Integrating the Stock Market Simulation Into the Core Curriculum of a Business Program: Evidence of the Impact on Learning From a Longitudinal Study

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This study examines the impact of a multi-year stock market simulation on undergraduate business students at East Central University. We used a quasi-experimental mixed-methods approach to analyze quantitative data (simulation participation, trades, and assessment scores) and qualitative data (student reflection papers) across lower and upper-division courses. Results indicate increased engagement and knowledge, with upper-level students showing better assessment performance. While complementary investing education did not significantly affect performance, qualitative analysis revealed deeper learning beyond quantitative measures. The findings support integrating simulations throughout the curriculum to enhance business students' financial literacy and investing competency.

Keywords: experiential learning, simulation, investment, economics and finance education

INTRODUCTION

Understanding the stock market and developing effective investment strategies is a complex skill that requires both theoretical knowledge and practical experience. Experiential learning techniques such as simulations, case studies, and hands-on exercises are increasingly incorporated into undergraduate business education. Experiential learning provides active engagement and connects conceptual knowledge to practical application (Kolb, 1984; Eckardt et al., 2015; Kolb & Kolb, 2017). One such technique is the stock market simulation, which allows students to practice investing in a virtual environment and has been shown to increase motivation, enjoyment, and perceptions of learning (Smith & Gibbs, 2019). However, research also suggests that simulations alone might not fully achieve learning objectives and require complementary education in investing fundamentals for students to develop core financial literacy and decision-making skills (Harter & Harter, 2010).

Most studies have analyzed the immediate effects of simulations within a single course. The longer-term outcomes of sustained participation across courses and years have not been assessed. However, few Economics and Finance instructors and authors, such as Mukherji et al. (2018), have reported embedding this tool in their curriculum. Results from a large randomized controlled trial (RCT) study conducted by Hinojosa et al. (2009) showed that students who played The Stock Market Game significantly outperformed those who did not on the mathematics and investor knowledge tests. A meta-analysis conducted by Chernikova et al. (2020) found that using scaffolding and technology in simulation-based learning greatly affected knowledge. However, the study did not specifically target the stock market simulation. The same study also found prior knowledge might positively affect learning.

This study aims to explore the longitudinal impacts of a multi-year stock market simulation program integrated into the core undergraduate business curriculum. Specifically, it examines whether consistent exposure to simulations over students' course of study enhances engagement and learning of investing concepts. It also investigates if providing basic investment education designed to complement the simulation exercise leads to improved outcomes compared to the simulation alone.

Our main objective is to demonstrate the positive effect of the stock market simulation on learning overtime during the student's academic career. The study addresses these gaps using core business courses to investigate the following research questions:

RQ1: *Does student engagement with stock market simulations increase over time in an undergraduate business program when incorporated longitudinally across core required courses?*

RQ2: *Is there a significant difference in simulation performance between lower-level students and upper-level students?*

RQ3: *Does providing foundational investment education designed to complement the simulation program lead to increased financial literacy and engagement compared to the simulation alone?*

RQ4: *Does learning acquisition occur among the students participating in this experiential learning project, and does this learning acquisition differ between lower- and upper-level students?*

We used a quasi-experimental mixed method in this study. Quantitative and qualitative data on simulation participation, trades, and assessment performance for lower- and upper-level courses with and without complementary education was collected. Qualitative data from reflection papers provided insights into student perceptions and experiences. Findings from this study will have implications for developing effective experiential learning business curricula. The rest of this paper is organized as follows: 1) we present the review of the literature, 2) we state our methods and source of data, 3) we present and discuss our results, and we present our conclusion and recommendations.

LITERATURE REVIEW

Impact of Simulation and Complementary Education on Stock Market Learning

Several studies have found benefits to using stock market simulations in undergraduate finance and economics courses. Simulations provide active learning opportunities and allow students to gain practical experience by making investment decisions in a risk-free environment (Smith & Gibbs, 2020; Bakoush, 2022). Studies have shown that simulations can improve students' financial literacy, conceptual understanding of markets, and confidence in their investing ability (Van Rooij et al., 2007). Marriott et al. (2015) investigated the effectiveness of trading simulations in finance education. They found that students who used simulations demonstrated an improved understanding of trading strategies and increased confidence in making investment decisions. Similarly, Jankowski & Shank (2010) reported that incorporating stock market simulations into an undergraduate finance course increased student engagement and better performance. Using the educational value model, Chulkov & Wang (2020) also found that simulation could improve students' engagement, satisfaction, and motivation. Additional research supports the motivational and engagement benefits of simulations for increasing student knowledge, interest, and self-efficacy related to investments (Mayer et al., 2014; Meltzer, 2021; Moffitt et al., 2010). However, simulations alone might not be enough.

