THE EFFECTIVENESS OF BLENDED LEARNING OVER TRADITIONAL LEARNING ON ACHIEVEMENT OF SENIOR SECONDARY CHEMISTRY STUDENTS

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ABSTRACT

This study examines the effectiveness of blended learning compared to traditional learning on the academic achievement of senior secondary chemistry students. A total of 100 students participated, with 50 students in each learning group. The results revealed that students in the blended learning group performed significantly better than those in the traditional learning group. Additionally, the study found that male students benefitted more from blended learning than female students, although no significant gender differences were observed within each learning environment.

Blended learning was found to foster student autonomy, increase engagement, and provide greater access to a variety of learning materials, which collectively contributed to improved academic performance. The study suggests that gender-specific strategies could further enhance the effectiveness of blended learning. Based on these findings, the study recommends that educators incorporate more blended learning methods, particularly in chemistry instruction, to enhance student achievement. Furthermore, school authorities and government bodies should invest in technology-enabled classrooms and provide comprehensive teacher training to ensure the effective implementation of blended learning. Ultimately, the study concludes that blended learning not only improves academic outcomes but also prepares students for success in an increasingly digital learning environment.

Keywords: Blended Learning, Traditional Learning, Senior Secondary Chemistry Students, Academic Achievement, Student Engagement, Gender Differences.

INTRODUCTION

In the latter half of 2019, a novel strain of coronavirus (COVID-19) emerged in Wuhan, China, soon becoming a global pandemic. COVID-19, where "CO" stands for corona, "VI" for virus, and "D" for disease, belongs to the same virus family as Severe Acute Respiratory Syndrome (SARS). By January 2020, COVID-19 cases had spread to India, with the first cases reported in Kerala on January 30, 2020, among medical students who had recently returned from Wuhan (The Hindu, January 20, 2020). In response to the escalating outbreak, Kerala announced the first lockdown on March 23, 2020, followed by a nationwide lockdown on March 25, 2020. A series of lockdown phases followed, disrupting numerous sectors—including education.

The educational system was significantly impacted, with school closures and major adjustments to curricula across the world. UNESCO reports that approximately 87% of the world's student population was affected by COVID-19 school closures (UNESCO, 2020). In this time of crisis, distance education, and specifically blended learning, emerged as a potential solution to support students' continued academic progress. Blended learning, a mix of traditional face-to-face instruction and online education, offered a flexible approach that could be adapted to the limitations imposed by lockdowns. This approach provided hope for over 1.5 billion students across 195 countries whose education had been disrupted by the pandemic. However, its implementation was challenged by various issues, including internet access, infrastructure limitations, and technical skill gaps among both students and teachers, as well as financial constraints faced by many families.

This study examines the effectiveness of blended learning compared to traditional learning in enhancing the academic achievement of senior secondary chemistry students. In a subject like chemistry, where understanding complex concepts and conducting practical experiments are essential, blended learning may offer unique advantages. This research seeks to determine whether blended learning provides an effective learning experience for students and can serve as a viable alternative to traditional classroom instruction in post-pandemic education.

PREVIOUS LITERATURE

Studies by Guskey (2000), Rovai (2003), Garrison and Kanuka (2004), Loukis, Georgiou, and Pazalo (2007), Hadad (2007), Park and Choi (2009), Morris and Lim (2009), Shraim and Khlaif (2010), Kenney and Newcombe (2011), Oxford Group (2013), Kwak, Menezes, and Sherwood (2013), Hofmann (2014), Demirkol and Kazu (2014), and Kintu and Zhu (2016) have explored blended learning environments in a variety of educational contexts, including higher education, professional development, and lower-grade levels (6th–10th grades). However, none of these studies specifically focus on senior secondary chemistry students, an important and transitional group in education. Given the significance of senior secondary education as a crucial step before entering higher education or the professional workforce, this gap in the literature underscores the need for further research in this area. This gap serves as the motivation for the present study.

