UNIVERSITY OF
GOTHENBURG

Virtual Investment for Real Gains

A review of stock market simulators on financial literacy for students in higher education

by
Qianqian Yang

Oct 2024

PDA675 - Technology, knowledge and learning: An introduction

Introduction

Traditionally, financial simulation is proven to be an effective learning way for business students to activate, exploit, and expand their existing knowledge (Henry et al., 2019). It means that the philosophy of experiential learning is adopted, designing real-world financial experiences into the finance curricula through the creation of effective learning spaces (Sharma et al., 2018). In this experimental way, students can better understand financial knowledge and enhance their financial problem-solving skills. One typical and representative example of financial simulation is the stock market simulation, which simulates the trading situation within the real stock market. This is also considered as one technical example of financial simulation, compared with other simulations, such as corporate decision simulation or accounting principle simulation, which might not necessarily be done on digital platforms. Within the stock market simulation, individuals can take on the role of investors, where they can invest in different stocks and then build on their investment portfolios. As stock market simulators can capture the dynamic nature of the stock market and help individuals study trading without monetary loss, these digital tools have been widely used in business schools as an educational tool for students (Smith & Gibbs, 2020). Researchers widely appraise the usefulness of stock market simulators as an active and effective learning tool (Alsmadi et al., 2022; Noreen, 2022).

Regarding financial literacy, it has a long history and nowadays the syllabus of finance curricula has been mature. As a result, the goal of finance literacy specializing in stock market trading is clear, concerning the aspects of modern portfolio theory, fundamental and technical analysis, behavioral finance, and financial risk management (Chulkov & Wang, 2020). Rooted on this basic financial literacy syllabus, a wide range of studies has been about how to educate students in both theoretical and practical ways, as finance often involves hands-on projects (Bakoush, 2022). In addition to solid financial knowledge, developing financial decision-making skills is also emphasized within the financial curriculum. As mentioned by the US Financial Literacy and Education Commission, financial decision-making skills are fundamental both for individuals as students and for their long-term path to financial well-being (US Financial Literacy and Education Commission, 2023).

This study aims to analyze how the digital stock market simulators will influence the financial literacy and education of students at the university level. The target is higher education because stock trading knowledge is usually gained at university when students are already grown up. Relevant studies assess the usefulness of using digital simulators, the actual impacts for students are various, including the cognitive, behavioral, and affective learning dimensions (Chulkov & Wang, 2020). Understanding these various impacts is essential for educators in the business area to design curricula effectively and efficiently for students. Consequently, this literature review uses a qualitative method to study the following research question:

How do stock market simulators influence the financial literacy of students in higher education?

Methods

Based on the main research question of analyzing how stock market simulators influence the financial literacy of students in higher education. This study uses the following search string as used in the chosen three databases of Scopus, EBSCO, and Web of Science:

finance OR financial, AND simulation, AND education OR educational OR teaching,

ADN stock OR invest OR investment OR trading

After doing the search string, this study applies the limitation of the year 2019-2024, peer-reviewed, full-text articles, English language, and academic journals. Details of the inclusion and exclusion criteria are shown in Table 1. A total of 263 articles appeared in the three databases after the limitation. The changes in article numbers during the selection process are shown in Table 2. By manually excluding articles that are:

Not within the financial literacy or education area. Eg. within the computer science area.

Not within the higher education area. Eg. focus on investors.

Simulation tools that are not technology. Eg. onsite board games.

In the end, there are a total of 6 articles that were chosen to be included in this systematic literature review, which are shown in Table 3. Each of the articles includes an experimental design process, which is about using the sock market simulation tools for allocating wealth, investing stocks, and building portfolios. These experimental designs are linked to the research question, as they work as channels to explore how the digital simulations will affect students' financial literacy under diverse educational contexts. The experimental design's similarities and differences are mainly from three aspects: the digital tool, sample students, and timezone. Details of the experimental design are shown in Table 4.