Effect of Complementary Education

Complementary education methods such as case studies, guest lectures, and field trips have been found to enhance stock market learning. Harter & Harter (2010) examined the impact of using case studies in a finance course and found that students who analyzed real-world case studies demonstrated improved critical

thinking skills and a better understanding of complex financial concepts. Moffit et al. (2010) reported that incorporating guest lectures by industry professionals into a finance course increased student interest and engagement in the subject matter. Some studies have found that combining simulations with basic instruction in investing principles might lead to better learning outcomes than simulations alone (Harter & Harter, 2010). Several recent studies have specifically examined the effects of complementary education on undergraduate investment simulation outcomes Marriott et al. (2015). Similarly, Davis (2021) showed that students made more informed, strategic investment decisions after a short course on investing basics preceding a simulation activity. These findings highlight the importance of enhancing simulations with education in financial literacy and core investing principles.

Methodological Approaches

Studies examining simulations and complementary education employ various quantitative, qualitative, and mixed methods approaches. Many utilize experimental or quasi-experimental designs comparing student outcomes like test scores, investment performance, surveys, and focus groups across simulation-only and complemented simulation conditions. Hinojosa et al. (2010), Harter and Harter (2010), and Day (2013-2014) used pre-and post-tests to assess the effectiveness of a stock market game in improving students' financial literacy. Davis (2021) and Harter & Harter (2010) employed survey questionnaires and focus groups to collect data on students' perceptions and attitudes toward the stock market simulation game. Moffit et al. (2010) analyzed student reflections and conducted interviews to extract insights from their learning experiences and explore the benefits and challenges of embedding the stock market simulation. A comparison of findings across these methodologies provides compelling evidence for the benefits of complementing simulations with basic investment education.

Overall, the existing literature suggests stock market simulations can be useful active learning tools for undergraduates but are most effective when paired with foundational education in core investment concepts and strategies. A blended approach allows students to apply their new financial knowledge in a practical yet low-stakes setting. Focusing on a study comparing simulation-only and complemented simulation approaches would provide useful insights for developing financial education curricula.

DATA AND METHODS

Simulation Setup

We used the StockTrak platform for our simulation. StockTrak (StockTrak, 2024) is a stock market simulation platform that aims to enhance financial education through interactive simulations and comprehensive learning materials. The platform features trading of U.S. stocks, options, bonds, futures, mutual funds, futures options, forex, cryptos, and equities from fifty (50) global exchanges. It also includes a built-in curriculum and allows instructors to create customized complimentary basic investing principles learning module, which requires students to read articles, watch videos, make trades, and complete a comprehensive assessment of the concepts learned.

Students were given $1,000,000 in virtual money to invest in twelve (12) weeks, starting with a 400,000 initial balance and a $50,000 deposit each week for the next 12 weeks. Students were instructed to invest this money during a 12-week-long session. There were no fees charged for trading stocks and ETFs to emulate the new era of retail investing spearheaded by companies such as Robinhood. However, students were charged a commission for trading other derivatives, such as options futures, bonds, treasuries, and currencies. There was an 8% interest rate charged on margin accounts. Students were required to invest in at least four (4) different types of securities (equities, bonds, mutual funds, currencies, etc.). They could not spend more than 25% of their funds on a single type of security.

Students were required to perform a minimum of 10 trades during the simulation. Trades were limited to four (4) per Day, limiting them to a maximum of 240 trades during the term. The minimum was set to discourage students from completing their required minimum transactions in one Day. The StockTrak simulation was worth 100 points.

TABLE 1
EXPERIENTIAL LEARNING COMPONENT SETUP

- Students receive $1M in virtual money
  - $450K initial deposit and $50K each week
- 12-week sessions
- Trading requirements & limits
  - No fee for trading equity
  - Commission charged on derivatives (options, futures, bonds, mutual funds, currencies)
  - Minimum of 10 trades required
  - No more than four (4) trades per Day
  - Students must spend at least 90% of their funds
  - No more than 25% of funds are spent on a single type of security
  - 8% interest charged on margin accounts
- Complete Supplemental Learning Module (optional in lower-level classes)

Submit a reflection paper (optional in lower-level classes)

Upper-level students (juniors and seniors) were required to complete an associated "Basic Principles of Stock Market Investing" leaning module, which comprised lectures and videos, to fulfill the partial requirement for the simulation assignment. In addition, these students had to submit reflection papers highlighting the lessons learned, their likes and dislikes, and the strategies used throughout the simulation. In contrast, for lower-level students (freshmen and sophomores enrolled in Principles of Economics), the Basic Principles of Investing course and the reflection paper were optional. Students who chose to submit them received extra credit points.