Objectives of the study

1. To compare the average achievement scores of Senior Secondary students in blended learning and traditional learning environments.
2. To compare the average achievement scores of male and female chemistry students in a blended learning environment.
3. To compare the average achievement scores of male and female chemistry students in a traditional learning environment.
4. To compare the average achievement scores of male chemistry students in blended versus traditional learning environments.

5. To compare the average achievement scores of female chemistry students in blended versus traditional learning environments.

Hypotheses

1 There is no significant difference in the achievement scores between the two learning environments.
2 There is no significant difference between male and female students' scores in blended learning.
3 There is no significant difference between male and female students' scores in traditional learning.
4 There is no significant difference in male students' scores between blended and traditional learning.
5 There is no significant difference in female students' scores between blended and traditional learning.

The achievement of students will be studied unit wisei.e. Unit 1, Unit -2 (Some basic concepts of Chemistry and Structure of atom)

Sample

The present study was conducted on senior secondary students of K.P. Inter College, Prayagraj, for the 2022–2023 academic session. A total of 100 students were selected randomly and divided into two groups: 50 students (31 males and 19 females) for the traditional learning method, and 50 students (22 males and 28 females) for the blended learning method.

DESIGN AND METHODOLOGY

This experimental study involved two independent groups of senior secondary students from the 2022–2023 session, each taught using a different instructional method. Group 1 was taught through the traditional, face-to-face method, while Group 2 received instruction through a blended learning approach. The blended method utilized a combination of live lectures via Microsoft Teams, PowerPoint presentations, Google Classroom, assignments, and tests. The study focused on two units in chemistry: Unit 1 (Some Basic Concepts of Chemistry) and Unit 2 (Structure of Atom).
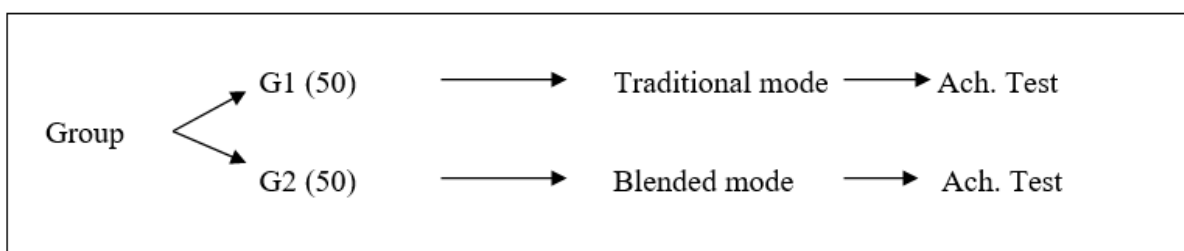
Tools Used

Achievement Tests: The effectiveness of each teaching method was measured using achievement tests specifically designed by the researcher for each unit. The reliability and validity of the tests were evaluated, yielding coefficients of 0.86 for reliability and 0.79 for validity.

Statistical Techniques

Data were analyzed using IBM SPSS Statistics 20.0 software, employing the T test to assess the differences in achievement between the two groups.

RESULT &INTERPRETATION

Table 1 *Comparison of Achievement Scores Between Blended and Traditional Learning Environments*

	method	N	Mean	Std. Deviation	t	df	Sig.
Achievement	Traditional	50	58.92	10.902	-3.32	98	0.05 *
	Blended	50	65.58	9.031			

Table 1 shows that the mean achievement score for students in the blended learning group (M = 65.58, SD = 9.03) was higher than that for students in the traditional learning group (M = 58.92, SD = 10.90) at a df = 98. The calculated t value of -3.32 was significant at the 0.05 level (p = 0.05). Thus, Hypothesis 1 was rejected, indicating that the achievement of students in the blended learning environment was significantly higher than those in the traditional learning environment. This finding is consistent with previous studies (Liu et al., 2016; Vo et al., 2017; Wei et al., 2017).

