic decision-making process albeit in a lower fidelity environment. This should make the transition to handling the much higher fidelity simulation environment ultimately easier to handle.

A final advantage to teaching students in TB4 scenario is that students would have been completely exposed to strategy choice, implementation, and evaluation instruction before beginning the simulation. This could result in better strategy choice and implementation earlier in the simulation play. Scholtz and Hughes (2018) observe that each decision round in a simulation enables or constrains choice in future round. TWP students would not have complete strategy knowledge until later in the simulation which may lead to switching strategies or inconsistencies in tactical decision-making. This could lead to lower simulation performance for TWP teams. Strategic consistency is strongly related to successful firm performance both in the real world (Lamberg et al., 2008) and in simulations (Mathieu & Rapp, 2009; Parnell & Crandle, 2021). Both Parnell and Chandler (2021) and Mathieu and Rapp (2009) found that student teams that laid a successful strategic foundation in early rounds had better simulation performance than other teams. Early simulation success is related to student motivation, and Skulmowki and Xu (2022) believe that this kind of motivation may even counteract the cognitive burden of the simulation to some extent. On the other hand, Hernández-Lara and Serradell-Lopez (2018) found that the most important factor limiting student learning from simulations was demotivation from students not understanding the consequences of their actions in the simulation. Indeed, Snow et al. (2002) suggests that students who are in simulation and theory information overload may not even try to succeed; they may simply give up.

See Table 1 for a summary of TWP and TB4 theoretical support. From problem-based learning, TWP would be the preferred technique as the main concern is to guide, not direct, student problem-solving through a just-in-time direct instruction scaffolding technique. In cognitive load theory, the main concern is to avoid overwhelming working memory. This tends to support TB4 direct instruction as working memory stress is reduced during the simulation play. As our study is the first to look at the effect of these two approaches and considering the latter choice is most used by business strategy professors (Faisal et al., 2022), we chose TB4 as the approach most likely to lead to higher simulation firm performance.

Hypothesis 1: TB4 student teams will have higher simulation firm performance than TWP student teams.

Method

Participants

Seven hundred twenty students from multiple sections of a strategic management course participated in the Business Strategy Game [www.bsg-online.com] for course credit over the course of a 10-week term. There were 281 teams overall. Of those, 140 teams were taught the course material interleaved throughout the simulation and 141 were taught the core course material prior to beginning the simulation. Teams were randomly created using the team generator in the learning management system. Team size ranged from individual students to 5-person teams. Simulation

The simulation creates an environment in which each company participating in the simulation competes against the others in their industry. The simulation teams began with two practice rounds followed by 10 decision rounds starting in year 11 and completing with year 20 of business. The teams were responsible for all decisions, and each decision deadline accounted for one year of business.

The simulation mimics a global athletic shoe company where students make all decisions for the company. Students made annual decisions once or twice a week, and the simulation results account for 30% of the grade in the class. To score well in the simulation, students need to annually increase earnings per share (EPS), stock price, return on equity (ROE), their firm's credit rating, and their firm's image rating. Simulation scores were calculated based on how closely teams met the investors' expectations and how well they performed in comparison to the top company in the industry. At the end of each decision round (year of business), teams were provided with financial performance information for their company and those

Table 1

Summary of Theoretical Support for TWP and TB4

Direct Instruction Approach	Theoretical Support	Learning Advantages for Simulation Performance
TWP	Problem-based Learning Cognitive Load Theory	Active learning motivates student strategy theory learning. Reduced extraneous processing load promotes generative learning.
TB4	Cognitive Load Theory Strategic Consistency	Reduced essential processing load promotes generative learning. Long-term memory usage reduces working memory load. Complete strategy theory instruction before simulation start aids effective strategy choice and implementation.

of their competitors as well as how they ranked within the industry.