Results

The selected six articles all study the impact of stock market simulators on students' financial literacy. The impact can be divided into three categories, which are the application of financial literacy to practice, changes in risk tolerance, and financial decision-making skills.

Application of Financial Literacy

By undergoing the experimental stock trading process, all the articles appraise the potential of stock market simulators to enhance students' skills in applying financial knowledge to real-world scenarios from a cognitivist perspective. Through the descriptive analysis, Noreen (2022) found that the majority of the students describe a better understanding of financial literacy under the real worldview of the stock market. The application of their existing knowledge using the stock market simulators can facilitate understanding and retention of financial knowledge at the conceptual, procedural, and strategic aspects. This is because the assignments based on digital financial simulation can create an interactive and effective learning experience for the students (Chulkov & Wang, 2020). Similarly, researchers widely support the idea that experimental ways of learning through stock trading simulations can increase student learning and performance (Alsmadi et al., 2022; Sharif & Naghavi, 2021; Smith & Gibbs, 2020). Smith

and Gibbs (2020) also found that the current generation of students has better utilization and responses to financial simulators compared to previous generations. As for the specification knowledge that is gained through the application of financial knowledge within the stock market simulator, Alsmadi et al. (2022) mention that students understand more about the operation of the stock market and the factors influencing stock values. Without a direct statement about the application of financial literacy under real scenarios, Prakash and Alagarsamy (2022) conducted their study under the assumption that the practical application of financial literacy is useful within the context of stock market trading.

Risk-Taking and Aggressiveness

Within the experimental learning process, the trading volume indicates the level of risk-taking and aggressiveness when students are investing and making changes under different scenarios. Smith and Gibbs (2020) found that students with stronger dedication to achieving higher scores might prefer taking risks through trading, which is supported by using the rankings of stock returns during the experimental process and thus giving extra credits to students with higher stock returns at the end. Based on the theory of planned behavior, Sharif and Naghavi (2021) focuses on the intention and confidence of the students to perform a behavior in trading. They found that trading skills and behavioral intention are negatively related and statistically significant, which means that students with higher financial knowledge are less likely to do frequent trading. From a different perspective, Prakash and Alagarsamy (2022) added additional factors about gender and family income, and focus on the trading mode which is measured by the trading numbers that occurred during the process. They found that male students are more aggressive in the market, while female students trade less frequently and are more risk-averse. In addition to supporting the previous studies that women are more risk-averse, Chulkov & Wang (2020) also found that students who lack prior experience in trading are less likely to trade risky assets. Despite the inbuilt risk within the nature of stock trading, the process of this experimental simulation can be described as challenging and exciting by students within the risk-free simulation environment (Alsmadi et al., 2022; Noreen, 2022).

Financial Decision Making

Based on the risk tolerance level as mentioned before, the financial decision-making skills are reflected by implementing the financial concepts by making decisions and experiencing the consequences of their actions in the interactive environment created by the stock trading simulators (Alsmadi et al., 2022; Chulkov & Wang, 2020; Noreen, 2022). Sharif and Naghavi (2021) employed the theory of flow to examine the hedonic element of technology usage, noting that intrinsic motivation such as attention and enjoyment may have a significant impact on students' attitudes and decisions toward using online trading. Also, their study shows that in determining intentions to adopt online financial trading, extrinsic motivation such as positive attitudes from other people, is also an additional important determinant of intended use. As for the reflection of the result regarding financial decision-making skills, they are actually shown as scores (Chulkov & Wang, 2020; Prakash & Alagarsamy, 2022; Smith & Gibbs, 2020). By comparing students who did not participate in the simulation, Smith and Gibbs (2020) found that students participating in the simulation appeared to have a better understanding of investments in addition to receiving higher overall course marks. However, they also mention

that within the simulated stock trading environment, students' trading decisions might not necessarily be the same as what they do in the real-world stock trading market. This could be attributed to the competitive simulation requirements within this designed finance course.