Table 2 *Achievement Scores of Male and Female Students in a Blended Learning Environment*

	Gender	N	Mean	Std. Deviation	t	df	Sig.
Achievement	Male	23	64.57	9.605	-0.73	48	Not Sig.
	Female	27	66.44	8.599			

Table 2 reveals that the mean achievement score for female students (M = 66.44, SD = 8.60) was slightly higher than that of male students (M = 64.57, SD = 9.61) in the blended learning environment at a df = 48. However, the calculated t value of -0.73 was not statistically significant (p > 0.05). Therefore, Hypothesis 2 was accepted, indicating that there was no significant difference in the average achievement scores between male and female chemistry students in the blended learning environment. This finding aligns with studies by Sahoo (2014), Oladejo et al. (2016), and Vahora (2018).

Table 3 *Achievement Scores of Male and Female Students in a Traditional Learning Environment*

	Gender	N	Mean	Std. Deviation	t	df	Sig.
Achievement	Male	31	57.55	11.676	-1.14	48	Not Sig.
	Female	19	61.16	9.371			

Table 3 shows that the mean achievement score for female students (M = 61.16, SD = 9.37) was higher than that of male students (M = 57.55, SD = 11.68) in the traditional learning environment at a df = 48. However, the calculated t value of -1.14 was not statistically significant (p > 0.05). As a result, Hypothesis 3 was accepted, meaning there was no significant difference between the average achievement scores of male and female students in the traditional learning environment. This finding is consistent with the research of Khan and Ali (2012), Dorji et al. (2015), and Okeke (2018).

Table 4 *Comparison of Achievement Scores of Male Students in Blended and Traditional Learning Environments*

	Gender	N	Mean	Std. Deviation	t	df	Sig.
Achievement	Traditional	31	57.55	11.676	-2.35	52	0.05 *
	Blended	23	64.57	9.605			

Table 4 illustrates that the mean achievement score for male students in the blended learning group (M = 64.57, SD = 9.61) was higher than that in the traditional learning group (M = 57.55, SD = 11.68) at a df = 52. The calculated t value of -2.35 was significant at the 0.05 level (p = 0.05). Therefore, Hypothesis 4 was rejected, indicating that the achievement scores of male students in the blended learning environment were significantly higher than those in the traditional learning environment. This finding is supported by research from Kenney and Newcombe (2011) and Melton et al. (2009).

Table 5 *Comparison of Achievement Scores of Female Students in Blended and Traditional Learning Environments*

	method	N	Mean	Std. Deviation	t	df	Sig.
Achievement	Traditional	19	61.16	9.371	1.97	44	0.05 *
	Blended	27	66.44	8.599			

Table 5 demonstrates that the mean achievement score for female students in the blended learning group (M = 66.44, SD = 8.60) was higher than in the traditional learning group (M = 61.16, SD = 9.37) at a df = 44. The calculated t value of 1.97 was significant at the 0.05 level (p = 0.05). Hence, Hypothesis 5 was rejected, indicating that the achievement scores of female students were significantly higher in the blended learning environment compared to the traditional learning environment. This finding is consistent with the research of Askar and Alton (2008) and Ranjan (2020).

EDUCATIONAL IMPLICATIONS

Based on the findings, blended learning offers significant educational benefits that can enhance the overall learning experience for students. By integrating the strengths of both traditional and digital learning environments, blended learning fosters increased student engagement, facilitates personalized learning, and encourages more frequent interaction between students and teachers. This approach offers greater flexibility, allowing students to learn at their own pace, which in turn enhances student autonomy, boosts confidence, and strengthens problem-solving skills. Moreover, the access to a wider range of learning materials in blended environments supports deeper understanding, leading to improved learning outcomes.

The analysis also revealed that male students benefit more from blended learning compared to their female counterparts, suggesting that the effectiveness of this instructional mode may vary based on gender. Therefore, teachers may need to tailor their use of blended learning to address gender-specific needs and achievement patterns, ensuring that all students have equal opportunities to succeed.