For this study, students were either taught textbook strategy theory prior to the start of the simulation (TB4) or the content was taught as interleaved with the simulation (TWP). Course content followed the textbook: overview, vision and mission, external environment, internal environment, generic strategies, additional strategies, choice of strategy, implementation, evaluation, and governance. The students who received course content prior to the start of the simulation were exposed to readings and lectures on the chapters. Then they completed two practice rounds. After that, they completed 10 decision rounds. The students who received course content during the simulation started with the overview, followed by practice rounds of the simulation. They then received lectures on one to two chapters of the book each week followed by that week's decisions (See Table 2 for the teaching schedule).

Measurements

EPS, ROE, stock price, image rating, and credit rating are typical KPIs in business. In the simulation, students apply their understanding of strategic management and are acting as executives of their respective companies. Student learning was operationalized via the outcome measures of the five targets of the simulation for year 20: EPS, ROE, stock price, image rating, and credit rating. These performance indicators provide an indication of student learning of the core concepts in strategy such as effective strategic choice, external and internal assessment, and appropriate governance.

The image rating is a composite of a number of items such as the quality of the shoes, market share in each region, and corporate social responsibility investments. The highest score possible on image rating is 100. Credit rating in the simulation is indicated by a letter grade. To include it in the analysis, credit rating was transformed to a percentage such that A+ = 100, A = 95, A- = 93, B+ = 87, B = 95, B- = 83, C+ = 77, C = 75, C- = 73.

Results

Table 3 shows means, standard deviations, and correlations for study variables. The number of team members was not significantly correlated with the outcome variables, and as such, the number of team members was not included in further analyses as a control variable. EPS, ROE, stock price, image rating, and credit rating were significantly and positively correlated with teaching the course material before the simulation started, supporting Hypothesis 1. Due to the high correlations among the dependent variables, we conducted principal components factor analysis with varimax rotation. One factor emerged (See Table 4). All factor loadings are greater than 0.4, which are considered stable (Guadagnoli & Velicer, 1988), and as such, we aggregated the outcome variables to one variable for hypothesis testing.

Hypothesis 1 was tested using OLS regression. The aggregate financial outcome was significantly related to when the course material was taught (R2 = .05, F(1, 280)

Table 2

Teaching Schedule

Week	Group 1 - TWP	Group 2 – TB4
Week 1	Overview, Mission and Vision	Overview, Mission and Vision
	Practice round 1, Quiz 1	External and internal assessment
Week 2	Practice round 2, Quiz 2	Types of strategies
	External and internal Assessment	Strategy analysis and choice
Week 3	Year 11	Strategy implementation
	Types of strategies	Strategy evaluation and governance
Week 4	Year 12	Practice round 1, Quiz 1
	Strategy analysis and choice	Practice round 2, Quiz 2
Week 5	Year 13	Year 11
	Strategy implementation	Year 12
Week 6	Year 14	Year 13
	Strategy evaluation and governance	Year 14
Week 7	Year 15	Year 15
	Year 16	Year 16
Week 8	Case analysis	Case analysis
	Case analysis	Case analysis
Week 9	Year 17	Year 17
	Year 18	Year 18
Week 10	Year 19	Year 19
	Year 20	Year 20
Final Exam Week	Final presentation	Final presentation

Table 3

Correlations, Means, and Standard Deviations

Variable	Mean	SD	1.	2.	3.	4.	5.	6.
1. Theory before simulation	.50	.50	-					
2. Credit Rating	7.81	2.19	.21**	-				
3. Image Rating	70.90	14.06	.09*	.27**	-			
4. EPS	7.54	7.33	.15**	.33**	.46**	-		
5. ROE	14.75	12.63	.19**	.50**	.42**	.52**	-	
6. Stock Price	115.13	102.27	.21**	.38**	.60**	.73**	.59**	-
7. Group size	2.56	1.26	-.04	-.03	.07	-.01	.04	-.07

*p < .10, **p < .01

Table 4

Results From a Principal Components Factor Analysis of the Dependent Variables

Dependent Variables	Factor loading
Stock Price	.88
EPS	.81
ROE	.79
Image Rating	.71
Credit Rating	.61

= 13.38, p.<.001) indicating that teaching theory prior to introducing the simulation is significantly and positively related to simulation outcomes.