Since this activity aimed to develop understanding, curiosity, and comfort about stock market investing among business students, engagement, measured by the number of trades made, carried the highest weight in evaluating student performance. This practice was consistent with Maier's (2002) findings, which suggest that due to the short-term nature of stock market simulation games, "winners are more likely created by luck than skill." Students with very low engagement were penalized in this context since most of the learning would occur simply due to participation. Portfolio performance and ranking carried relatively lower weight compared to trading activity.

Data Sources

All data used for this analysis were extracted from the stock market simulation set up on the StockTrak platform in the Spring of 2024. The following courses each had a simulation component that included Principles of Macroeconomics, Principles of Microeconomics, Financial Management, Fundamentals of Insurance & Risk Management. Seventy-nine (79) students enrolled in these classes participated in the simulation exercise and were classified as lower- and upper-level students.

We collected data on student participation, the number of trades made (as a measure of engagement), and participation in the Basic of Investing learning module. A 50 multiple-choice questions assessment was administered to all participants at the end of the simulation to measure the extent of their learning. The assignment was identical for all students. Data were analyzed using a toolkit that included Microsoft Excel, the R software package (using R-Studio), and the Voyant Tool (https://voyant-tools.org) for text analysis.

Hypothesis

To answer our research questions, we made the following hypothesis:

H1: *Knowledge would increase with successive participation in the stock market simulation. To test this hypothesis, we looked at the average assessment score at the number of trades across all classes and levels.*

H2: *There will be a difference in performance across all classes, and upper-level students will perform better and be more active than lower-level students.*

To test this hypothesis, we conducted a single-factor analysis of variance on the mean scores of the 50-question assessment administered to all participants at the end of the simulation. We also compared the average number of trades between lower-level students (freshmen and sophomores) and upper-level students (juniors and seniors). We postulated that increased knowledge would translate into more enthusiasm and interest, leading to more transactions.

H3: *"The Basic Principles of Stock Market Investing" learning module will positively affect the accumulation of knowledge.*

To test this hypothesis, we conducted a multiple regression analysis to determine the effects of the following predictors on the response variable: Self-reported learning (*Learned*), completion of "The Basic Principles of Stock Market Investing" learning module (*Basic_Invest*), the number of trade (*Num_Trade*), and the academic level (*Acad_Levl*). The response variable was the student's score on the assessment quiz (*Qscore*). In addition, correlation analysis was performed to determine a potential association between those variables.

H4: *Learning acquisition occurs among the students participating in the stock marking simulation.*

Students were asked to submit a reflection paper. The *Voyant Tools* software was used to analyze the papers submitted and extract keywords that would indicate knowledge acquisition. *Voyant Tools* is a web-based text reading and analysis environment (Voyant Tools, n.d.). We followed Nagy & Townsend (2012) and considered that using instructed words in reflection papers would indicate learning. We analyzed the papers for specific words that would indicate student learning.

Four courses were used for this study: Principles of Macroeconomics (ECON 2003), Principles of Microeconomics (ECON 2013), Fundamental of Financial Management (FIN 3113), and Fundamentals of Insurance and Risk Management (FIN 3913). ECON 2003 and ECON 2013 are lower-level courses. We refer to these students as lower-level students. FIN 3113 and FIN 3913 are upper-level courses. We refer to these students as upper-level students. Table 1 below shows the descriptive statistics for the two quantitative variables in our study: the assessment score and number of trades made during the simulation.

Lower-level and upper-level students participated in the simulation exercise and completed an assessment quiz, which was identical for both levels and covered only basic investment concepts. The material covered in the assessment quiz was neither discussed nor reviewed with the students before the quiz administration. While upper-level students were required to complete the associated "basics principle of stock market investing" learning module, this component was optional for lower-level students. Upper-level students also had to submit a self-reflection report on their simulation experience. The reflection paper would contain the strategies they used to build their portfolio and the lessons they had learned by participating in the simulation. Lower-level students were only given the option to submit the reflection paper. Table 1 shows the descriptive statistics for the study's only quantitative variables.

RESULTS AND DISCUSSION

Descriptive Statistics and Correlation Analysis

The final assessment quiz contained the following question to capture their self-reported learning: "Did you learn by participating in the stock market simulation exercise?" Table 1 below summarizes the descriptive statistics of the assessment quiz scores and the number of trades. It shows that lower- and upper-level students reported learning from the exercise (94.5% and 90.5%, respectively). The assessment quiz mean score shows an increase in performance from the freshmen level (ECON 2003) to the Junior level (FIN 3113 and FIN 3913). There is a 15-point difference in performance between the freshman class

(ECON 2003) and the sophomore class (ECON 2013) and a 14-point difference between lower- and upper-level students. There is no difference between the mean scores of the two junior-level classes involved (the mean score difference is just 1). There is also no difference in the number of trades between lower-level and upper-level students.

