Evaluation of the Impact of Utilizing Stock Market Simulators for Enhancing Analytical Competence: An Experiential Learning Approach

Krishnaji Sarjerao Patil [1], Digvijay Satish Patil[2] Hemlata Vivek Gaikwad[3] Suruchi Pandey[4]

[1, 2, 3] Department of Management Studies, Rajarambapu Institute of Technology, Islampur   [4]
Symbiosis Institute of Management Studies, Symbiosis International (Deemed University) Pune.
[1]krishnaji.patil@ritindia.edu [2]digvijays.patil@ritindia.edu [3]hemlata.gaikwad@ritindia.edu [4]suruchi.p@sims.edu

Abstract -**This research explores the impact of stock market simulators on students pursuing technical education, specifically focusing on developing analytical skills in finance. Fifty students enrolled in technical courses with finance components participated in an experimental study. Pre and post-test surveys were conducted to assess their financial analytical skills before and after exposure to a stock market simulator, specifically Money Control. The students were given 60 days to build and operate investment portfolios using acquired analytical skills.**

Results from the study reveal a significant positive impact on students' analytical skills, demonstrating increased interest and motivation in utilizing stock market simulators for learning subjects like security analysis and portfolio management. The findings suggest that stock market simulators serve as valuable tools for teaching, practising, and enhancing analytical skills in finance, particularly for students pursuing technical courses.

Keywords: **Analytical skills, stock market simulator, teaching-learning.**

I. INTRODUCTION

In higher education, especially in science and professional fields, fostering critical and analytical thinking skills is imperative. The ability to dissect complex problems, choose appropriate methodologies, derive effective solutions, and articulate analyses accurately is crucial for aspiring scientists and technical professionals (Ahdika, 2017). Employers highly value analytical skills, making them a sought-after trait (Peter A. Brous, 2017). Stock market simulators, facilitating risk-free replication of stock market experiences, have become integral educational tools, aiding in developing investment skills and a foundational understanding of market operations (Nelson et al., 2015).

Analytical proficiency transcends industries, empowering individuals to substantiate decisions with data, gain deeper customer insights, and predict trends (How to Improve Your Analytical Skills | HBS Online, n.d.). This research delves into the significance of stock market simulators in enhancing analytical skills among professional education students, specifically those in engineering and MBA programs tackling finance-related subjects.

Enhancing students' analytical thinking enables logical problem-solving by breaking down issues, elucidating system functions, identifying causality, and distinguishing between phenomena (Yulina et al., 2019). Real-world, open-ended projects, a cornerstone for improving analytical and critical thinking, encourage collaboration between students and faculty, fostering skill development (Peter A. Brous, 2017; Politsinsky et al., 2015). Aligning teaching, learning, and assessment methods enhances engagement and correlates with improved academic achievement. Despite historically being limited to advanced courses, trading simulators have proven effective in boosting knowledge acquisition and performance (McCann & Russon, 2019; Moffit et al., 2010). This study aimed to enhance analytical skills through a systematic three-stage approach: preparation, implementation, and evaluation (Yakub et al., 2021).

While prior studies highlight the effectiveness of stock market simulators in teaching finance, research gaps persist. There's a need for long-term impact assessments on students' analytical skills, comparative studies on simulator types in different contexts, and exploration of simulators' role in promoting analytical skills, especially among diverse socioeconomic backgrounds and underserved communities (Patterson, n.d.; Linda Meltzer, 2021; Taherizadeh & Zamani, 2023).This research paper seeks to address these gaps by presenting evidence of enhanced analytical skills among professional education students using stock market simulators during their finance learning process.

II. PROPOSED METHOD

The present study is based on descriptive research, including the pre-test and post-test survey to analyze the analytical skills of the student's pre and post-exposure and hands-on experience with stock market simulators (Yakub et al., 2021) This experiment was conducted on 50 students pursuing professional education and opted for finance subjects to learn analytical skills in finance (Hardiana et al., 2020). The researcher has selected a census sampling method to select the study's respondents. A study is based on the 60 days (Patterson, n.d.) of observations of building investment portfolios with the help

Krishnaji Sarjerao Patil,
Department of Management Studies, Rajarambapu Institute of Technology, Islampur, Maharashtra, India.
krishnaji.patil@ritindia.edu

of analytical skills developed by the students through the hands-on experience of stock market simulators.

In this research study, we employed Spearman's rank correlation coefficient method to examine the correlation between utilizing stock market simulators and improving the analytical skills of 50 students (Moffit et al., 2010) who want to develop analytical skills in finance.