Post-hoc Analyses

To further understand the impact of each teaching method, we conducted an additional OLS regression for each year of the simulation. The deviation between the groups began almost immediately and reached significance by year 14: $R2= .02$, $F(1, 280) = 6.98$, $p. < .01$ (See Figure 1) suggesting that TWP is insufficient for simulation performance.

Discussion

The results support the hypothesis that TB4 student teams have stronger simulation performance than TWP teams. The students who experienced theory prior to the simulation, TB4, were able to learn the game from the practice rounds and were able to compete well at the outset. While the mean scores of the aggregated performance indicators in Figure 1 show that TB4 student teams initially start off with slightly lower team performance, TB4 teams begin to surpass the TWP teams by the second round of the simulation and achieve significantly greater performance by the fourth decision round. TWP teams improve their performance in the second half of simulation play, but they never catch up to the cumulative performance levels of the TB4 teams.

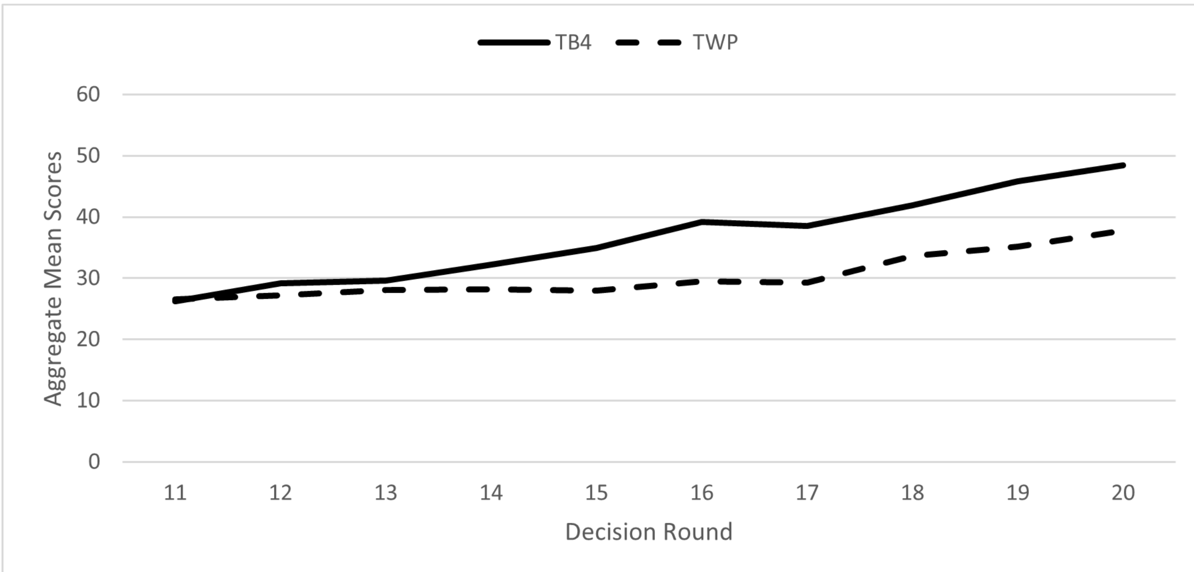
Overall, these results suggests that the TB4 student teams are moving more rapidly through the startup simulation phase than the TWP student teams. The performance of the TB4 teams seems to follow the simulation cycle that Cadotte and Macquire (2013) laid out. There appears to be a startup phase in the first 3 years in which teams increasingly acclimate themselves to the levers that drive performance. Mid-simulation, TB4 teams level out in simulation performance and then improve their performance even more in the final simulation rounds. In contrast, TWP teams seem to muddle through the first few simulation decision rounds and do not show better performance until the second half of the simulation. Looking at the course schedule in Table 2, this better performance by TWP teams starts about the same time as completion of the strategy theory coursework. TB4 student teams seemed to also have the learning experience of reaching a performance plateau and finetuning their strategies and tactics to pursue stronger team performance. On the other hand, because it took TWP teams so long to achieve substantial simulation performance, most TWP teams would likely not have had that experience. In essence, their long startup phase seemed to preclude the opportunity of moving through the standard simulation cycles outlined in Cadotte and Macquire (2013). They got the initial increase expected in the start-up phase but never progressed to the transition or growth phases. This represents a loss of typical simulation experience and contrasts with the TB4 student team simulation experience.