TABLE 1
DESCRIPTIVE STATISTICS FOR QUANTITATIVE VARIABLES

Variable	Mean	Median	Mode	Standard Deviation	Minimum	Maximum
Lower-level students (N=48)						
Assessment Score	51.75	52	42	12.63	22	72
# of Trades	34.65	34	33	19.64	0	101
Junior/Seniors (N=31)						
Assessment Score	66.45	66	54	13.17	40	98
# of Trades	34.65	34	31	12.93	8	63
Overall (N=79)						
Assessment Score	57.52	56	54	14.66	22	98
# of Trades	34.65	34	31	17.23	0	101

The assessment score increased with the academic level, with the most significant increase between Level 1 (Freshmen) and Level 2 (Sophomores). The Self-reported learning was almost the same across all academic levels, with a slight drop-off between Levels 2 and 3 (See Table 2). The lower percentage of self-reported learners for upper-level students can be attributed to some diminishing returns. These students have been through multiple simulation rounds. They might not have perceived as much learning occurring in their later years as it did in the first two years, which might also explain why they did much better than lower-level students on the assessment quiz, with a 66.5% mean score compared to 51.7%. The difference in the two scores was confirmed by the results of ANOVA (See Table 4).

TABLE 2
RESULTS OF THE ASSESSMENT QUIZ

Academic Level	Assessment Mean Score	Std Dev	Proportion of self-reported learning	N
ECON 2003 (1)	45.9%	11.8	93.1%	29
ECON 2013 (2)	60.8%	7.6	94.7%	19
FIN3113 (3)	66.5%	13.5	94.1%	17
FIN3913 (3)	66.4%	13.1	85.7%	14
Lower-level students	**51.7%**	**12.6**	**93.7%**	48
Upper-level students	**66.5%**	**13.1**	**90.3%**	31
Total				79

Figure 1 shows that the Assessment score (*Qscore*) and the number of trades (*Num_Trades*) positively correlate. Furthermore, the correlation matrix between the two variables shows a relatively strong correlation, which might signify that student engagement positively impacted learning if we assume that increased trades indicated more engagement. Since the mean number of trades was statistically identical at all educational levels, we cannot conclude that engagement increased as students progressed during their academic journey.

FIGURE 1
SCATTER PLOT OF THE ASSESSMENT SCORE AND THE NUMBER OF TRADES

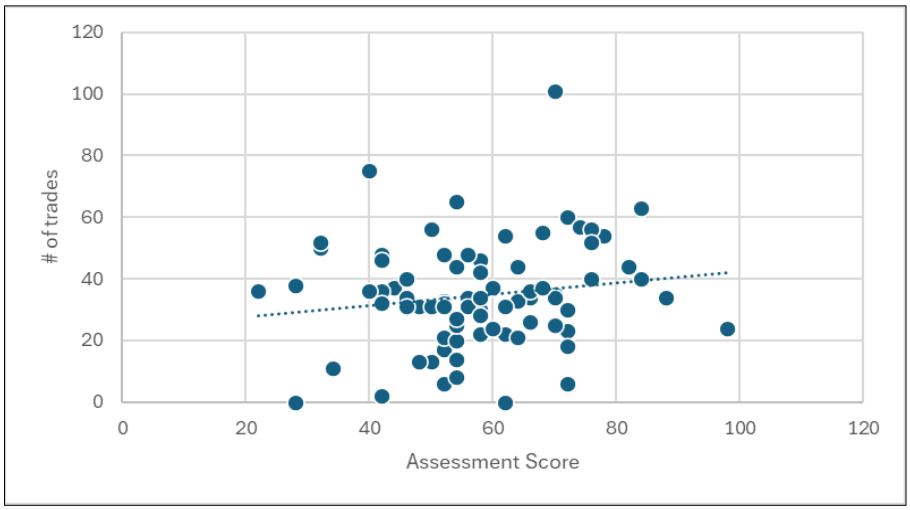

TABLE 3
CORRELATION MATRIX BETWEEN QSCORE AND ACAD_LEVL

Variable	***Qscore***	***Acad_Levl***
Qscore	1	
Acad_Levl	0.613328	1

TABLE 4
ANALYSIS OF VARIANCE FOR ASSESSMENT SCORES

Single-factor ANOVA between Lower-level students and Upper-level students

Source of Variation	***S.S.***	***df***	***M.S.***	***F***	***P-value***	***F crit***
Between Groups	4071.044	1	4071.044	24.68528	<0.0001	3.965094067
Within Groups	12698.68	77	164.9179			
Total	16769.72	78				

Single-factor ANOVA for FIN 3113 and FIN 3913

	S.S.	**df**	**M.S.**	**F**	**P-value**	**F crit**
Between Groups	0.013554	1	0.013554	0.0000755	0.9932	4.182964289
Within Groups	5205.664	29	179.5057			
Total	5205.677	30				

Single Factor ANOVA for ECON 2003 and ECON 2013

Source of Variation	S.S.	df	M.S.	F	P-value	F crit
Between Groups	2539.868	1	2539.868	23.58788	<0.0001	4.051748692
Within Groups	4953.132	46	107.6768			
Total	7493	47				

We conducted a single-factor ANOVA to the hypothesis that the mean scores for the two groups are equal.

$$H0: \mu_1 - \mu_2 = 0$$
$$HA: \mu_1 - \mu_2 \neq 0$$

The ANOVA result is highly significant at a 99% confidence level, suggesting a significant difference between the two groups. We reject the null hypothesis and conclude that the upper-level students performed much better than the lower-level students.