A pre-test survey was conducted to assess the participants' analytical skills before providing them access to a stock market simulator, specifically the money control platform. The students were given 60 days (Patterson, n.d.) to construct and manage investment portfolios using the simulator, where they could get an opportunity to learn and develop analytical skills.

Following the 60 days, a post-test survey was administered to evaluate the acquisition of analytical skills by the students through their engagement with the stock market simulator. The pre and post-test surveys comprised questions that evaluated various dimensions of investment, such as knowledge, objectives, preferences, time horizon, risk capacity, and risk attitude. The survey consisted of 10 questions, each assigned a weightage of 10 marks.

The total population of students was divided into five class intervals according to scored marks in the survey, and the percentage of students falling within each class interval was calculated. Subsequently, ranks (X) indicate the percentage of students belonging to concerned class intervals were assigned in descending order, with the highest percentage being assigned the first rank and the lowest percentage assigned the fifth rank. Similarly, ranks (Y) denotes the class intervals assigned based on the highest class interval, such that the first rank corresponded to marks ranging from 81 to 100, while the fifth rank corresponded to marks ranging from 0 to 20. Spearman's rank correlation coefficient (ρ) was then computed to determine the correlation between these variables based on the assigned ranks.

TABLE I
RANK ASSOCIATION OF PRE-TEST SURVEY RESULTS WITH
INVESTMENT SKILLS OF STUDENTS

Marks	% of Students	Rank X	Rank Y	d	d^2
0-20	17	3	5	-2	4
21-40	44	1	4	-3	9
41-60	20	2	3	-1	1
61-80	11	4	2	2	4
81-100	8	5	1	4	16
∑ d^2=					34

Source: Author's primary data collection

$$n=5, \sum d^2 = 34; \quad \rho\, 1 - \frac{6 \sum d^2}{n(n^2-1)}; \quad \rho = -0.7$$

TABLE II
RANK ASSOCIATION OF PRE-TEST SURVEY

			X	Y
Spearman's rho	X	Correlation Coefficient	1.000	-.700
		Sig. (1-tailed)	.	.094
		N	5	5
	Y	Correlation Coefficient	-.700	1.000
		Sig. (1-tailed)	.094	.
		N	5	5

Source: Calculations based on SPSS

TABLE III
RANK ASSOCIATION OF POST-TEST SURVEY RESULTS WITH
INVESTMENT SKILLS OF STUDENTS

Marks	% of Students	Rank X	Rank Y	d	d^2
0-20	6.4	5	5	0	0
21-40	13.8	3	4	-1	1
41-60	27.78	2	3	-1	1
61-80	42.5	1	2	-1	1
81-100	9.52	4	1	3	9
∑ d^2=					12

Source: Author's primary data collection

$$n=5, \sum d^2 = 12; \quad \rho\, 1 - \frac{6 \sum d^2}{n(n^2-1)}; \quad \rho = +0.4$$

TABLE IV
RANK ASSOCIATION OF POST-TEST SURVEY

			X	Y
Spearman's rho	X	Correlation Coefficient	1.000	.400
		Sig. (1-tailed)	.	.252
		N	5	5
	Y	Correlation Coefficient	.400	1.000
		Sig. (1-tailed)	.252	.
		N	5	5

Source: Calculations based on SPSS

By applying Spearman's correlation method, the researchers examined the correlation between the use of the stock market simulator and the improvement in investment skills, as measured by the pre and post-test surveys and the valuation of the portfolios. This statistical method allows for assessing the strength and direction of the relationship between two variables, in this case, the simulator and the enhancement of investment skills.

Spearman's correlation coefficient, denoted as "ρ" (rho), is then calculated using these ranks. This correlation coefficient ranges from -1 to +1, where a positive value indicates a positive relationship between the variables (as one variable increases, the other tends to increase), and a negative value indicates a negative relationship (as one variable increases, the other tends to decrease). A value of zero implies no correlation between the variables.

III. RESULT AND DISCUSSION

The transformation of raw mark data into ranks, as suggested by Jonsson and Lennung (2011), offers a unique perspective on the impact of the stock market simulator intervention on students' analytical skills. This method of analysis enables a comparison of the student's performance before and after the exposure to the stock market simulator, providing insights into the effectiveness of the intervention in enhancing their analytical abilities (Jonsson & Lennung, 2011).

The negative correlation (-0.7) observed in the rank association (ρ) of pre-test survey results signifies a decline in analytical skills, with fewer students falling into higher class intervals of marks. It suggests that students may have lacked hands-on experience and awareness of investment avenues before exposure to the stock market simulator, leading to comparatively lower analytical skills. It aligns with the notion

that practical experience is pivotal in fostering analytical thinking (Moffit et al., 2010).