For broader success, government bodies and school authorities should play a key role in promoting the use of blended learning by providing well-equipped, technology-enabled classrooms. This can include investing in infrastructure and offering orientation programs that equip teachers with the skills and knowledge to use digital tools effectively. By supporting teachers with the necessary resources and training, schools can create more dynamic, inclusive, and engaging learning environments that cater to diverse student needs.

Ultimately, these efforts will not only improve academic performance but also help prepare students for success in a technology-driven world, where digital literacy and problem-solving abilities are crucial.

REFERENCES

[1]   Demirkol, M., &Kazu, I. Y. (2014). Effect of blended environment model on high school students' academic achievement. The Turkish Online Journal of Educational Technology, 13(1), 78–87.

[2]   Garrison, D. R., &Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. Internet and Higher Education, 7(2), 95–105.

[3]   Guskey, T. R. (2000). Evaluating professional development. Corwin Press.

[4]   Hadad, W. (2007). ICT-in-education toolkit reference handbook. InfoDev. Retrieved August 24, 2024, from http://www.infodev.org/en/Publication.301.html

[5]   Hofmann, J. (2014). Solutions to the top 10 challenges of blended learning. Top 10 challenges of blended learning. Available on cedma-europe.org.

[6]   Kenney, J., &Newcombe, E. (2011). Adopting a blended learning approach: Challenges encountered and lessons learned in an action research study. Journal of Asynchronous Learning Networks, 15(1), 45–57.

[7]   Liu, Q., Peng, W. J., Zhang, F., Hu, R., Li, Y. X., & Yan, W. R. (2016). The effectiveness of blended learning in health professions: Systematic review and meta-analysis. Journal of Medical Internet Research, 18, e2. https://doi.org/10.2196/jmir.4807

[8]   Loukis, E., Georgiou, S., &Pazalo, K. (2007). A value flow model for the evaluation of an e-learning service. ECIS, 2007 Proceedings, Paper 175.

[9]   Melton, B., Graf, H., &Chopak-Foss, J. (2009). Achievement and satisfaction in blended learning versus traditional general health course designs. International Journal for the Scholarship of Teaching and Learning, 3, 1–10. https://doi.org/10.20429/ijsotl.2009.030126

[10]   Oladejo, A., Nwaboku, N., Okebukola, P., &Ademola, I. (2021). Gender difference in students' performance in chemistry – can computer simulation bridge the gap?.Research in Science & Technological Education, 41, 1–20. https://doi.org/10.1080/02635143.2021.1981280

[11]   Oxford Group. (2013). Blended learning-current use, challenges and best practices. Retrieved August 24, 2024, from http://www.kineo.com/m/0/blended-learning-report-202013.pdf

[12]   Rovai, A. P. (2003). In search of higher persistence rates in distance education online programs. Computers & Education, 6(1), 1–16.

[13]   Shraim, K., &Khlaif, Z. N. (2010). An e-learning approach to secondary education in Palestine: Opportunities and challenges. Information Technology for Development, 16(3), 159–173.

[14]   Shrain, K. (2012). Moving towards e-learning paradigm: Readiness of higher education instructors in Palestine. International Journal on E-Learning, 11(4), 441–463.

[15]   Swan, K. (2001). Virtual interactivity: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. Distance Education, 22(2), 306–331.

[16]   Vo, H. M., Zhu, C., & Diep, N. A. (2017). The effect of blended learning on student performance at course-level in higher education: A meta-analysis. Studies in Educational Evaluation, 53, 17–28. https://doi.org/10.1016/j.stueduc.2017.01.002

[17]   Willging, P. A., & Johnson, S. D. (2009). Factors that influence students' decision to drop out of online courses. Journal of Asynchronous Learning Networks, 13(3), 115–127.

[18]   Wei, Y., Shi, Y., Yang, H. H., & Liu, J. (2017). Blended learning versus traditional learning: A study on students' learning achievements and academic pressure. In Proceedings of the International Conference on Information Science and Education (pp. 219–223). https://doi.org/10.1109/ISET.2017.57