We also conducted a single-factor ANOVA for the mean scores of lower-level and upper-level students. The ANOVA results (See Table 4) show that while the mean scores of the two lower-level courses are significantly different (P-value is less than 0.001), the mean scores for the two upper-level courses are not (P-value is 0.9931, greater than 0.005). We conclude that the performances of upper-level students are statistically identical in the two courses that make up this group. In comparison, the performance of lower-level students is significantly different for the two courses that make up the group. This result is further confirmed by the almost 15-point difference between ECON 2013 and 2003, while the point differential between FIN 3113 and FIN 3913 is less than one (See Table 2).

We also conducted a single-factor ANOVA on the difference between the mean number of trades of the two groups. Table 7 shows the results of the ANOVA. The P-value is 0.99, greater than the cutoff value of 0.05. There is no statistically significant difference between the mean number of trades across the two groups. Consequently, we cannot conclude that upper-level students are more active than lower-level students.

TABLE 7
ANOVA FOR LOWER-LEVEL STUDENTS AND UPPER-LEVEL STUDENTS MEAN NUMBER OF TRADES

Source of Variation	*S.S.*	*df*	*M.S.*	*F*	*P-value*	*F crit*
Between Groups	8.50688E-06	1	8.51E-06	2.83E-08	0.9998	3.965094
Within Groups	23152.07594	77	300.6763			
Total	23152.07595	78				

Regression Analysis

We postulated that the Assessment quiz score (*Qscore*) would depend on the following factors shown in Table 8: 1) the amount of knowledge accumulated during the simulation exercise, 2) the academic level of the student, the number of trades made during the simulation, and 3) whether the student completed the supplemental learning module (Basic Principles of Stock Market Investing).

TABLE 8
REGRESSION VARIABLES

Variable	**Type**	**Description**
Qscore	Quantitative	Student score on the Assessment quiz.
Learned	Categorical	Self-reported learning. Students who answered "yes" to the question "Did you learn by participating in the stock market simulation exercise?)."
Acad_Levl	Categorical	Student's academic level (1=Freshman, 2=Sophomore, 3=Junior/Senior).

Basic_Invest	Categorical	Completed the Basic Principles of Stock Market Investment (1=yes; 0=No).
Num_Trade	Quantitative	Number of trades made during the simulation.
*Acad_Levl*Basic_Invest*	Interaction	Interaction variable between academic level and learning module
*Acad_Levl*Num_Trade*	Interaction	Interaction variable between academic level and number of trades made.

For the linear regression analysis, the response variable was *Qscore*, and the predictors were Learned, *Acad_Levl*, *Basic_Invest*, and *Num_Trade*. Since we could not assume the data was normally distributed, we performed a standard normal transformation on the two quantitative variables *Qscore* and *Num_Trade*. Three models were formulated as follows:

Model 1: $QScore = \beta_0 + \beta_1 Learned + \beta_2 Basic\_Invest + \beta_3 Acad\_Levl + \beta_4 Num\_Trade + \varepsilon$

Model 2: $QScore = \beta_0 + \beta_1 Learned + \beta_2 Acad\_Levl + \beta_3 Num\_Trade + \varepsilon$

Model 3: $QScore = \beta_0 + \beta_1 Learned + \beta_2 Basic\_Invest + \beta_3 Acad\_Levl + \beta_4 Num\_Trade + \beta_5\ Acad\_Level \times Basic\_Invest + \beta_6\ Acad\_Levl \times Num\_Trade + \varepsilon$

Model 1 included all predictors. Model 2 dropped the learning module as a variable since its coefficient was not statistically significant in Model 1. Model 3 added two interaction variables to capture any potential interaction between the academic level, the learning module, and the number of trades.