Conversely, the positive correlation (+0.4) observed in the rank association (ρ) of post-test survey results indicates improved analytical skills after students engaged with the stock market simulator. The intervention, involving hands-on experience and exposure to investment avenues, contributed to an enhanced understanding of analytical concepts. The positive correlation also signifies that after the intervention, students exhibited a more favourable distribution across class intervals, suggesting an overall improvement in their analytical skills.

The participation of students in constructing their investment portfolios during the 60-day hands-on experience yielded noteworthy outcomes. The fact that 78% of students effectively used the stock market simulator and maintained a profitable investment portfolio underscores the practical utility of the simulator. This hands-on engagement resulted in tangible financial gains and fostered a sense of joy in learning and self-motivation among the students (Moffit et al., 2010). The experiential learning approach involving real-world application is a catalyst for enhancing analytical skills and intrinsic motivation.

The observed difference between marks obtained by students in the pre-test and post-test surveys highlights the significance of proper training and hands-on experience with a stock market simulator before constructing an investment portfolio. The 60 days provided (Patterson, n.d.) a substantial timeframe for students to acclimate to the simulator, demonstrating that consistent practice in selecting appropriate investment opportunities through risk-return analysis effectively hones newly acquired analytical abilities.
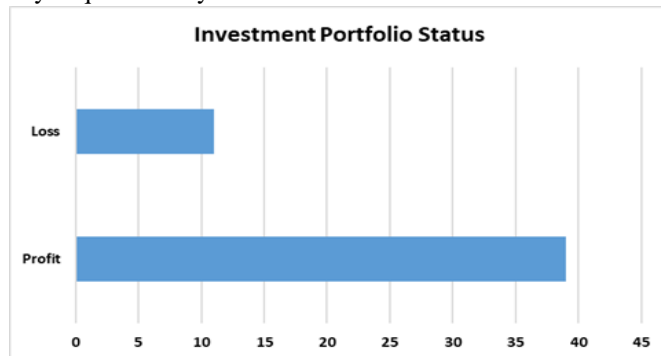

Fig. 1. Investment Portfolio Status (Source: Author's primary data collection)

Evaluation of the long-term impact of the stock market simulators on the analytical skills of the students evaluated through the valuation of an investment portfolio constructed by students in 60 days with the help of a stock market simulator. It has been observed that 39 students out of 50 had done excellent work in constructing investment portfolios. They earned a profit on their selected avenues of investment during the given period, and there was a positive difference in the investment cost and the latest investment value. It also indicated that 11 students could have performed the instructed activity better, and due to the wrong selection of investment avenues and inability to practice analytical skills, their investment portfolios showed losses.
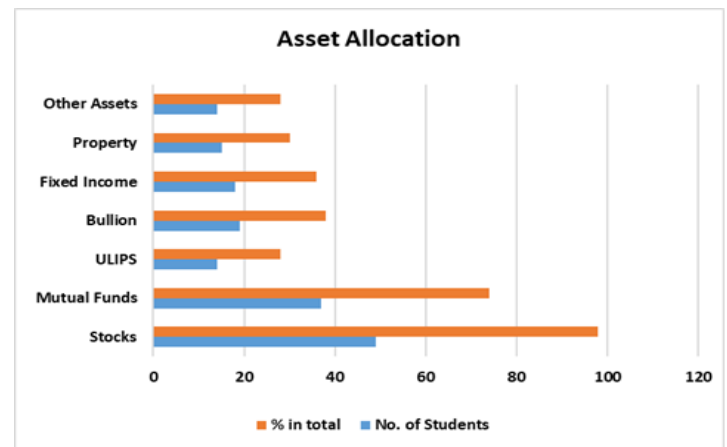

Fig. 2. Asset Allocation Status (Source: Author's primary data collection)

Students could learn about the diversification of risk through a diversified investment portfolio. It indicates that growing analytical skills help manage the risk with a diversified portfolio. The results shown in Fig. 2 indicated that 98% of students added stocks to their portfolio, 74% of students selected mutual funds as an investment option and ULIPS, bullion, fixed income, property, and other assets preferred by 28%, 38%, 36%, 30% and 28% of students respectively. It suggested that students make conscious decisions to diversify their investment portfolios, incorporating a mix of stocks, mutual funds, and various asset classes. It reflects a positive trend in using stock market simulators and awareness among students, laying a foundation for sound investment practices.