Early Strategy and Investment Choices

A possible explanation for the pattern of results we see is in early round investment choices. In the opening decision round, TB4 teams have lower performance than TWP teams. Investments in such things as employee training, advertising, and research and development are often expensive in early simulation rounds but can pay big dividends in later rounds, when appropriately matched with a strategy. Students without an appreciation of the differing levels of investment needed for different strategic choices can make poor budget allocation decisions in

Figure 1

Aggregate Outcome Variables Difference in Mean Scores



early rounds. A team pursuing using a differentiation strategy with multiple products in niche markets can achieve superior firm performance from significant investment in early decision rounds if that investment leads to the ability to offer specialized products that better meet the needs of customers. This same level of investment can be an inappropriate match and a poor prioritization of limited resources for student teams pursuing other strategies. Good investment choices come from a strong initial strategy selection and appropriate early round implementation of that strategy. Parnell and Crandell (2021, p. 459) note, "Firms with clear strategies typically benefit from doing so during the middle and late rounds. In contrast, teams that fail to formulate a strategy early on often struggle as the game unfolds." TB4 teams seem to show that they have clearer strategy and investment choices in early rounds, which leads to higher simulation performance at both the midpoint and ending rounds of the simulation (Matheiu & Rapp, 2009).

Investment Choice Timing in Later Rounds

Another example of the benefits of TB4 apply to preparing for and correctly timing expensive investments. For example, a student team that wants to pursue a low-cost strategy may need to invest in increased production capacity to meet expected increased demand. When done at the appropriate time, this investment decision supports the strategic choice. When done too early or too late, it becomes a costly mistake from which it takes time to recover. In the course schedule in Table 2 TWP student teams would have been through three decision rounds before learning about strategy implementation issues. TWP students would likely take longer to respond because they would still be learning the implementation needs of their strategy choices. In contrast, TB4 student teams would be more likely to be prepared for simulation challenges like forecasting demand appropriately for a production capacity investment. Because they have gained a richer understanding of implementation pitfalls earlier, TB4 students would also likely be more able to identify and respond to investment decision needs quickly. In Figure 1, TB4 teams respond appropriately with investment choices to build profitability in the final half of the simulation.

Strategy Choice, Implementation, and Evaluation

Each year of the simulation builds on the previous year, which can add a level of complexity to strategy simulations that other simulations may not have, and which would make theory instruction timing an important consideration. While learning the details of strategy piece by piece as they progress through the simulation, TWP students would be making decisions that cannot be easily undone. They set their company on a course that would be costly to change should they decide later that they want a different strategy than the one they are currently pursuing. While there is ample learning for students in changing a strategy, overall TWP student team simulation performance could suffer. An example of this is the competitive force of rival companies. Students are often so consumed with trying to make decisions for their own companies, they can neglect to consider what the competition is doing. This can lead to, for example, delayed awareness of multiple firms competing in the same market for customers. The increased competition can lead to lower profit margins and lower overall team simulation profitability. TWP students may take longer to recognize and appreciate the significance of competition effects because they are learning about strategy implementation and evaluation in later rounds. For example, in our study, TWP students are learning this topical area around the same time they are making 4th round simulation decisions. At this point in the simulation, TWP student teams are already significantly behind TB4 teams in firm performance measures. If teams need to change strategy or reposition to target a different, less competitive market, they will need to make expensive readjustments to their investments to implement the new strategy or to effectively target the new market. This likely would put an additional drag on simulation firm performance.