Discussion

Under the search string without the year limitation, there exist only a few articles about financial simulation tools for financial literacy. Also, even after constraining the year to the recent five years, only a limited number of articles answered the research question issued by this literature review, which is shown in Figure 1. The lack of exciting articles on the stock market simulation tools used for education, as well as the proven usage of these digital simulators for business school students, has thrown the importance of further academic research and expanding the use of these tools practically within higher education.

While all papers appraise the positive effects of using stock simulators for trading, it is important to note that some articles collect findings using questionnaires. That result suggests that the majority of students provide favorable feedback and satisfaction after using it, but there still exist a few students who disagree with the skill development during the simulation exercises or have had an unpleasant experience when trading on the simulators (Chulkov & Wang, 2020; Noreen, 2022). The reasons for this adverse outcome might be attributed to students' educational background, investing profile, and risk tolerance, as noted by Chulkov and Wang (2020). This leads to the consideration of applying personalized design for these students within the educational area. Furthermore, this personalized instructional design for individuals has raised questions about additional monetary and time costs that are incurred during this potential new instructional design process.

As for the content of the related studies, several articles show similarities both in the study purpose and study results, which is indicated by the satisfaction and academic scores. However, all the studies have their own focus, such as introducing extra factors, focusing on the learning process with supporting psychological theories, and analyzing the users' engagement during the process (Chulkov & Wang, 2020; Prakash & Alagarsamy, 2022; Sharif & Naghavi, 2021). Even with these differences, there are other factors yet to be explored that are within the social constructivism theory, such as peer interaction and collaboration among students in higher education, despite the existing study about gender, age, background, and social support. This is because the stock market is a social product created by humans and is sensitively influenced by human emotions and intentions from a behavioral finance aspect. Only one among the selected articles mentions the enhanced group work and collaboration after the simulation procedure (Noreen, 2022). As a result, further research into this research gap about collaboration needs to be considered and conducted.

Also, the selected articles are all about the application of financial literacy from cognitivism's perspective and assessing students' skill development via behaviorism's perspective. Within the financial education area, the use of constructivism is often about case studies, where students fit into roles and solve problems (Ekpenyong & Edokpolor, 2016). However, the dilemma is that digital technology is not utilized within this constructivism process. In this sense, case studies or related educational methods can be said to be traditional and should be

developed in modern times. Recalling the digital tools used in this literature review, simulation tools or similar gamification tools are widely viewed as efficient utilization of constructivism (Lainema, 2008). The usage of financial simulation tools as a way of creating meanings based on existing financial terms is yet to be explored. The potential solution for this is to break the box. The thinking of trans-disciplinarity can be introduced into the financial literacy area, which is about constituting a framework that is multidisciplinary, evolutionary, and reflexive (Quattrone, 2000).

Appendix

Table 1: Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Publication Date	2019-2024	Before 2019
Review	Peer reviewed	Under reviewed
Publication Stage	Full text	Without full access
Language	English	Other languages
Publication Type	Academic Journal	Other types

Table 2 Selection Number

Database	Scopus	EBSCO	Web of Science
After Search String	237	597	1924
After Limitation	49	124	90
After Manual Choosing	3	2	1

Note: Limitation criteria are the same as Table 1. Except: Web of Science has additional limitations of Web of Science Categories: economics; business finance; social science mathematical methods; management; business; education or educational research or educational scientific disciplines. Mannual Chooing includes the process of deleting the duplicates.