TABLE 9
LINEAR REGRESSION RESULTS

Variable	**Model 1**	**Model 2**	**Model 3**
Constant	-2.3342*** (-6.31)	-2.28922*** (-6.16)	-2.3444*** (-5.67)
Learned (dummy)	0.99047*** (-3.08)	0.9106*** (2.86)	1.1153*** (3.47)
Acad_Levl (categorical)	0.7779*** (-7.35)	0.71483*** (7.39)	0.7127*** (4.27)
Basic_ Invest (dummy)	-0.26888 (-1.42)		-0.4588 (-1.02)
Num_Trad	0.17424** (-2.06)	0.18232** (2.14)	-0.2906 (-1.25)
Acad_Levl*Basic_Invest			0.1035 (0.48)
Acad_Level*Num_Trade			0.24998** (2.15)
Adjusted R-squared	0.4478	0.4403	0.4663

(t-statistics in parentheses)
***p < .001 **p <01. *p <.05

The regression results (See Table 9) show positive relationships between the predictors and the response variable (*Qscore*). The variables *Learned*, *Acad_Levl*, and *Num_Trade* all contribute positively to the assessment score, which validates the results reported by previous authors such as Smith & Gibbs (2020),

Bakoush (2022), and Marriott et al. (2015). Except for learning, these variables are all statistically significant at a 95% confidence level and above. These results suggest that the added learning module, on its own, did not significantly affect the students' performances. Dropping the learning module from the list of predictors in Module 2 did not affect relationships. This result contrasts with that of Harter & Harter (2010) but confirms Maier's (2002) findings that the benefits come from participating in the simulation exercise. The interaction variable created by combining the academic level and the learning module (*Acad_Levl*Basic_Invest*) was still not statistically significant. The sign of the constant was negative, which indicates that students would not have acquired any of the measured knowledge had they not participated in the simulation. This result aligns with most of the previous authors cited in this paper. The result also aligns with the correlation analysis between *Qscore* and *Num-Trade*. It supports the idea that increased engagement positively impacts knowledge acquisition but also implies the accumulation of knowledge throughout the student's program of study. These results reinforce the positive effect of scaffolding, as stated by Chernikova et al. (2020) and Jankowski & Shank (2010).

Text Analysis Results

Insights from the reflection papers' text analysis show self-reported learning beyond what the quantitative data demonstrates. Table 10 shows an excerpt of contextual analysis from the submitted reflection paper. More contextual analysis results are included in Appendix 1.

TABLE 10
SAMPLE OF CONTEXTUAL ANALYSIS OF REFECTION PAPERS

LOWER-LEVEL STUDENTS			
Document	**Left**	**Term**	**Right**
0	also invested in more sectors this time around. The biggest	lesson	that I learned was balancing risk. Last time, I made
3	hold on to what I had already is a valuable	lesson	I will be taking away with me from this assignment
9	and find another security or stock to invest in. The	lesson	I learned in Stock Trak includes learning how to trade
10	losses when it prices fell a certain percentage. The biggest	lesson	that I learned was that I need to not be
13	then you will be even more upset about it. The	lesson	I learned from this is you got to have patience
22	is low, but it is a long-term asset. The	lesson	that I learned from this project is that the stock
27	should have taken more risks to learn from. The biggest	lesson	I learned is that to be successful in the market
31	me to be a better trader. I will say a	lesson	I learnt is just because a stock does well today
35	go down, then I would pull my stock. The biggest	lesson	I learned from Stock Trak about investing is that it
36	another security or stock to invest in. Lessons Learned The	lesson	I learned in Stock Trak includes learning how to trade
37	maintaining self-control and resisting emotional urges…	lesson	discovered. Unexpected developments and changes in…
38	plummeted, the others probably were still OK. Stocktrak was a	lesson	in the complexities of investing. If I did it again
39	watch stocks change values in the market. A big takeaway	lesson	that I would say I have from Stock Trak Simulation
2	that I had learned among the many other Stock-Trak	lessons	Lessons I Learned The lessons I learned from the Stock