Working Memory Usage

Student extraneous processing usage and essential processing usage need to be lower than total working memory capacity for generative learning to occur. TWP is theorized to reduce extraneous processing load, but TB4 is theorized to decrease essential processing load and utilizes long-term memory in place of short-term memory. It may be that playing the simulation requires so much in essential processing load that students become overwhelmed unless they offload some of that processing load to long-term memory. TWP reduction in extraneous processing load may simply not be enough to offset the working memory strain of learning theory and playing the simulation at the same time. TWP teams do not seem to be able to improve their simulation play until most of the theory learning has taken place and has been moved to long-term memory. The study results suggest that student learning and experience benefits from a reduction in working memory cognitive load.

Effect of Lower Early Simulation Performance

Learning from decision-making mistakes and less than optimal choices is an expected simulation experience for all student teams. It could be that TWP students are learning more deeply as they struggle with team performance through their long startup phase. This struggle may not always be a positive learning experience, however. As part of their grade rests on how well they perform in the simulation, poor initial student team performance can lead to increased student anxiety, lowered student self-efficacy, and demotivation (Deitz et al., 2022).

If student teams become less convinced that they can effectively handle simulation firm performance issues through strategy, they may resort to heuristics and weak problem-solving strategies (e.g., trial and error; combinations of advertising, production, employees), trying anything that they can think of to better their performance. Matheiu and Rapp (2009) observe that student teams without a coordinated strategy implementation "become mired in haphazard and reactive task-related decisions that result in lower levels of . . . performance" (p.93). Teach and Murff (2009) note that poor performing simulation student teams become de-motivated and begin making choices mindlessly, based on conjecture or random guessing. Novice students, like undergraduate students, are more prone to choosing a weak problem-solving approach to a simulation (Erhel & Jamet, 2019).

Unfortunately, this kind of weak problem-solving approach further taxes cognitive working memory (Van Merriënboer & Sweller, 2010) and means that students are even more unlikely to move to generative learning. Students do not learn how to choose and apply a strategy. As simulations tend to reward students for implementing strategies well, students who resort to a weak problem-solving strategy will likely not be as successful. Strategies succeed when different operational decisions come together to support the strategy. Students who lurch from tactic to tactic without a coherent strategic choice will have lower simulation scores throughout the simulation, will not learn how to successfully implement a strategy, and will likely have lower decision-making self-efficacy. Dietz et al. (2022) found a positive relationship between simulation student self-efficacy and student perceptions of critical thinking skills development. If students believe they are poor business managers because of the simulation, this is a negative learning experience. Successful simulation use is predicated on building competence for students (Buil et al., 2020). Our study suggests that TB4 is more likely to lead to successful cycles of strategy competence building for students.

Educator Recommendations for Blending Strategy Theory with Simulations

The reason instructors choose to use simulations is to provide students with the opportunity to put theory into practice. A simulation provides students, especially less-experienced undergraduates, with a relatively risk-free opportunity to gain managerial experience and confidence in cycles of strategy choice, implementation, and evaluation. The best of both worlds would be to cover the theory completely first and then interleave the material again as students go through the simulation. This would allow students to get a complete overview of context analysis, theory choices, implementation considerations, and strategy evaluation needs before they start the simulation. Student teams would then be reinforced with readily available reminders focusing attention along the way. Dietz et al. (2022) recommends this kind of simulation pedagogical approach as one most likely to support student self-efficacy, engagement, and motivation. The reality is that many instructors cannot take the time to incorporate both approaches into their courses.