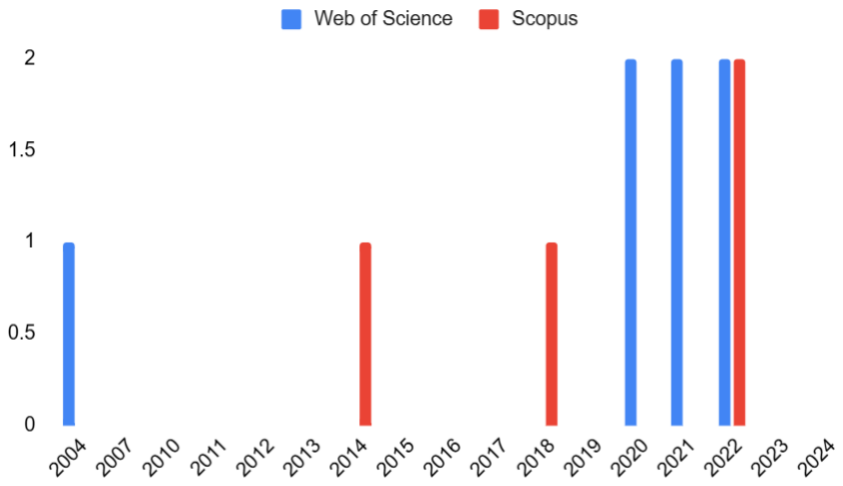
Table 3: Chosen Articles

Year	Authors	Title	Journal	Volume	Issue Number	Pages
2020	Smith & Gibbs	Stock market trading simulations: Assessing the impact on student learning	Journal of Education for Business	95	4	234–241
2020	Chulkov & Wang	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
2021	Prakash & Alagarsamy	Does Gender and Family Income Impact Stock Trading of B-School Students? Findings from a Stock Simulation Exercise	VISION-THE JOURNAL OF BUSINESS PERSPECTIVE	26	4	454–460
2021	Sharif & Naghavi	Online Financial Trading among Young Adults: Integrating the Theory of Planned Behavior, Technology Acceptance Model, and Theory of Flow	International Journal of Human-Computer Interaction	37	10	949–962
2022	Noreen	Enhancing student's learning through trading simulation: a vehicle for experiential learning: an action research	International Journal of Business and Globalisation	30	1	81–91
2022	Alsmadi	The Impact of Amman Stock Exchange Simulation Room on the Level of the Business College Students at Al-Zaytoonah University of Jordan (Predictive Approach)	Journal of Higher Education Theory and Practice	22	13	236–242

Table 4: Experimental Design

Authors	Digital Simulator	Timezone	Sample Students
Smith & Gibbs	StockTrak	70 days	Business Administration and Economics Department undergraduate students
Chulkov & Wang	StockTrak	112 days	Business school undergraduate & MBA
Prakash & Alagarsamy	not specified	56 days	Business school undergraduate students
Sharif & Naghavi	Plus500	1.5 hour	General university students (not specified)
Noreen	Tadawul's trading simulator	60 days	Finance track undergraduate students
Alsmadi	Amman Stock Exchange Simulation Room	not specified	Business school undergraduate

Figure 1: History of the Research



Personal Reflections

Reasons for Choosing the Topic

When it comes to education and technology, the first thing that comes into my mind is to reflect on what technology was used in my previous education. Naturally, it reminds me of the digital simulation tools that I used at my bachelor's university while I was studying finance, which is about using the stock market simulator to make investments and build portfolios. Students who earn higher returns in simulations get higher scores, while others get lower or 0 scores. I feel that the whole process is exciting and interesting. Also, this experimental course within the finance area is actually among the most popular courses at the business school. Everyone loves that and the lecture for that course is always full of people. However, despite the popularity of the courses, I start to question the actual usefulness of this experimental procedure. As luck and uncertainty is the nature of investment, sometimes randomly investing in some assets also generates great benefits. So during this informal investing procedure, what will students actually gain? So this literature review seeks to answer this question.

Relation to Educational Goal

I am curious about learning the new applications of technology within the current world, including the educational area, finance industry, and tech industry. This program provides me with both the theoretical framework and support to study and explore more areas that I am not yet familiar with. For further study, I am interested in learning more about finding the most effective and efficient ways of learning or training, as well as human-computer interaction.