FIGURE 2
KNOWLEDGE ACQUISITION TERMS TRENDS GRAPH

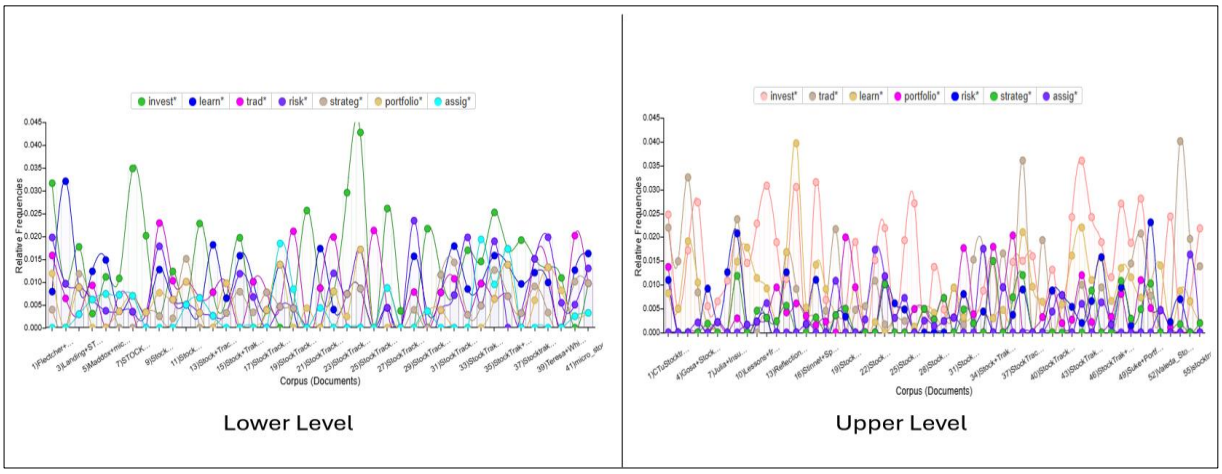

Table 10 shows a contextual analysis of the term "lesson" learned in a sample of student statements (See Appendix 1, 2, and 3) for more complete contextual and word cloud analysis tables for both lower-level and upper-level students). Figure 2 shows the relative frequency of certain technical terms in student papers both for lower and upper-level students. Appendix 3 shows that upper-level students used more advanced terms in their self-reflection papers than lower-level students. The contextual analysis and the terms trends graph show similar terms related to learning acquisition in the reflection papers of lower- and upper-level students. Overall, the results of the text analysis confirm that of the regression and correlation analysis. We can conclude that knowledge acquisition occurred during the simulation and throughout the students' program.

CONCLUSION

The results of this study demonstrate the positive impacts of integrating a stock market simulation program longitudinally across the core undergraduate business curriculum. Quantitative analysis showed that knowledge acquisition and engagement, as measured by assessment scores and trading activity, increased as students progressed from lower to upper-division courses. The significant performance differential between under and upper-level students highlights the cumulative learning effects of repeated simulation exposure.

Interestingly, while upper-level students were required to complete a "Basic Principles of Stock Market Investing" learning module to complement the simulation, regression analysis indicated this did not significantly impact assessment scores. The learning benefits appear to derive primarily from the hands-on simulation experience itself. However, qualitative analysis of student reflection papers revealed self-reported learning and the use of terms indicating knowledge acquisition beyond what the quantitative data captured. This result underscores the importance of employing mixed methods to assess learning outcomes fully.

These findings support the integration of stock market simulations across multiple core courses to give business students repeated opportunities to apply investing concepts in a practical yet low-stakes setting. Scaffolding the simulation with a supporting curriculum is also valuable, even if the quantitative performance impacts are not immediately apparent. Maximizing student engagement with the simulation is key to promoting financial literacy and investing competency.

Future research should explore the specific learning outcomes at each academic level to optimize curricular design. Additional qualitative methods, such as interviews and focus groups, could provide deeper insights into the student experience. Tracking students' investing behavior and financial well-being

post-graduation would also be valuable in assessing long-term impacts. Despite these limitations, the current study demonstrates the benefits of a longitudinal, experiential learning approach to business education. It offers a model for institutions seeking to enhance their finance and investing curriculum.

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APPENDIX 1 – SELF-REFLECTION PAPERS CONTEXTUAL ANALYSIS

Contextual Text Analysis for Lower-Level Students			
Document	**Left**	**Term**	**Right**
0	also invested in more sectors this time around. The biggest	lesson	that I learned was balancing risk. Last time, I made
3	hold on to what I had already is a valuable	lesson	I will be taking away with me from this assignment
9	and find another security or stock to invest in. The	lesson	I learned in Stock Trak includes learning how to trade
10	losses when it prices fell a certain percentage. The biggest	lesson	that I learned was that I need to not be
13	then you will be even more upset about it. The	lesson	I learned from this is you got to have patience
22	is low, but it is a long-term asset. The	lesson	that I learned from this project is that the stock
27	should have taken more risks to learn from. The biggest	lesson	I learned is that to be successful in the market
31	started so well and just continued to go down. Another	lesson	I learnt was that I need to take more risks
36	another security or stock to invest in. Lessons Learned The	lesson	I learned in Stock Trak includes learning how to trade
37	maintaining self-control and resisting emotional urges…	lesson	discovered. Unexpected developments and changes in…
38	plummeted, the others probably were still OK. Stocktrak was a	lesson	in the complexities of investing. If I did it again
3	have learned strategy, risk taking, and many other stocks market	lessons	My approach was diverse, by trying to manage both long
3	I have. The journey on Stock Trak taught me several	lessons	Taking my time and not rushing into a decision is
14	to ensure that I wouldn't go broke. I learned multiple	lessons	when experimenting with Stock Trak. I learned that there are
17	a great opportunity for me and I will use its	lessons	as I move through the world of business
18	can figure out when to make your own trades. The	lessons	that Stock Trak provided were also very helpful. They really
23	especially with how down the stock market has been lately.	lessons	I learned was mainly how to manage my own portfolio
28	them once I am older. This assignment taught me many	lessons	that I will remember once I get back into investing
29	and sell them before I lost any extra cash. Some	lessons	that are learned were: it depends on whether you are
30	have been to stick with my original trading plan. What	lessons	did I learn through this? I learned what the stock
33	on the Stock Trak platform, I have learned several crucial	lessons	: Patience is imperative to successful investing. It often requires long
33	who adapt and learn can thrive. One of the critical	lessons	I learned was the importance of adaptability in response to