A less time-consuming approach for instructors could be to incorporate executive briefings into the simulation play. Cadotte and Macquire (2013) advocate for the use of graduate assistants or outside business community members as simulation executive coaches. Coaches provide focused guidance and feedback on student performance during simulation play. Executive briefings by the coaches allow for framing simulation issues and choices so students can focus on the tradeoffs inherent in limited resource simulation environments. The executive briefings also give the opportunity for mini lectures if students do not understand a concept. Resource availability is key to being able to provide this kind of support. Increased demands on faculty time, instructional modality issues, and quarter systems can all limit the time instructors have to provide content and support to students during their simulation rounds. Without community support or available graduate assistants, instructors may be forced to choose between TB4 and TWP.

If instructors do have to choose between one or the other, our research suggests that the TB4 learning approach is more likely to lead to better simulation performance outcomes. Instructors facing time and resource constraints can distill coursework to the core components of strategic management prior to the beginning of play. If teaching in a condensed format, we recommend teaching at the very least: strategy formulation and implementation, external and internal considerations, types of strategies, and how to choose a strategy; the simulation will provide experience with strategy implementation and evaluation. We also recommend other standard techniques to lower the cognitive load on students: teamwork, 1-3 practice rounds, and spreading out simulation decisions (Teach and Murff, 2009).

Additionally, as many strategy simulations are targeted to MBA and executive level students, to assist students without work experience, instructors could include reflection assignments from students so that they could more closely monitor their understanding of the simulation. An additional recommendation is to have regular meetings with the students to support them in their understanding of what is most important when leading a business as part of a top management team.

Limitations and Future Research

To our knowledge, this is the first study examining the timing of coursework along with a simulation. Because of the lack of other research, these results should be interpreted with some caution. Our study looked at strategy coursework and included a single management strategy capstone simulation. This focus is desirable as a pilot study, but it is possible that our results are driven by nuances of this situation. Additional research into coursework and simulation timing with other simulations and with a focus on strategy in different business functional areas (e.g., marketing, supply chain management) would be very helpful in determining the scope of generalization for this study.

It is also possible that these results would not apply to more targeted simulations that focus on specific tasks. Strategy is generally a big picture, more holistic type of simulation decision making. This makes strategy simulations and strategy decision making more complicated. Other simulations are not as broad based. These results may not apply, for example, to a simulation that focused on specific inventory management techniques. Again, additional research with different simulations and domains would be helpful in teasing out potential differences.

The student subjects in this research were all taught in a quarter system with 10-week terms. The Business Strategy Game simulation authors suggest having student teams make one decision a week, however, the condensed nature of the terms necessitated a compressed simulation decision schedule. This meant that TWP student teams made one decision a week for the 2 practice rounds and the first 4 simulation rounds and 2 decisions a week for the last 6 simulation rounds. TB4 teams made two decisions a week for the 2 practice rounds and all 10 decision rounds of their simulation play. This may limit the generalizability of these findings to shorter term situations. It would be interesting to see if the same pattern of results appeared in settings where all students completed one decision round per week.

It is possible that results were impacted by external factors. For example, in a capstone course like our study, student prior knowledge of accounting, finance, marketing, and other business functional courses affect how well teams perform in the simulation (Teach and Murff, 2009). Also, many of the students were non-traditional students with work experience. While student teams were randomly distributed, it is possible that skewed distributions of these students influenced our results.

Finally, Vos (2015) interviewed instructors using simulations in their courses. Examining major themes, they found that skill weakness was the biggest challenge for student success in simulations. Students seemed to struggle with quantitative and financial skills, critical thinking skills and analysis, connecting theory with practice, thinking strategically, and working in teams (Vos, 2015). Our research focused on the timing of strategy theory learning with simulation play, but future research on the timing of student skill development coursework in these other areas with simulation play would be beneficial. It would encourage students to have a more substantial simulation experience.