The study's findings were analysed based on the data collected from the surveys and the valuation of the investment portfolios constructed by the respondents. Spearman's correlation method enabled the researchers to determine whether there was a significant correlation between using the stock market simulator and improving the students' analytical skills in finance. The undertaken research study could record the following observations: Students of professional or technical education are opting for finance subjects like finance (Linda Meltzer, 2021) for engineers, investment analysis, personal finance management, project finance, etc., to develop analytical skills in finance (Moffit et al., 2010).

Using stock market simulators helps them enhance analytical skills if hands-on experience is provided for the long term (Raghava & Singh, 2016) in the learning process. It will enable them to get good employment opportunities in finance sector companies (Raghava & Singh, 2016) (Katrina Kirsch, 2021). Exposure to investment avenues could be possible by assigning one's investment portfolio construction tasks. The risk-taking ability of the students can be improved with the increasing interest in experimenting with different combinations of investment avenues based on the analysis of risk and return. The quality of investment decisions can be improved due to the freedom of independent decisions and the opportunity for repetitive trial and error methods.

The right preferences for the right investment avenues can be assigned during selection. It requires an in-depth analysis of principal investment, maturity period, returns generated over time and exact investment time. Analysis of a constructed investment portfolio can be possible due to the excellent verse

with risk-return trade of mechanism developed during the hands-on experience of stock market simulators. The structured teaching, learning and evaluation process helps in student engagement (Linda Meltzer, 2021) and attaining the desired outcomes (McCann & Russon, 2019).

IV. CONCLUSION

In conclusion, utilising stock market simulators emerges as a pivotal tool for enhancing students' analytical skills in finance. The transformation of raw mark data into ranks, guided by Jonsson and Lennung's approach, provided a nuanced understanding of the impact of the stock market simulator intervention. The negative correlation in the pre-test survey underscored the initial deficiency in analytical skills, potentially due to a lack of hands-on experience and awareness of investment avenues.

Conversely, the positive correlation in the post-test survey results highlighted a significant improvement in analytical skills following exposure to the stock market simulator. This positive shift was attributed to the hands-on experience and exposure to investment avenues, demonstrating the effectiveness of experiential learning in enhancing analytical abilities. The 60-day hands-on experience, where students actively participated in constructing their investment portfolios, yielded substantial benefits. The impressive 78% success rate in maintaining profitable portfolios showcased the simulator's practical utility. It instilled a sense of joy in learning and self-motivation among students, aligning with the principles of experiential learning.

The observed difference in marks between the pre-test and post-test surveys emphasized the need for proper training and hands-on experience before constructing an investment portfolio. The 60 days provided (Patterson, n.d.) ample time for students to acclimate to the simulator, reinforcing the idea that consistent practice in risk-return analysis effectively refines newly acquired analytical abilities. The study's broader implications suggest that students pursuing professional or technical education, especially in finance-related subjects, benefit significantly from using stock market simulators. The hands-on experience contributes to skill development and provides suitable employment opportunities in the finance sector. Exposure to investment avenues through portfolio construction tasks enhances risk-taking ability, improves the quality of investment decisions, and refines the selection of appropriate investment avenues.

Analytical skills are crucial for technical education students seeking employment in finance, particularly with investment bankers, merchant bankers, and financial service providers (Raghava & Singh, 2016). These skills are essential for handling vast customer data and transactions, enabling students to convert raw data into valuable information for effective decision-making (Areesophonpichet, 2013). Finance subjects like finance for engineers, investment analysis, and project finance are vital avenues for developing these skills (Linda Meltzer, 2021). To impart these skills, educational institutes should offer relevant finance subjects as major, minor, or open electives. Additionally, hands-on training with simulators during the teaching-learning process is crucial. This practical exposure helps students develop confidence in dealing with

market investment avenues, enabling them to effectively assess and predict risk-return trade-offs (Hardiana et al., 2020).

Ultimately, the structured teaching, learning, and evaluation process and the engagement facilitated by stock market simulators prove instrumental in achieving desired outcomes. The study provides a comprehensive understanding of the positive impact of stock market simulators on analytical skills, offering valuable insights for educators, institutions, and students in pursuing financial knowledge and proficiency.