Lessons from the Assignment

Based on the theory that I learned through this course, I managed to combine those theories of behaviorism, cognitivism, constructivism, and social constructivism into my existing knowledge about finance. Thus, this assignment is the perfect practice for me to assess the learning theory within this research. By analyzing how those theories are utilized in financial literacy, and combining them in this literature review, I got familiar with these theories and this kind of digital educational technology. Apart from the application of educational theories, I also practice my academic writing skills within this course paper, which I believe will be really helpful for my master's thesis. During the assignment, it was that that I went through the structured research procedure, where I formed a topic, searched related studies, wrote contents, adjusting the entire paper. Despite this being only a course paper about literature review, I actually gained knowledge from the selected articles about how to do the whole research, including writing abstracts, doing empirical analysis, drawing conclusions, etc. This has laid the foundation for me for any further research and I really appreciate it.

References

Alsmadi, A. A., Al-Dweik, A. F., & Kasasbeh, H. (2022). The Impact of Amman Stock Exchange Simulation Room on the Level of the Business College Students at Al-Zaytoonah University of Jordan (Predictive Approach). *Journal of Higher Education Theory and Practice*, *22*(13), 236–242. Scopus. https://doi.org/10.33423/jhetp.v22i13.5522

Bakoush, M. (2022). Evaluating the role of simulation-based experiential learning in improving satisfaction of finance students. *International Journal of Management Education*, *20*(3). Scopus. https://doi.org/10.1016/j.ijme.2022.100690

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.

Ekpenyong, L. E., & Edokpolor, J. E. (2016). Constructivist approaches: An emerging paradigm for the teaching and learning of business education. *Nigerian Journal of Business Education (NIGJBED, 3 (1), 149-158*. https://www.academia.edu/download/87218553/16.pdf

Henry, D., McCormack, S., & Saeed, N. (2019). An evaluation of a simulation learning task in finance education. *Journal of Education for Business*, *94*(8), 549–560. https://doi.org/10.1080/08832323.2019.1579162

Lainema, T. (2008). Perspective Making: Constructivism as a Meaning-Making Structure for Simulation Gaming. *Simulation & Gaming - Simulat Gaming*, *40*, 48–67. https://doi.org/10.1177/1046878107308074

Noreen, U. (2022). Enhancing student's learning through trading simulation: A vehicle for experiential learning: an action research. *International Journal of Business and Globalisation*, *30*(1), 81–91. Scopus. https://doi.org/10.1504/IJBG.2022.122299

Prakash, N., & Alagarsamy, S. (2022). Does Gender and Family Income Impact Stock Trading of B-School Students? Findings from a Stock Simulation Exercise. *VISION-THE JOURNAL OF BUSINESS PERSPECTIVE*, *26*(4), 454–460. https://doi.org/10.1177/0972262921992591

Quattrone, P. (2000). Constructivism and accounting research: Towards a trans-disciplinary perspective. *Accounting, Auditing & Accountability Journal*, *13*(2), 130–155. https://doi.org/10.1108/09513570010323047

Sharif, S. P., & Naghavi, N. (2021). Online Financial Trading among Young Adults: Integrating the Theory of Planned Behavior, Technology Acceptance Model, and Theory of Flow. *International Journal of Human-Computer Interaction*, *37*(10), 949–962. Scopus. https://doi.org/10.1080/10447318.2020.1861761

Sharma, S., Charity, I., Robson, A., & Lillystone, S. (2018). How do students conceptualise a 'real world' learning environment: An empirical study of a financial trading room?

International Journal of Management Education (Elsevier Science), *16*(3), 541–557. https://doi.org/10.1016/j.ijme.2017.09.001

Smith, C. M., & Gibbs, S. C. (2020). Stock market trading simulations: Assessing the impact on student learning. *Journal of Education for Business*, *95*(4), 234–241. https://doi.org/10.1080/08832323.2019.1643279

US Financial Literacy and Education Commission, U. F. L. and E. C. (2023). *Best Practices for Financial Literacy and Education at Institutions of Higher Education* (Non-Journal ED630384; Higher Education Financial Education Resources Updates. 2023, pp. 1–8). US Financial Literacy and Education Commission. https://home.treasury.gov/system/files/231/FLEC_Resources_FactSheet_ao2023_508ready.pdf