Conclusion

Instructors play an important role in using simulations effectively in their strategy courses. Strategy theory knowledge is part of the instructional interpretive support that students need to bring theory into practice during a strategy simulation. This study examined the timing of simulation play in comparison to traditional strategy theory coursework, an original contribution to simulation use pedagogy. Because simulation team performance is positively related to student engagement and deep learning, higher student team simulation performance, especially in early simulation rounds, can increase student self-efficacy and engagement and support continued student engagement throughout the simulation. Our analysis shows that student teams have a significantly better, more complete, and richer simulation performance when they complete strategy theory coursework prior to beginning simulation play.

References

Bitrián, P., Buil, I., & Catalán, S. (2020). Flow and business simulation games: A typology of students. The International *Journal of Management Education, 18*(1), 100365. https://doi.org/10.1016/j.ijme.2020.100365

Buil, I., Catalán, S., & Martínez, E. (2020). Engagement in business simulation games: A self-system model of motivational development. *British Journal of Educational Technology, 51* (1), 297-311. https://doi.org/10.1111/bjet.12762

Cadotte, E. R., & MacGuire, C. (2013). A pedagogy to enhance the value of simulations in the classroom. *Journal for Advancement of Marketing Education, 21*(2), 38-52.

Capon, N., & Kuhn, D. (2004). What's so good about problem-based learning? Cognition and Instruction, 22, 61–79.

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020). Simulation-based learning in higher education: A meta-analysis. *Review of educational research, 90*(4), 499-541. https://doi.org/10.3102/0034654320933544

Chulkov, D., & Wang, X. (2020). The Educational Value of Simulation as a Teaching Strategy in a Finance Course. e-*Journal of Business Education and Scholarship of Teaching, 14*(1), 40-56.

Davis, K., Gowda, A. S., Thompson-Newell, N., Maloney, C., Fayyaz, J., & Chang, T. (2024). Gamification, Serious Games, and Simulation in Health Professions Education. *Pediatric Annals, 53*(11), e401-e407. https://doi.org/10.3928/19382359-20240908-06

Deitz, G. D., Fox, A. K., & Fox, J. D. (2022). The effects of individual and team characteristics on simulation-enhanced critical thinking: A multilevel analysis. *Marketing Education Review, 32*(1), 18-32. https://doi.org/10.1080/10528008.2021.1957689

Erhel, S., & Jamet, E. (2019). Improving instructions in educational computer games: Exploring the relations between goal specificity, flow experience and learning outcomes. *Computers in Human Behavior, 91*, 106-114. https://doi.org/10.1016/j.chb.2018.09.020

Faisal, N., Chadhar, M., Goriss-Hunter, A., & Stranieri, A. (2022). Business simulation games in higher education: A systematic review of empirical research. *Human Behavior and Emerging Technologies, 2022*(1), 1578791. https://doi.org/10.1155/2022/1578791

Fox, J., Pittaway, L., & Uzuegbunam, I. (2018). Simulations in Entrepreneurship Education: Serious Games and Learning Through Play. *Entrepreneurship Education and Pedagogy, 1* (1), 61-89. https://doi.org/10.1177/2515127417737285

Guadagnoli, E. & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103*(2), pp. 265-275.

Hendy, N. T. (2021). The effectiveness of technology delivered instruction in teaching Human Resource Management. *The International Journal of Management Education, 19*(2), 100479. https://doi.org/10.1016/j.ijme.2021.100479

Hernández-Lara, A. B., & Serradell-López, E. (2018). Student interactions in online discussion forums: their perception on learning with business simulation games. *Behaviour & Information Technology, 37*(4), 419-429. https://doi.org/10.1080/0144929X.2018.1441326

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist, 42*(2), 99–107. https://doi.org/10.1080/00461520701263368

Hong, C. M., & Kang, S. J. (2018). Labor and delivery simulation: does timing matter? *Clinical Simulation in Nursing, 20*, 24-27. https://doi.org/10.1016/j.ecns.2018.04.005