34	strategy to build up my portfolio. I learned some valuable	lessons	such as the basic information of what a stock is
36	it and find another security or stock to invest in.	lessons	Learned The lesson I learned in Stock Trak includes learning
36	how they are identified, and who owns them. The beginner	lessons	mainly delt with how to trade different securities and what
37	learning, adaptation, good risk management, and …	lessons	are applicable to real-world investment situations and go beyond
40	what I needed to do. I have learned so many	lessons	from Stocktrak that I can carry on into reality. Lessons
40	lessons from Stocktrak that I can carry on into reality.	lessons	such as taking risks, being able to know the performers

APPENDIX 2 – SELF-REFLECTION PAPERS CONTEXTUAL ANALYSIS

Contextual Text Analysis for Upper-Level Students			
Document	**Left**	**Term**	**Right**
2	EFT stands for electronic funds transfers. The next thing I	learned	how to trade was mutual funds. An example definition of
2	them. Another thing I thought was really cool that I	learned	about was the investment return calculator and the net present
3	my second time completing the Stock Trak assignment. I have	learned	so much more about trading stocks this time around than
4	enjoyed analyzing the market and I feel as though I	learned	some good lessons about investing
7	One of the key lessons I	learned	from using StockTrak is the significance of developing and sticking
7	the consequences of poor risk management decisions. I	learned	to implement risk mitigation techniques such as diversification, stop-loss
8	something I am still struggling with. This semester, I have	learned	more about various kinds of securities, and how they work
8	various kinds of securities, and how they work. I have	learned	how to research securities more effectively, and when to purchase
9	the world of finance and investment. Through this experience, I've	learned	important lessons that have shaped my approach to investing, prepared
9	Reckless Investment Decisions One of the most important lessons I	learned	from StockTrak is avoiding reckless investment decisions. Initially, I approached
10	hold, or buy a specific stock. I wish I had	learned	about that feature sooner because it would have helped me
10	found StockTrak and the Advanced Investing Assignments informative and	learned	a lot throughout this semester. My portfolio might reflect something
11	Throughout this course, I have	learned	valuable concepts about Stock Trak and the value of diversifying
12	and with good reason. When I first started investing, I	learned	that it is important to diversify my portfolio by spreading

13	Reflection Report While participating in the StockTrak course I	learned	many things about investing. Most of what I learned was
13	things I learned about are options, futures, and spots. I	learned	what each of these are and ways to trade them
14	from buying and holding stock. As for the lessons I	learned	this semester, a big one was just being patient and
15	financial statements, studying industry dynamics, …	learned	to make more informed investment decisions. For instance, analyzing key
16	trade stocks and bonds. This was fascinating to me I	learned	about the different services brokers provide and I have come
17	was enduring; however, it did have its educational benefits. I	learned	that when investing in the stock market, you need to
19	for a class. After doing this 3 times I have	learned	some valuable things. The biggest thing I have learned is
25	I am really looking forward to using these tips I	learned	in class in the real stock markets such as NASDAQ
27	continue to grow. There were a few things that I	learned	this time that I had not seen in the past
27	and that just costs me money. The second thing I	learned	is that I do not have to invest all my
29	my best simulation to date while using the program. I	learned	a lot more than I have in previous semesters and
29	grow was very interesting, and I really feel like I	learned	a lot while doing this
30	this investing exercise several times, I feel like I have	learned	a lot of overtime. This is the best my portfolio
30	the highest I have ever been ranked. Other lessons I	learned	is it seems effective to start with a small, steady
33	the financial markets. In conclusion, I used the things I	learned	using Stock Trak to build I diverse portfolio of some
36	but also seeing how they perform against their peers. I	learned	some interesting history about stock trading and the stock market
37	not realize how helpful and educational it was. I have	learned	a lot this semester from the Stocktrack and the learning
38	makes a lot of sense. A lesson that I have	learned	is in that short amount of time, do not really

APPENDIX 3 – WORD CLOUDS OF STUDENT REFLECTION PAPERS

A. Cirrus Word Cloud of the Lower-Level Students' Self-reflections Corpus

B. Cirrus Word Cloud of the Upper-Level Students' Self-Reflections Corpus