REFERENCES

Ahdika, A. (2017). Improvement of Quality, Interest, Critical, and Analytical Thinking Ability of Students through the Application of Research Based Learning (RBL) in Introduction to Stochastic Processes Subject. *International Electronic Journal of Mathematics Education*, *12*(2), 167–191. https://doi.org/10.29333/IEJME/608

Areesophonpichet, S. (2013). *A Development of Analytical Thinking Skills of Graduate Students by using Concept Mapping*. www.iafor.org

Hardiana, N., Widoretno, S., Dwiastuti, S., -, al, Carmeli, C., Heinosaari, T., Toigo -, A., Karenina, A., Adi Prayitno -, B., & Putri Kus Sundari, P. (2020). Effectiveness of analytical thinking–based module to improve students' learning outcomes using concept map. *Journal of Physics: Conference Series*, *1511*(1), 012110. https://doi.org/10.1088/1742-6596/1511/1/012110

Hira, T. K., & Loibl, C. (2005). Understanding the impact of employer-provided financial education on workplace satisfaction. *Journal of Consumer Affairs*, *39*(1), 173–194. https://doi.org/10.1111/J.1745-6606.2005.00008.X

How to Improve Your Analytical Skills | HBS Online. (n.d.). Retrieved September 5, 2023, from https://online.hbs.edu/blog/post/how-to-improve-analytical-skills

Jonsson, A., & Lennung, S. A. (2011). ISSN 2094-5876 Educational Measurement and Evaluation Review (EMEReview). *Educational Measurement and Evaluation Review*, *2*, 3–17. http://pemea.club.officelive.com/EMEReview.aspx

Katrina Kirsch. (2021, November). *6 Analytical Skills Marketers Need and How to Improve Them*. Https://Blog.Hubspot.Com/. https://blog.hubspot.com/marketing/analytical-skills

Linda Meltzer. (2021). Experiential Learning and Student Engagement Through a Stock Market Simulation Game. *Developments in Business Simulation and Experiential Learning*, *48*(1), 35–46.

McCann, M., & Russon, J. A. (2019). Active financial analysis: Stimulating engagement using Bloomberg for introductory finance students. *International Review of Economics Education*, *30*, 100153. https://doi.org/10.1016/J.IREE.2018.12.001

Moffit, T., Stull, C., & McKinney, H. (2010). Learning Through Equity Trading Simulation. *American Journal of Business Education (AJBE)*, *3*(2), 65–74. https://doi.org/10.19030/AJBE.V3I2.386

Patterson, B. R. (n.d.). *THE EFFECTS OF THE STOCK MARKET GAME© SIMULATION AND CURRICULUM*

ON THE FINANCIAL LITERACY OF HIGH SCHOOL STUDENTS.

Peter A. Brous. (2017). *Real Option Application Project Enhancing Students' Analytical and Critical Thinking Skills on JSTOR*. Journal of Financial Education. https://www.jstor.org/stable/90018419?read-now=1#page_scan_tab_contents

Politsinsky, E., Demenkova, L., & Medvedeva, O. (2015). Ways of Students Training Aimed at Analytical Skills Development while Solving Learning Tasks. *Procedia - Social and Behavioral Sciences*, *206*, 383–387. https://doi.org/10.1016/J.SBSPRO.2015.10.070

Raghava, R., & Singh, M. (2016). Number 2 INNOVATIVE ASSESSMENT AND TEACHING PRACTICES IN MULTIPLE SETTINGS Article 2 2016 Part of the Education Commons Recommended Citation Recommended Citation Gundala. In *Journal of Educational Research and Innovation Fall* (Vol. 5, Issue 2). https://digscholarship.unco.edu/jeriAvailableat:https://digscholarship.unco.edu/jeri/vol5/iss2/2

Smith, C. M., & Gibbs, S. C. (2019). Stock market trading simulations: Assessing the impact on student learning. *Https://Doi.Org/10.1080/08832323.2019.1643279*, *95*(4), 234–241. https://doi.org/10.1080/08832323.2019.1643279

Taherizadeh, A., & Zamani, S. (2023). Winner Strategies in a Simulated Stock Market. *International Journal of Financial Studies 2023, Vol. 11, Page 73*, *11*(2), 73. https://doi.org/10.3390/IJFS11020073

Yakub, P., Puspitawati, R. P., & Bashri, A. (2021). Developing analytical skills through optimizing the learning process by science teachers in Nganjuk Regency. *Journal of Community Service and Empowerment*, *2*(2), 77–82. https://doi.org/10.22219/jcse.v2i2.16750

Yulina, I. K., Permanasari, A., Hernani, H., & Setiawan, W. (2019). Analytical thinking skill profile and perception of pre service chemistry teachers in analytical chemistry learning. *Journal of Physics: Conference Series*, *1157*(4). https://doi.org/10.1088/1742-6596/1157/4/042046