Ke, F. (2011). A qualitative meta-analysis of computer games as learning tools. Gaming and simulations: Concepts, methodologies, tools and applications, 1619-1665.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist, 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Lamberg, J. A., Tikkanen, H., Nokelainen, T., & Suur-Inkeroinen, H. (2009). Competitive dynamics, strategic consistency, and organizational survival. Strategic *Management Journal, 30*(1), 45-60. https://doi.org/10.1002/smj.726

Laverie, D. A., Hass, A., & Mitchell, C. (2020). Experiential Learning: A Study of Simulations as a Pedagogical Tool. *Marketing Education Review, 32*(1), 3–17. https://doi.org/10.1080/10528008.2020.1843360

Lojo, M. P. (2016). Improving undergraduate student performance on the Littlefield simulation. INFORMS *Transactions on Education, 16*(2), 54-59. https://doi.org/10.1287/ited.2015.0148

Mathieu, J. E., & Rapp, T. L. (2009). Laying the foundation for successful team performance trajectories: The roles of team charters and performance strategies. *Journal of Applied Psychology, 94*(1), 90.

Mayer, R. E. (2019). Computer games in education. *Annual review of psychology, 70*(1), 531-549. https://doi.org/10.1146/annurev-psych-010418-102744

Mitchell, R. C. (2004). Combining cases and computer simulations in strategic management courses. *Journal of Education for Business, 79*(4), 198-204. https://doi.org/10.3200/JOEB.79.4.198-204

Parnell, J.A., & Crandall, W.R. (2021). Success factors in Capsim's capstone: an empirical investigation. *Journal of Education for Business, 96*(7), 454-460. https://doi.org/10.1080/08832323.2020.1854161

Pratt, M. A., & Hahn, S. (2016). Enhancing hospitality student learning through the use of a business simulation. *Journal of Hospitality, Leisure, Sport & Tourism Education, 19*, 10-18. https://doi.org/10.1016/j.jhlste.2016.05.001

Rogmans, T., & Abaza, W. (2019). The impact of international business strategy simulation games on student engagement. *Simulation & Gaming, 50*(3), 393-407. https://doi.org/10.1177/1046878119848138

Scholtz, F., & Hughes, S. (2021). A systematic review of educator interventions in facilitating simulation based learning. *Journal of Applied Research in Higher Education, 13*(5), 1408-1435. https://doi.org/10.1108/JARHE-02-2018-0019

Snider, B., & Balakrishnan, J. (2013). Lessons learned from implementing web-based simulations to teach operations management concepts. I*NFORMS Transactions on Education, 13*(3), 152-161. https://doi.org/10.1287/ited.2013.0108

Snow, S. C., Gehlen, F. L., & Green, J. C. (2002). Different ways to introduce a business simulation: The effect on student performance. *Simulation & Gaming, 33*(4), 526-532. https://doi.org/10.1177/1046878102238617

Skulmowski, A., & Xu, K. M. (2022). Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load. *Educational Psychology Review, 34* (1), 171-196. https://doi.org/10.1007/s10648-021-09624-7

Teach, R., & Murff, E. (2009). *Learning inhibitors in business simulations and games*. In Developments in Business Simulation and Experiential Learning: Proceedings of the Annual ABSEL conference (Vol. 36).

Van Merriënboer, J. J., & Sweller, J. (2010). Cognitive load theory in health professional education: design principles and strategies. *Medical Education, 44*(1), 85-93. https://doi.org/10.1111/j.1365-2923.2009.03498.x

Vos, L. (2015). Simulation games in business and marketing education: How educators assess student learning from simulations. *The International Journal of Management Education, 13*(1), 57-74. https://doi.org/10.1016/j.ijme.2015.01.001

Yin, H. (2020). Effectiveness of a Negotiation Simulation Game in IB Learning. *Journal of Teaching in International Business, 31*(1), 28–50. https://doi.org/10.1080/08975930.2020.1729291

Zendejas, B., Cook, D. A., & Farley, D. R. (2010). Teaching first or teaching last: does the timing matter in simulation-based surgical scenarios? *Journal of Surgical Education, 67* (6), 432-438.

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